Part II
Changing Factor Costs and Shares of Gross Income by Industry

Sector Changes in Unit Labor Costs

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Introduction

The subject of unit costs, including labor costs, at one time aroused
sporadic interest, which tended to be highly correlated with the oc-
currence, or the threat of inflation. The promulgation of wage-price
guideposts by the Council of Economic Advisers in January 1962 [1] and
the increasing role they have played as policy instruments has fostered
a more frequent and regular examination of unit cost trends and tended
to bring the subject to the attention of a wider audience, particularly
outside the economic profession. With or without the guideposts, the
analysis of unit labor-cost trends has included intensive examination of
two major determinants of cost—productivity and wages.

Analysis of these trends has been aided by the availability of annual
indexes of productivity, compensation per man-hour, and compensation
per unit of output for employees in the nonfarm sector of the economy,
which have been published regularly by the Bureau of Labor Statistics
since 1957. More recently, the Bureau has developed and published a
similar range of estimates for employment costs in the total private
economy, including both the farm and nonfarm sectors.[2] There are some
questions about the meaningfulness of these over-all measures—about
which more will be said later.

[1] *Economic Report of the President,* January 1962.
[2] *Economic Report of the President,* January 1966.

The recent availability of sector output measures consistent with the concept of gross national product has made it possible to develop new estimates of sector output per man-hour, compensation per man-hour, and unit employment costs (Table 1).[3] These sector ratios are useful not only for tracing the individual sector trends but also for "explaining" the trends of the total private economy.[4]

The purpose of this paper is to examine the trends in the sector ratios, the determinants of variation in sector unit labor-cost trends, and the effect of sector trends on the over-all figures for the private economy. The paper also examines the extent to which the trends in unit labor costs, hourly compensation, and output per man-hour for the nonfarm economy and for the private economy are affected by shifts among sectors.

Limitations, Qualifications, and Definitions

The analysis of the trends in the private economy and its component sectors and their interrelationships has encountered some difficult problems arising out of (1) limitations or inadequacies in the basic data and (2) the difficulty of defining conceptual issues sharply and clearly.

The sector output measures are gross output originating in the respective sectors, in constant (1958) dollars. When these sector output measures are summed they equal total private gross national product. The availability of this detail makes it easier to scrutinize the composition of GNP, and computing the various ratios makes it easier to evaluate the "reasonableness" of some of the trends.

To be sure, this evaluation often tends to be influenced by intuitive judgments. Nevertheless, the productivity trends derived for some of the sectors do not appear reasonable. For example, those for the construction sector show a decline in productivity in the last few years—a trend which does not accord with other information available for this important activity. In this case, the deflator for construction volume

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[3] The sector data from the Office of Business Economics cover the period 1947–64 and are not yet consistent with the most recent revised estimates of total gross national product and are being revised. It is hoped that the revised sector estimates will not yield significantly different results from those appearing in this paper. Meanwhile, these estimates are tentative and not to be regarded as official BLS estimates of either productivity or unit labor costs.

[4] The general government sector is excluded from these calculations. Its output is measured by wages and salaries moved by the trend in employment.

TABLE 1

Indexes of Unit Labor Costs, Hourly Compensation, and Output Per Man-Hour for Employees in the Private Nonfarm Economy and Major Sectors, 1947–64

(1947 = 100)

Years	Private Nonfarm Economy[a]			Mining			Construction			Manufacturing		
	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour
1948	107.3	108.7	103.0	106.5	114.3	104.8	112.8	111.6	100.3	106.2	109.4	104.9
1949	104.9	111.9	107.9	106.5	117.5	108.5	106.4	111.0	105.8	106.2	114.4	108.4
1950	104.9	118.3	114.1	106.5	127.9	119.5	110.6	118.7	109.2	104.2	120.1	115.7
1951	112.2	128.6	115.8	109.7	139.6	125.8	121.3	129.7	108.3	112.5	132.4	118.5
1952	117.1	135.7	116.8	112.9	146.1	128.6	131.9	136.8	105.2	120.8	141.0	118.9
1953	122.0	143.7	119.7	112.9	155.2	137.2	134.0	147.7	111.9	122.9	148.9	122.0
1954	122.0	148.4	122.7	106.5	156.5	145.9	134.0	154.2	116.8	127.1	155.4	124.1
1955	122.0	153.2	127.6	103.2	161.0	152.5	134.0	154.8	117.4	125.0	161.2	131.1
1956	129.3	162.7	127.0	109.7	173.4	154.7	140.4	159.4	114.1	133.3	171.9	129.7
1957	134.1	172.2	129.9	112.9	180.5	156.1	151.1	171.0	115.0	139.6	182.0	132.2
1958	134.1	178.6	133.6	112.9	183.8	161.8	153.2	181.3	119.0	145.8	189.9	132.2
1959	136.6	186.5	137.2	109.7	185.1	165.8	157.4	185.2	119.3	143.7	197.8	139.5
1960	141.5	193.7	139.1	109.7	191.6	174.8	163.8	196.8	120.8	147.9	205.8	142.0
1961	141.5	200.0	143.4	106.5	198.7	186.5	170.2	205.2	121.1	147.9	212.2	145.5
1962	141.5	207.9	149.0	103.2	205.8	195.4	178.7	211.0	119.0	145.8	220.9	154.2
1963	141.5	215.1	153.0	103.2	209.1	201.8	189.4	218.7	116.2	143.7	228.8	160.1
1964	143.9	225.4	158.2	103.2	215.6	207.0	200.0	231.6	116.8	143.7	238.8	167.5

(continued)

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TABLE 1 (continued)

Years	Transportation			Communications			Public Utilities			Trade		
	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour
1948	108.7	109.5	100.7	104.3	107.1	102.7	100.0	109.0	109.0	107.0	106.8	99.6
1949	117.4	117.5	99.0	104.3	115.7	110.7	100.0	115.2	117.0	104.7	108.5	101.4
1950	115.2	127.0	110.1	102.1	122.1	118.1	100.0	121.4	123.4	102.3	114.5	109.4
1951	119.6	137.2	113.8	102.1	129.3	126.4	94.4	131.7	138.7	111.6	121.4	107.2
1952	128.3	145.3	112.4	106.4	140.0	129.8	97.2	141.4	146.9	114.0	125.6	108.3
1953	134.8	152.6	113.1	108.5	147.1	135.1	97.2	150.3	154.6	118.6	131.6	110.1
1954	137.0	157.7	115.8	112.8	154.3	137.5	94.4	158.6	169.6	120.9	135.9	111.6
1955	132.6	162.8	123.5	108.5	160.0	145.8	94.4	165.5	178.8	116.3	141.0	118.8
1956	137.0	173.7	126.2	112.8	165.7	147.5	94.4	175.2	187.8	123.3	149.6	119.6
1957	145.7	184.7	126.5	110.6	175.0	157.2	94.4	184.1	196.5	127.9	159.0	122.8
1958	150.0	194.2	129.5	106.4	184.3	171.6	97.2	199.3	205.7	130.2	164.1	124.6
1959	152.2	202.2	133.6	104.3	196.4	186.3	94.4	210.3	222.2	130.2	170.9	129.3
1960	154.3	210.9	136.2	104.3	204.3	194.3	94.4	218.6	234.9	134.9	177.8	127.9
1961	154.3	216.1	140.6	102.1	215.7	209.0	94.4	230.3	246.9	137.2	183.8	132.2
1962	152.2	223.4	147.7	100.0	224.3	224.1	91.7	239.3	261.3	134.9	190.6	138.4
1963	147.8	229.9	155.7	95.7	232.9	239.8	91.7	249.0	270.3	137.2	198.3	142.0
1964	147.8	238.0	161.7	97.9	245.7	250.8	94.4	261.4	281.8	139.5	206.8	146.7

(continued)

TABLE 1 (concluded)

Years	Finance, Insurance, and Real Estate			Services			Government Enterprises		
	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour
1948	115.4	106.9	98.5	102.5	108.1	104.6	101.9	106.3	105.1
1949	115.4	110.8	100.8	105.0	112.8	105.5	101.9	112.6	110.6
1950	115.4	119.2	105.8	107.5	114.0	104.6	111.1	119.7	107.7
1951	123.1	126.2	106.9	115.0	123.3	105.5	111.1	126.8	114.5
1952	123.1	131.5	106.8	120.0	130.2	106.0	116.7	135.4	115.3
1953	130.8	138.5	108.1	127.5	137.2	106.4	120.4	139.4	116.2
1954	138.5	145.4	110.9	132.5	143.0	106.9	127.8	140.9	110.2
1955	138.5	150.8	112.1	135.0	146.5	108.3	140.7	148.8	106.4
1956	146.2	161.5	114.2	140.0	155.8	110.1	159.3	155.1	97.4
1957	146.2	170.8	117.8	145.0	166.3	112.8	161.1	162.2	100.4
1958	153.8	178.5	118.9	150.0	174.4	114.7	172.2	174.8	102.1
1959	161.5	187.7	119.8	155.5	183.7	117.4	174.1	178.7	103.0
1960	161.5	195.4	121.4	162.5	191.9	117.4	181.5	190.6	104.7
1961	169.2	206.9	125.1	165.0	198.8	119.3	172.2	190.6	110.6
1962	169.2	210.0	127.7	170.0	208.1	121.1	172.2	200.0	116.2
1963	169.2	216.2	128.9	175.0	216.3	121.1	183.3	210.2	114.9
1964	176.9	225.4	132.3	185.0	230.2	122.9	174.1	217.3	124.7

Source: Output and compensation data are from the U.S. Department of Commerce, Office of Business Economics. Man-hour data are from U.S. Department of Labor, Bureau of Labor Statistics.

a Excludes general government and farm.
b Employee compensation per unit of output.

appears suspect. In other sectors where the changes in the volume of
output are largely determined by the trend in wages and salaries, the
output measure has limitations similar to that of the government sector
—the output and productivity trends may be understated and the
resultant unit labor-cost trends overstated.

The concept or definition of unit labor costs may be a bit trouble-
some depending on the objective and uses of the measures. One may
be interested in determining whether, for the total private economy,
there has been an imbalance in the trends of productivity and compensa-
tion and whether, as a result, unit labor costs have been declining or
rising. An economy-wide measure may, however, not be useful in ex-
amining cost-price relationships because of the variable impact of costs
upon prices among different sectors of the economy.

Compensation (or wages) per man-hour and unit labor costs are
usually derived—although not explicitly spelled out—in the context of
all employee costs. However, unit labor costs are often mentally trans-
lated as relating to production workers, or blue-collar workers, al-
though they include administrative, supervisory, clerical, and other
employees.

In deriving unit labor cost estimates by relating productivity to com-
pensation per man-hour, one has to take account of the fact that the
productivity figures are usually based on output per man-hour of all
persons engaged, including employees, self-employed, and unpaid
family workers. A compatible compensation per man-hour figure would
also have to include all persons. However, wage (or salary, or com-
pensation) statistics are not available for the self-employed. The in-
come reported for this group is total income (of proprietors), which
includes, implicitly, wage payments, return on investment, interest, etc.
So it is necessary to estimate compensation per man-hour for the self-
employed (i.e., the wage return to proprietors) for comparison with
output per man-hour of all persons in the total private economy.

In sectors such as manufacturing, finance, mining, and transporta-
tion, where there is relatively very little self-employment, trends in out-
put per man-hour of all persons or of employees would be virtually the
same. For sectors such as trade and construction, where self-employ-
ment is rather important, a change in the ratio of self-employed to the
total could have a significant effect on productivity trends. In the farm

sector, where only one-third of the persons engaged are employees, an output per employee figure would have little meaning.

Alternative compensation and cost estimates are, therefore, presented in this paper. One estimate, for the total private economy, is based on all persons, including the self-employed. Another estimate, for the nonfarm sector, includes employees only, and omits the self-employed. Unit labor-cost estimates for the nonfarm sector are probably more appropriate for wage-cost-price analysis than those for the total private economy since prices of farm output are largely determined by factors other than labor costs.

Compensation, as used in this paper, reflects payments by an employer directly to employees (wages and salaries) and to Social Security and private welfare and pension plans. There is another concept of employment costs which embraces a group of indirect employment costs such as maintenance of a cafeteria, recreational facilities and first aid unit, payments for workmen's compensation, and others. These costs are not included in the compensation and unit labor-cost estimates.

The man-hour estimates used in the hourly compensation and productivity measures were developed primarily from published estimates of employment and hours obtained by the Bureau of Labor Statistics from establishments in the various industries throughout the economy. These BLS establishment estimates provided data on employment for all sectors of the private nonfarm economy, but average-hours data were available only for production workers in manufacturing and mining and nonsupervisory workers in certain nonmanufacturing industries. As a result, the BLS establishment data had to be supplemented with data from other sources and in some cases imputations had to be made.

Major supplements included the following: (a) average hours for nonsupervisory workers in some sectors for which no establishment information was available, (b) average hours of nonproduction workers and supervisory workers for all sectors, and (c) numbers and average hours of self-employed and unpaid family workers by sector. For the most part, data for (a) were based on unpublished estimates from the household (labor force) surveys conducted by the Bureau of the Census for the BLS. These data were adjusted to make them as consistent as possible in concept with the hours from the establishment

survey. Estimates for (b), the average hours of nonproduction workers, were based either on information on scheduled hours of professional, technical, clerical, and administrative workers derived from the BLS surveys of supplementary payments and community wage surveys or by imputing the average hours of nonsupervisory workers for each sector to those of supervisory workers. Data for (c) were developed from OBE information on the number of proprietors as derived from the *Survey of Current Business* and on BLS Labor Force estimates of weekly hours.

Finally, this analysis is focused primarily on the question of costs. It is important, however, not to overlook the income implications of the wage-productivity relationship. Unit labor costs may remain stable, but if consumer prices increase, the increase in money wages does not measure the change in purchasing power of the worker. In order to examine the extent to which workers are sharing the economy's productivity growth, it would be necessary to compare changes in *real* compensation per man-hour with the trend in output per man-hour for the economy. Since this paper is to deal specifically with costs, the real-wage–productivity relationship is not explored, but it should not be ignored in any analysis of the income-sharing potential of productivity growth.
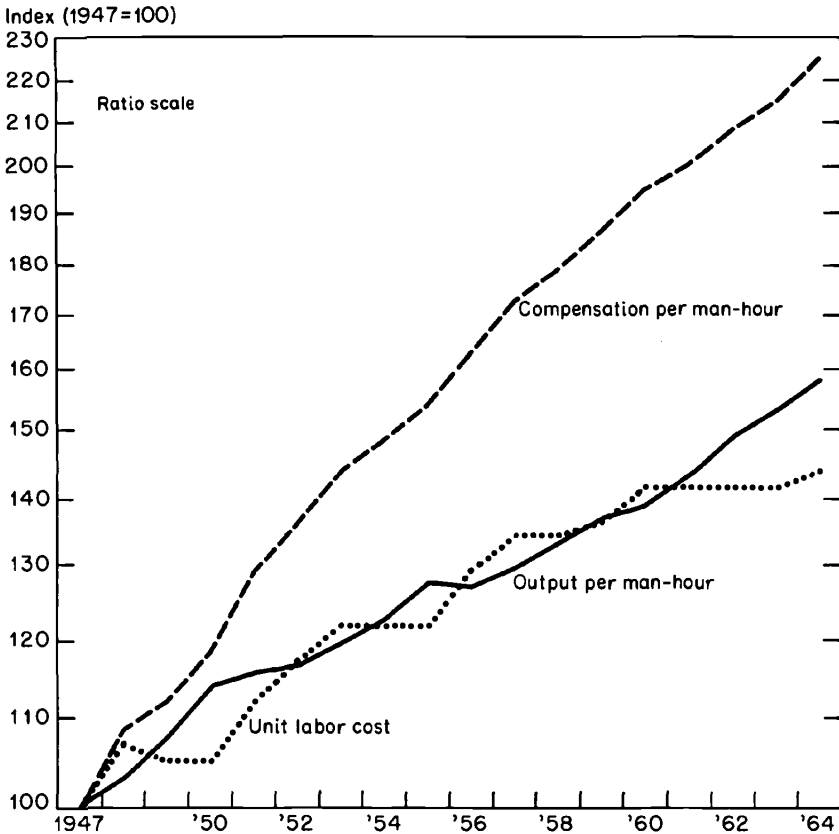
Employee Unit Labor Costs in the Nonfarm Economy

The analysis will first be focused on unit labor costs for employees in the private nonfarm economy—employees only because employee man-hours represent over 85 per cent of the total man-hours of persons engaged in nonfarm activities and employee compensation is the largest single element of the value of production—the nonfarm economy because of the important role of unit labor costs in relation to price movements. In contrast, farm price movements are largely determined by elements other than employee unit labor costs. Moreover, employees comprise less than a third of the work force in the farm sector; [5] cost estimates based on compensation of employees only would exclude payment for the bulk of labor activities involved in the farm production process.

[5] In 1947 the man-hours of proprietors and unpaid family workers represented 81 per cent of total man-hours. In 1964 they were 71 per cent.

CHART 1

Indexes of Unit Labor Costs: Hourly Compensation and Output per Man-Hour for Employees in the Private Nonfarm Economy, 1947–64 (1947 = 100)

OVER-ALL SECTOR TRENDS

Over the entire postwar period 1947–64 employee compensation per unit of output in the private nonfarm economy (unit labor costs) rose 2.2 per cent per year.[6] This growth was not uniform, however, as can be seen in Chart 1. A pattern of sharp increases from 1947–60, interrupted briefly for two two-year periods, was followed by a pattern of relatively small increases in the 1960's.

[6] This rate and all rates in this paper were derived from the least squares trend of the logarithms of the index numbers.

The figures present the common problem of showing different trends depending on which terminal years are selected for analysis. But they do seem to indicate two periods with different patterns of change within the 1947–60 period. First, the period 1947–56 which included alternating periods of sharp increases and moderate decreases in unit labor costs for an average gain of 2.7 per cent. Second, the period 1956–60 with a fairly steady but more moderate average rise of 1.9 per cent. The more recent period 1960–64, with an average gain of 0.5 per cent, can be regarded as one of virtual stability in unit labor costs.

Since changes in unit labor costs reflect the interplay of changes in hourly compensation and hourly output (productivity), one avenue of analysis is to explore how these have moved relative to each other at the aggregate level. At the same time, since trends in unit labor costs in the nonfarm economy reflect the separate movements of the component sectors as well as shifts in the importance of these sectors, another avenue would be to explore the separate sector movements and how they contributed to the total change.

Starting at the aggregate level, over the entire period 1947–64 the increase in hourly compensation was 4.8 per cent per year. This reflected a rise of 5.2 per cent per year from 1947–60 and 3.8 per cent from 1960–64—a substantial decline in the rate. Output per employee man-hour had a correspondingly reverse pattern, rising from a 2.5 per cent annual rate from 1947–60 to a 3.3 per cent rate from 1960–64. The interplay of the two patterns resulted in the sharp break which occurred in the trend of unit labor costs around 1960. Thus, greater-than-average (i.e., postwar average) increases in hourly compensation with approximately average productivity gains resulted in the 2.6 per cent annual increase in unit labor costs in the first part of the period (1947–60). Less-than-average increases in hourly compensation and greater-than-average gains in output per man-hour provided the small 0.5 per cent rate for the later years.

Annual and cyclical variations in the movement of unit labor costs also seem to have undergone some change. The years 1947–60 were characterized by brief periods of rapid increases and decreases in unit labor costs and the magnitude of these changes was substantial. In contrast, the 1960–64 period has been marked by smaller year-to-year fluctuations. As can be seen in Chart 1, these short-term changes in

unit labor costs in the early part of the period are primarily reflections of changes in the movements of productivity.

INDIVIDUAL SECTORS

Table 2 presents the average annual rates of growth of unit labor costs, hourly compensation, and output per man-hour for each of the separate sectors which comprise the nonfarm economy. They are listed in order of unit labor-cost increases from the smallest to the highest. It is evident that the over-all rate reflects a wide dispersion of individual sector rates, ranging from an actual decline of 0.4 per cent per year for public utilities to a rise of 4.2 per cent for government enterprises.[7] The degree of dispersion as measured by the coefficient of variation [8] of the various sector rates about the nonfarm rate is a very high 74 per cent.

What is also evident from the table is that the dispersion in the changes in unit labor-cost rates among the various sectors is almost entirely a reflection of the variation in the rates of productivity growth. The coefficient of variation of the rates of productivity change among the sectors was 79 per cent, whereas the coefficient for hourly compensation was only 10 per cent.

These findings are consistent with those found in earlier studies of the relationship of movements in hourly compensation, productivity, and unit labor costs. For example, in their examination of costs in manufacturing industries covering the period 1948–56, Schultze and Tryon found that there was substantial variation among different industries in the percentage rise in unit labor costs (Chart 2) and that differences in productivity behavior (Chart 4) were more important than wage and salary changes (Chart 3) in producing the variation in unit labor-cost changes.[9]

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[7] Too much emphasis should not be placed on the actual level of the increases for some of the sectors. The adequacy of the separate sector output and man-hour measures vary considerably. While these measures are useful as general indicators, they do have limitations.

[8] The coefficient of variation, the standard deviation as a percentage of the weighted mean change, measures the extent to which indicated changes for the individual sectors are clustered about the mean percentage change for the nonfarm economy.

[9] Charles L. Schultze and Joseph I. Tryon, "Prices and Costs in Manufacturing Industries," Study Paper No. 17. Materials prepared in connection with the Study of Employment Growth and Price Levels, Joint Economic Committee, Congress of the United States, January 1960.

TABLE 2

Average Annual Rates of Change[a] in Unit Labor Costs, Hourly Compensation, and Output per Man-Hour for Employees in the Private Nonfarm Economy and Major Sectors, Selected Periods, 1947–64, in Percentages

Sector	1947–64			1947–60			1960–64		
	Unit Labor Costs	Output Per Man-Hour	Hourly Compensation	Unit Labor Costs	Output Per Man-Hour	Hourly Compensation	Unit Labor Costs	Output Per Man-Hour	Hourly Compensation
Private nonfarm economy[b]	2.2	2.5	4.8	2.6	2.5	5.2	0.5	3.3	3.8
Public utilities	-0.4	6.3	5.8	-0.5	6.7	6.2	-0.3	4.7	4.5
Communications	-0.2	5.5	5.3	0.4	5.0	5.5	-1.9	6.7	4.6
Mining	-0.0	4.3	4.2	0.5	4.4	4.9	-1.5	4.3	2.9
Trade	2.0	2.3	4.4	2.3	2.1	4.5	0.7	3.5	3.9
Transportation	2.3	2.8	5.1	3.1	2.5	5.7	-1.3	4.6	3.1
Manufacturing	2.5	2.7	5.2	3.2	2.5	5.7	-0.9	4.4	3.8
Finance, insurance, and real estate	3.1	1.7	5.0	3.5	1.6	5.3	1.8	2.0	3.4
Services	3.7	1.2	4.9	3.9	1.1	5.1	3.2	1.1	4.6
Construction	3.8	1.0	4.9	3.7	1.4	5.1	5.2	-1.1	4.0
Government enterprises	4.2	0.4	4.6	5.3	-0.4	4.8	-0.2	4.0	3.7

Source: Output and compensation data are from the U.S. Department of Commerce, Office of Business Economics. Man-hours data are from the U.S. Department of Labor, Bureau of Labor Statistics.

[a] All rates computed from the least squares trend of the logarithms of the index numbers.

[b] Excludes general government and farm.

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CHART 2

Indexes of Unit Labor Costs for Employees in Nonfarm Sectors,
1947–64
(1947 = 100)
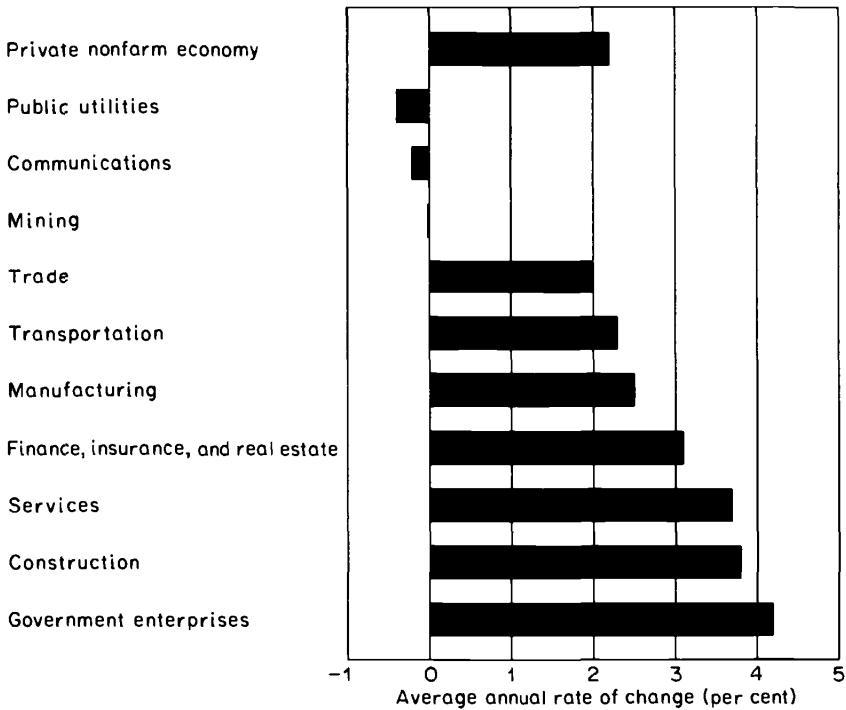
Apparently, this wide dispersion of unit labor-cost movements and their close relationship to differences in productivity changes rather than differences in hourly compensation movements was true for sub-periods within the postwar period.

Not only did each of the separate sectors show differences in their average annual rates over the entire period but their patterns of movement varied. For example, the over-all decline in unit labor costs for the public utilities sector and the communications sector are the result of two distinctly different patterns of change over the period. The following section describes in somewhat repetitive detail the movements of unit labor costs and the related productivity and hourly compensation behavior for each of the major sectors. No attempt was made

CHART 3
Indexes of Hourly Compensation for Employees in Nonfarm Sectors,
1947–64
(1947 = 100)
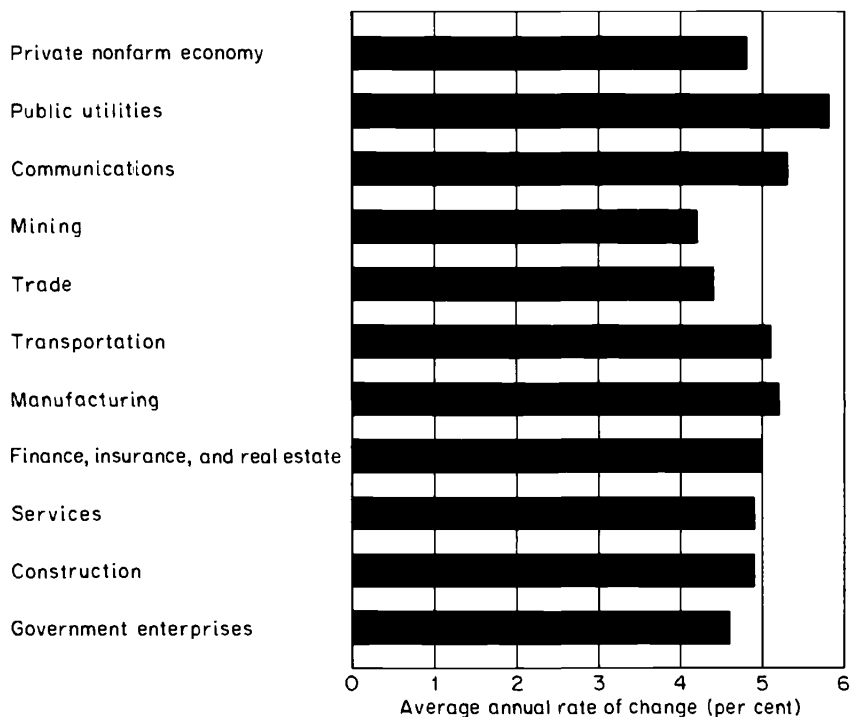
to explain differences in movements or underlying factors contributing
to the pattern primarily because of data limitations as well as a desire
to minimize the speculation which would have been required.

Public Utilities

This sector comprises electrical, gas, and sanitary enterprises. In
1964 it produced approximately 3 per cent of the output in the non-
farm sector and its employee man-hours accounted for 1.3 per cent
of nonfarm man-hours.

Unit labor costs for this sector show the greatest decline of all
nonfarm sectors in the entire postwar period. The average annual rate
of decline was 0.4 per cent per year. This sector also experienced the

CHART 4

Indexes of Output per Man-Hour for Employees in Nonfarm Sectors,
1947–64
$(1947 = 100)$
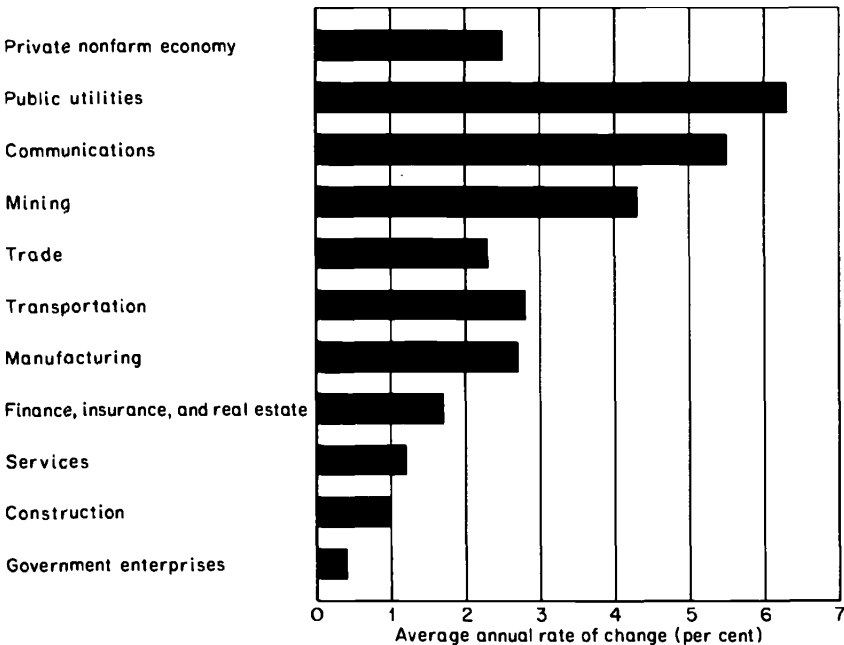
greatest increase in hourly compensation for all sectors (5.8 per cent per year). Despite the high wage cost increase, the decline in unit labor costs occurred because the productivity increase was a substantial 6.3 per cent per year, the highest increase of all sectors.

The over-all decline in unit labor costs was not uniform, however, and resulted from numerous reversals in the trend within the period. There were, in fact, three annual increases in unit labor costs, two years with no change, and twelve annual declines with as many as six turning points. However, within the period, three general patterns of trend movement seem to emerge from examination of Chart 5. From 1947 to 1955 there was an irregular but still over-all decline, followed by a gradual rise and sharp gain in the recession year 1958, after which the decline continued. It has been modified in the last few years and, in fact, from 1959 the long-run rate of change has been virtually stable.

CHART 5

Indexes of Unit Labor Costs: Hourly Compensation and Output per
Man-Hour for Employees in Public Utilities, 1947–64
(1947 = 100)
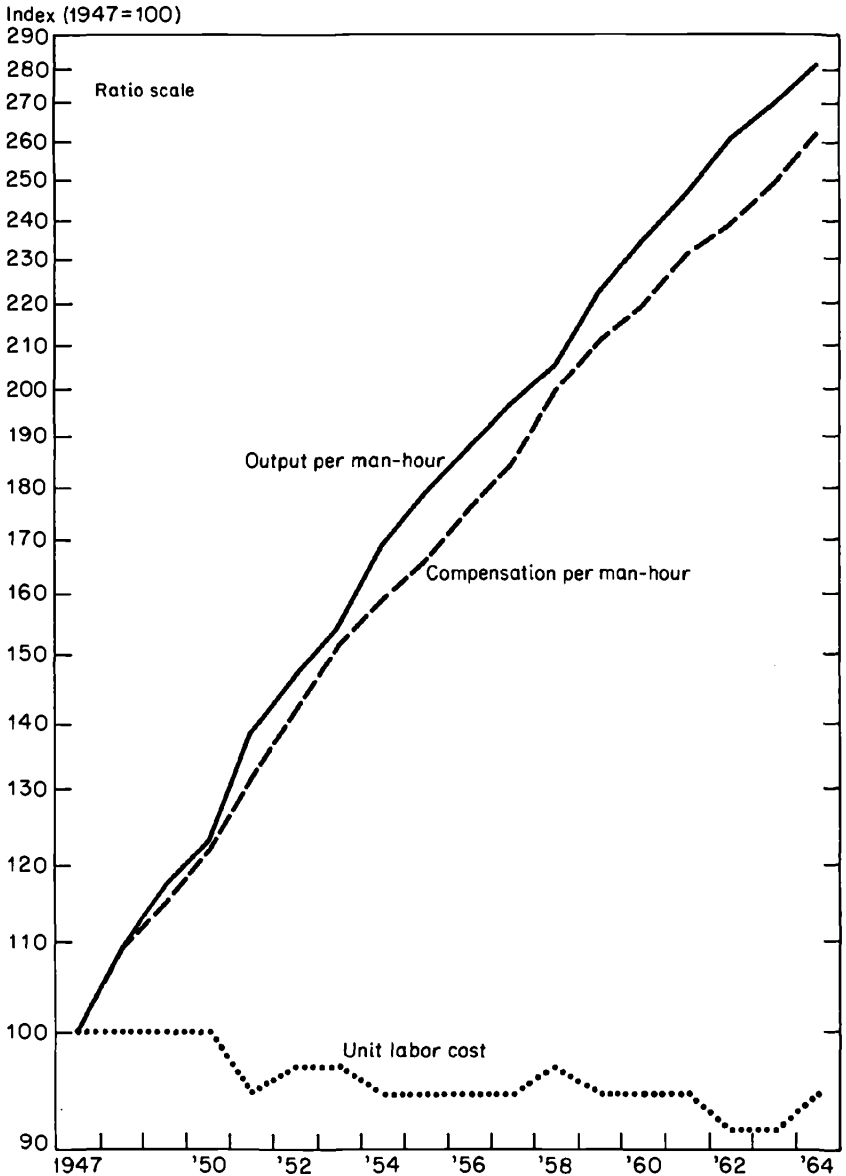
The year-to-year variability in unit labor-cost movements was primarily a reflection of the variability in the productivity movements. Productivity in this sector was very sensitive to output changes and the over-all trend corresponded very closely to the movement of output.

Communications

This sector comprises the telephone, telegraph, and radio and television industries, representing approximately 2 and one-half per cent of the output in the nonfarm sector and 1.7 per cent of the man-hours. It also experienced an over-all decline in the trend of unit labor costs over the entire period, although the decline was small (0.2 per cent per year). Again, both the increases in productivity and in hourly compensation were substantial (5.5 and 5.3 per cent per year, respectively).

The over-all slight decline in unit labor costs resulted from a very distinctly diiierent pattern of movement from that of public utilities. Here, a period of increases was followed by a period of steady declines (Chart 6). With the exception of small declines in 1950 and 1951, from 1947 through the middle 1950's the pattern was rising unit labor costs averaging 1.3 per cent per year, which was primarily a reflection of very substantial increases in hourly compensation. Since 1956, with the exception of 1964, there was a rather steady decline in unit labor costs, averaging 1.9 per cent for the period 1956–64.

The decline since 1956 has resulted from the very high productivity gains with the somewhat less than average increases in hourly compensation. The high productivity gains in turn were associated with large output increases. Since 1956, communications was the leading growth sector in the private nonfarm economy. Its output grew at a rate of 6.5 per cent during this period and its productivity gains averaged 7.0 per cent.
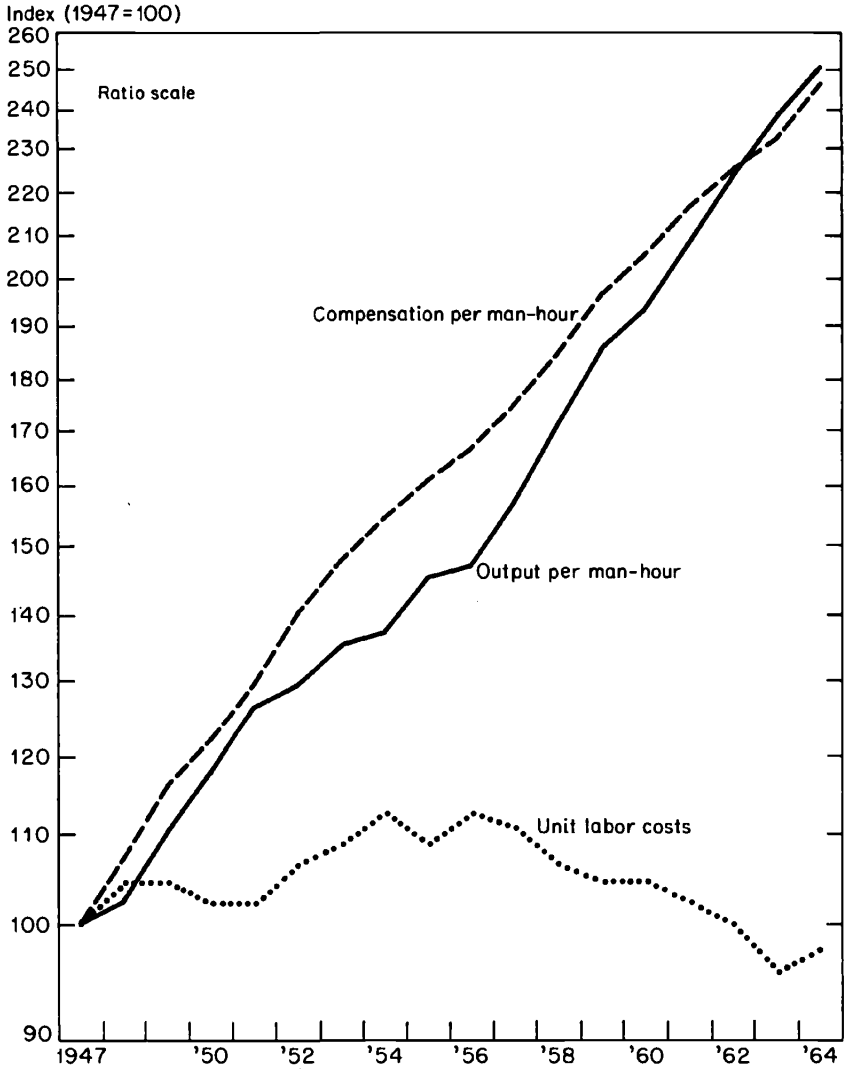
Mining

This sector comprises metal mining, coal mining, crude petroleum and natural gas production, and the mining and quarrying of nonmetallic minerals. It accounted for approximately 3 per cent of the output in 1964 and 1.3 per cent of the total man-hours. Its importance within the nonfarm sector has declined very substantially since 1947.

Despite a low output growth rate (2.1 per cent per year, which was

CHART 6

Indexes of Unit Labor Costs: Hourly Compensation and Output per
Man-Hour for Employees in Communications, 1947–64
(1947 = 100)

Index (1947 = 100)

next to the lowest for the individual sectors), mining maintained a high and stable rate of productivity gains (4.3 per cent per year). Its gain exceeded those for all sectors with the exception of public utilities and communications. The high productivity rate had the effect of keeping unit labor costs almost stable. For the entire period, they showed an insignificant decrease of less than one-tenth of a per cent per year and for the seven years 1957–64 there was a substantial decline, averaging 1.5 per cent annually (Chart 7).

CHART 7

Indexes of Unit Labor Costs: Hourly Compensation and Output per Man-Hour for Employees in Mining, 1947–64
(1947 = 100)
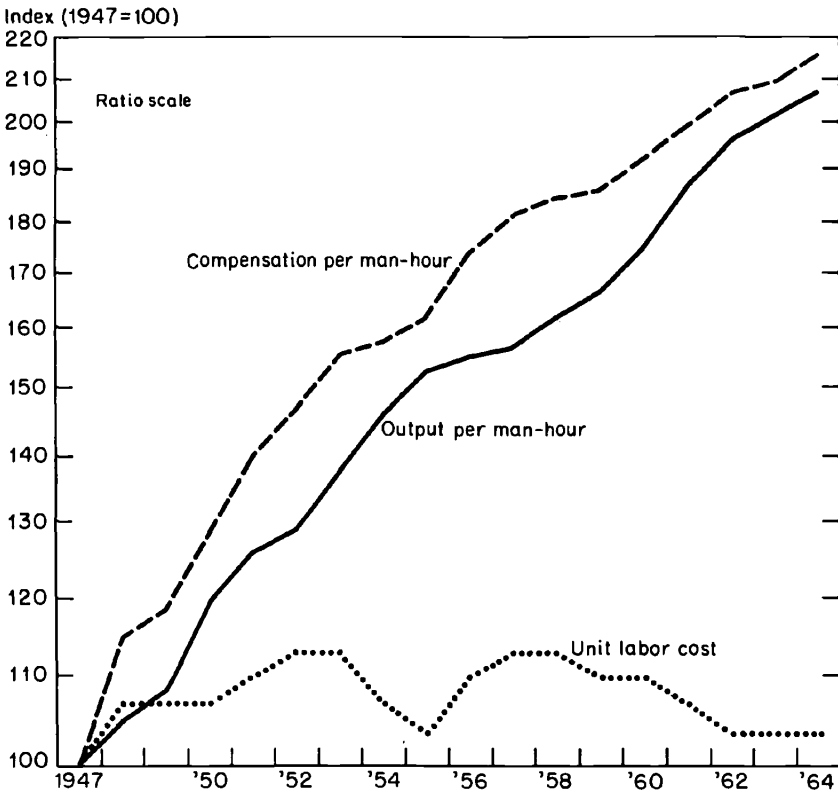
Within the period, unit labor costs displayed two distinct patterns—
from 1947–57, an over-all increase in unit labor costs with relatively
large year-to-year alternative increases and decreases; from 1957–64,
steadily declining unit labor costs and small year-to-year fluctuations.
The smaller fluctuations during the latter part of the period are pri-
marily a reflection of the relatively steady trends which occurred in both
productivity and hourly compensation.

CHART 8

Indexes of Unit Labor Costs: Hourly Compensation and Output per
Man-Hour for Employees in Trade, 1947–64
(1947 = 100)
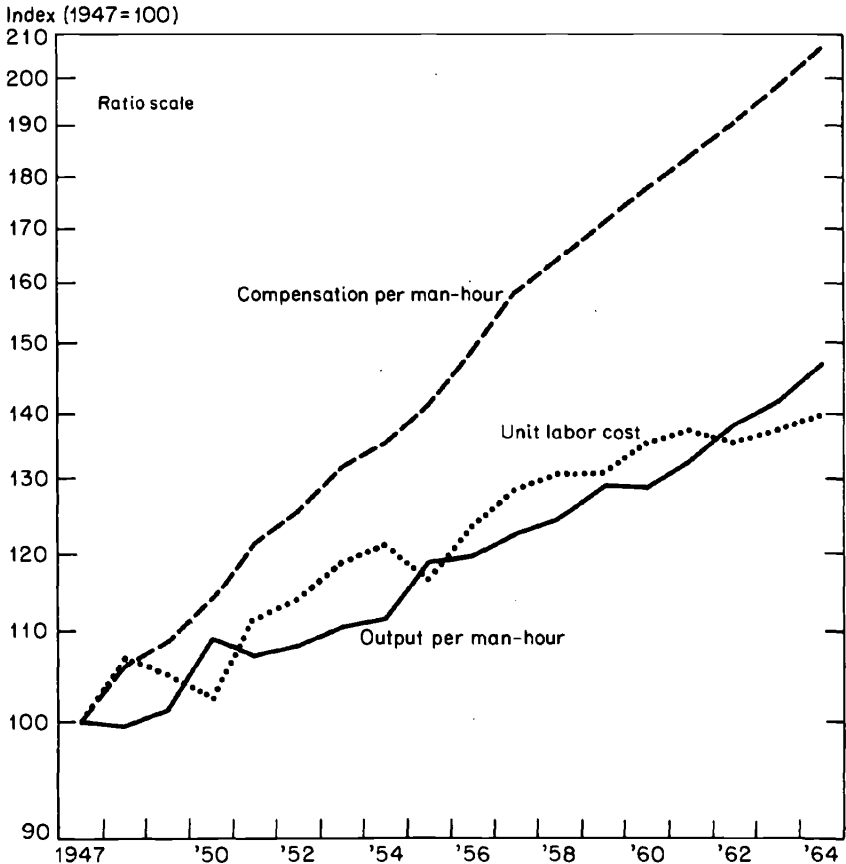
Trade

This sector includes wholesale and retail trade establishments. It ranks second in importance in the private nonfarm economy (after manufacturing), accounting for approximately one-fifth of private nonfarm output and 23 per cent of the man-hours throughout the period.

Unit labor costs for trade increased at about the same rate as the average for the entire nonfarm sector. However, this was the result of a slightly lower than average rate of gain in productivity (2.3 per cent) combined with a below average increase in compensation—in fact the latter showed the smallest increase (4.4 per cent) of all the sectors (Chart 8).

The pattern of change in unit labor costs was slightly different from that of the nonfarm sector as a whole—large fluctuations with rising costs for 1947–60; smaller fluctuations and continuing, though smaller, increases during 1960–64. These changes in turn are very sensitive to, and directly related to, output changes which took place.
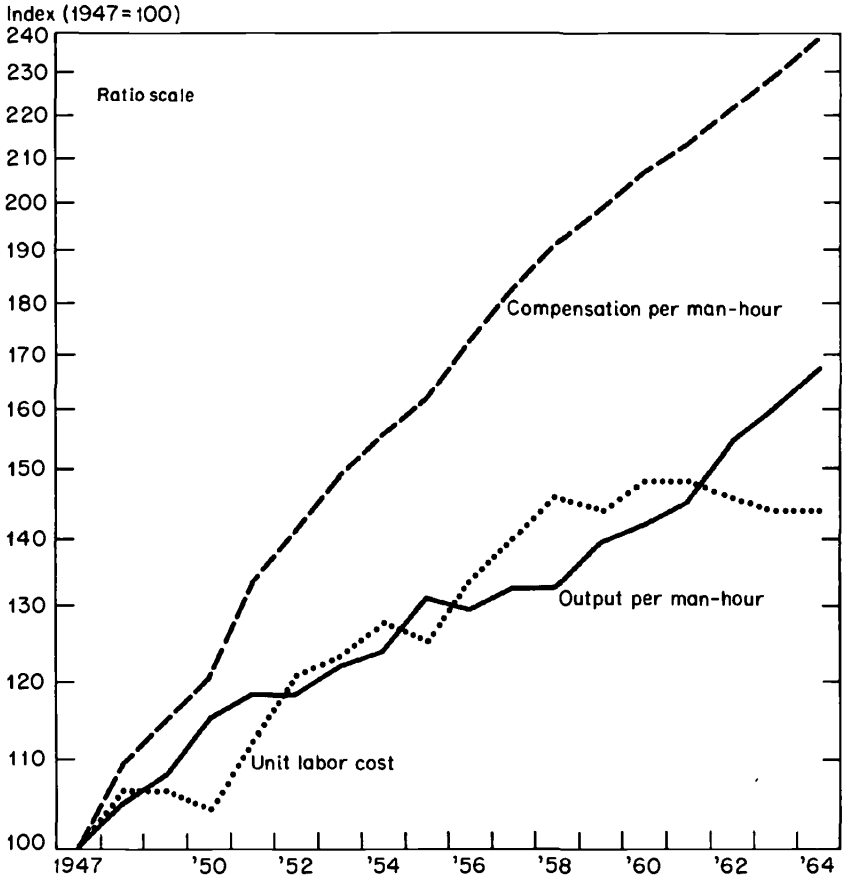
Manufacturing

Manufacturing accounts for more than a third of the output generated in the private nonfarm economy and over 35 per cent of the man-hours. It represents, by far, the most important sector of the economy. In many ways its trends in labor costs dominate those for the private nonfarm economy. Until 1961, the revenue share of manufacturing had been declining, but since then the rate of output growth has been above the average rate for the nonfarm economy as a whole, resulting in a small increase in its revenue share.

Unit labor costs rose over the whole period at a rate of 2.5 per cent a year—this is above the increase for the private nonfarm economy as a whole. Also, the productivity gains in manufacturing and the hourly compensation gains exceeded those for the nonfarm sector as a whole. Over the whole period, productivity rose 2.7 per cent per year and hourly compensation 5.2 per cent (Chart 9).

A very significant change occurred in the pattern of movement within the postwar period. From 1947 to 1960, the average annual increase in unit labor costs in manufacturing was very high—3.2 per cent. Since that time, however, virtual stability has occurred with a

CHART 9

Indexes of Unit Labor Costs: Hourly Compensation and Output per
Man-Hour for Employees in Manufacturing, 1947–64
(1947 = 100)

Index (1947 = 100)

slight decline in recent years. The change in direction was primarily
the reflection of the sharp increases in manufacturing productivity
which occurred in the latter part of the period. From 1960–64, pro-
ductivity rose to 4.4 per cent a year in contrast to the earlier gain of
2.5 per cent. While the hourly compensation increase was also some-
what small in the latter part of the period in contrast to the earlier
part, the difference was far less than that for productivity.

Transportation

This sector covers rail, water, bus, motor freight, air, and pipeline transportation establishments and accounts for approximately 5 per cent of the goods and services produced by the private nonfarm economy. It had the lowest rate of output growth for any sector (1.4 per cent annually), and, consequently, its share within the nonfarm economy declined from 8 per cent in 1947. Man-hours of this sector also declined from 8 per cent of the total nonfarm man-hours in 1947 to 5 per cent in 1964.

Over the entire period, unit labor costs in transportation increased 2.3 per cent per year—slightly higher than the average for all nonfarm sectors. As in the case of other sectors, the over-all rate reflected a substantially higher rate in the earlier part of the period followed by a decline over the last four years. Although there were two declines in 1950 and 1955, the over-all annual increase from 1947–60 was 3.1 per cent in contrast to the decline of 1.3 per cent per year after 1960. Again, yearly fluctuations were much greater in the earlier period than in recent years (Chart 10).

The change in direction in unit labor costs reflected to some extent the decline in the growth rate of hourly compensation but, more importantly, the very sharp increase in the productivity rate. In the latter part of the period, the productivity rate almost doubled. The sharp increase in the productivity rate was also associated with a relatively higher increase in output in the latter part of the period.

Finance, Insurance, and Real Estate

In 1947 this sector accounted for 13.5 per cent of total nonfarm output and approximately 4 per cent of nonfarm man-hours. By 1964, these proportions had increased to 16 per cent and almost 6 per cent (Chart 11).

Unit labor costs in the sector rose at a substantial rate of 3.1 per cent per year over the entire period. This increase was fairly uniform and, although there was some decline in the rate of increase after 1960 (from 3.5 per cent 1947–60 to 1.8 per cent), the rate for the latter part was still higher than that for all other sectors with the exception of services, construction, and government enterprises. Moreover, in contrast to almost all other sectors, the year-to-year fluctuations were not much different in the later years from the earlier part of the period.

CHART 10

Indexes of Unit Labor Costs: Hourly Compensation and Output per
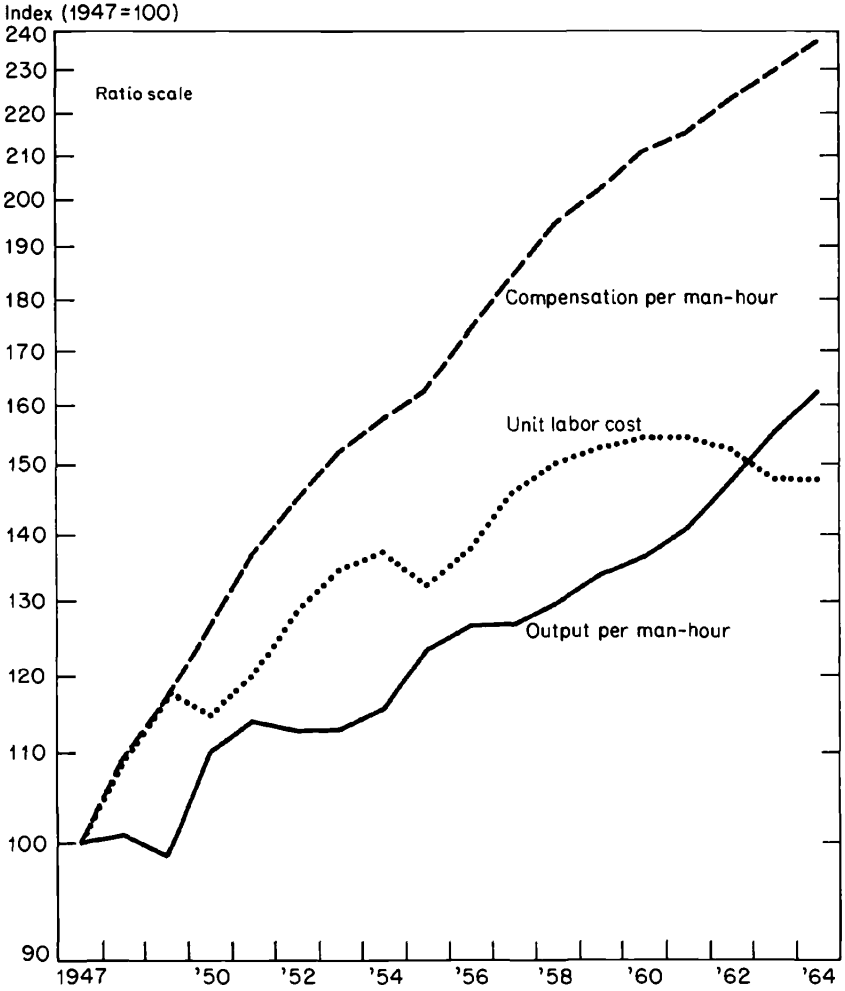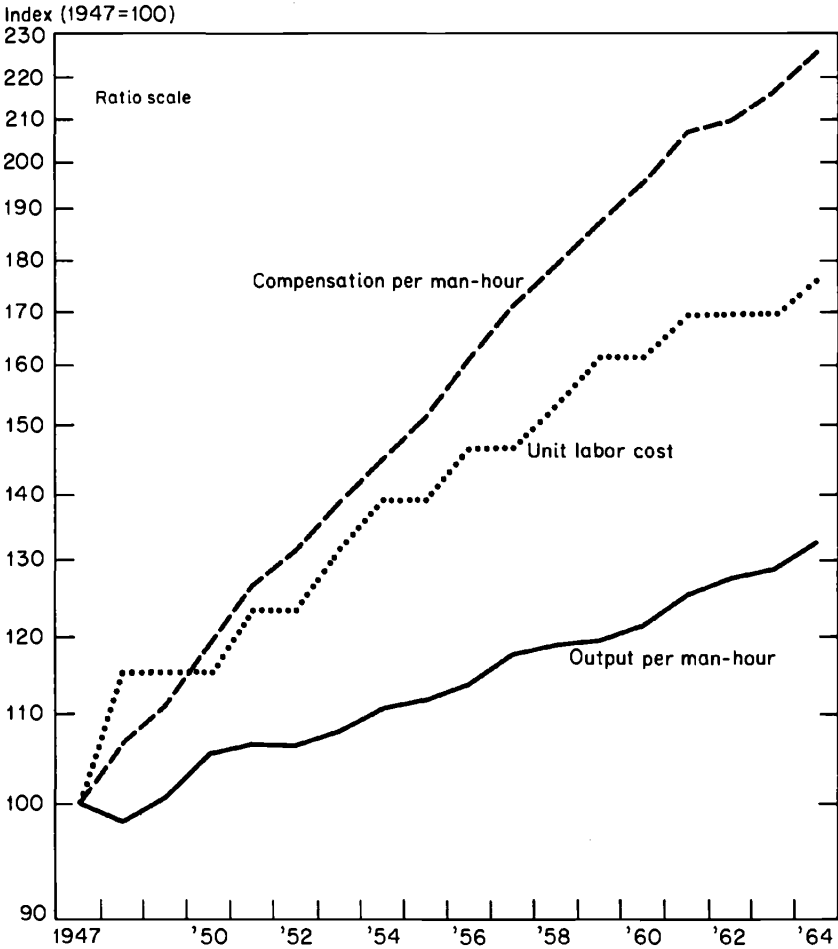Man-Hour for Employees in Transportation, 1947–64
(1947 = 100)

Index (1947=100)

CHART 11

Indexes of Unit Labor Costs: Hourly Compensation and Output per Man-Hour for Employees in Finance, Insurance, and Real Estate, 1947–64

(1947 = 100)

Index (1947=100)

Although output per employee man-hour rose at a slightly higher rate from 1960–64 than before (2.0 per cent versus 1.6 per cent) the smaller increase in unit labor costs was primarily a reflection of the decline in the rate of increase in hourly compensation. From 1947–60, the annual gain was 5.3 per cent. It dropped to 3.4 per cent per year from 1960–64.

Services

This sector covers a wide array of service categories including personal, industrial, agricultural, educational, legal, medical, and household service establishments. In 1947 it accounted for 12 per cent of total nonfarm output and 17 per cent of man-hours. While the importance of the sector actually decreased slightly in terms of output by 1964 (11 per cent), in terms of man-hours it increased to almost 20 per cent. The service sector had the third highest increases in unit labor costs—3.7 per cent annually—and although there was some decline in the rate of increase from 1960–64, it was still a substantial 3.2 per cent (Chart 12).

Throughout the entire period hourly compensation rose at a rate close to 5 per cent per year with very little fluctuation or change in the rate during the period. Output per man-hour rose at a uniformly low rate over the eighteen-year period (1.2 per cent)—rising slightly less in the later years 1960–64 (1.1 per cent).

Construction

This sector comprises contract building construction, general construction, and special trade construction establishments. It accounted for approximately 5 per cent of private nonfarm output in 1947, and its importance has remained fairly stable from 1947–64. In terms of employee man-hours its importance has increased somewhat—from 4.5 per cent in 1947 to 5.6 per cent in 1964.

The data show that unit employment costs in construction rose 2.8 · per cent per year from 1947–64—the second highest of any sector.[10] In recent years they indicate that the increase was even higher—5.2

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[10] Employee compensation is somewhat less complete as a basis for measuring movements in labor costs per unit of output for this sector than for perhaps any other nonfarm sector. Self-employed account for 24 per cent of the number of persons engaged in activities in this sector in contrast to the average of 15 per cent for the nonfarm sector as a whole.

CHART 12

Indexes of Unit Labor Costs: Hourly Compensation and Output per
Man-Hour for Employees in Services, 1947–64
(1947 = 100)

Index (1947=100)
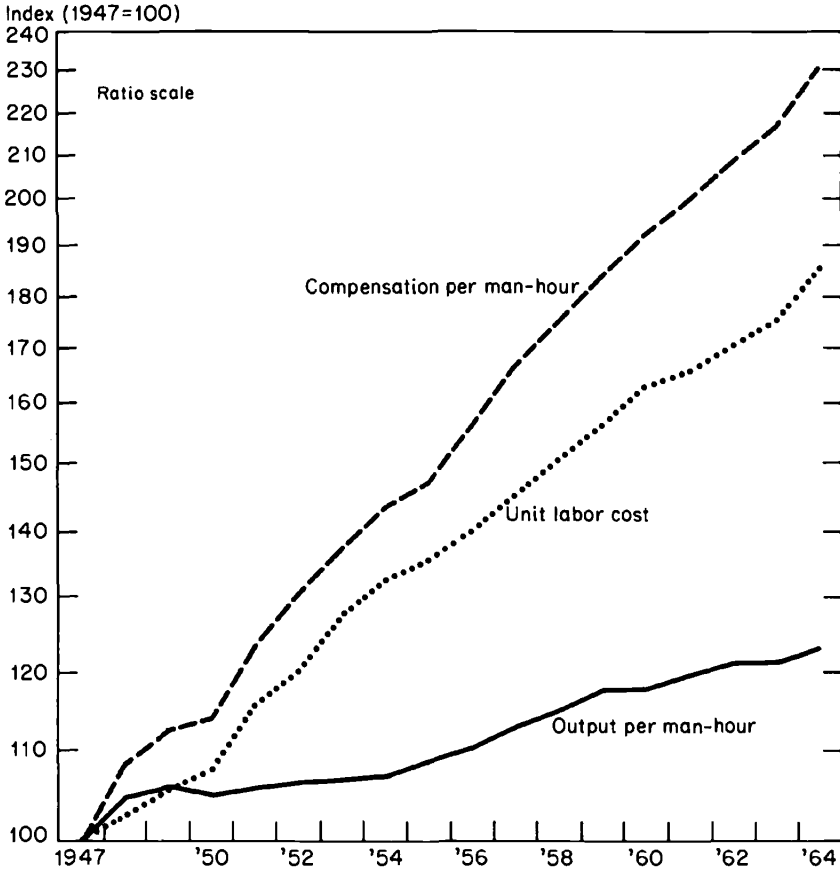
per cent per year from 1960–64. From 1947–60 the rate was 3.7 per
cent, reflecting very sharp gains from 1950–52, then stability 1952–55,
followed by a steep rise (Chart 13).

Hourly compensation averaged 4.9 per cent increases over the period
with a slackening occurring from 1960–64 (4.0 per cent). But pro-
ductivity according to the data rose very little—1 per cent per year
from 1947–64—and declined by 1.1 per cent per year from 1960–64.

CHART 13

Indexes of Unit Labor Costs: Hourly Compensation and Output per
Man-Hour for Employees in Construction, 1947–64
(1947 = 100)

Index (1947=100)
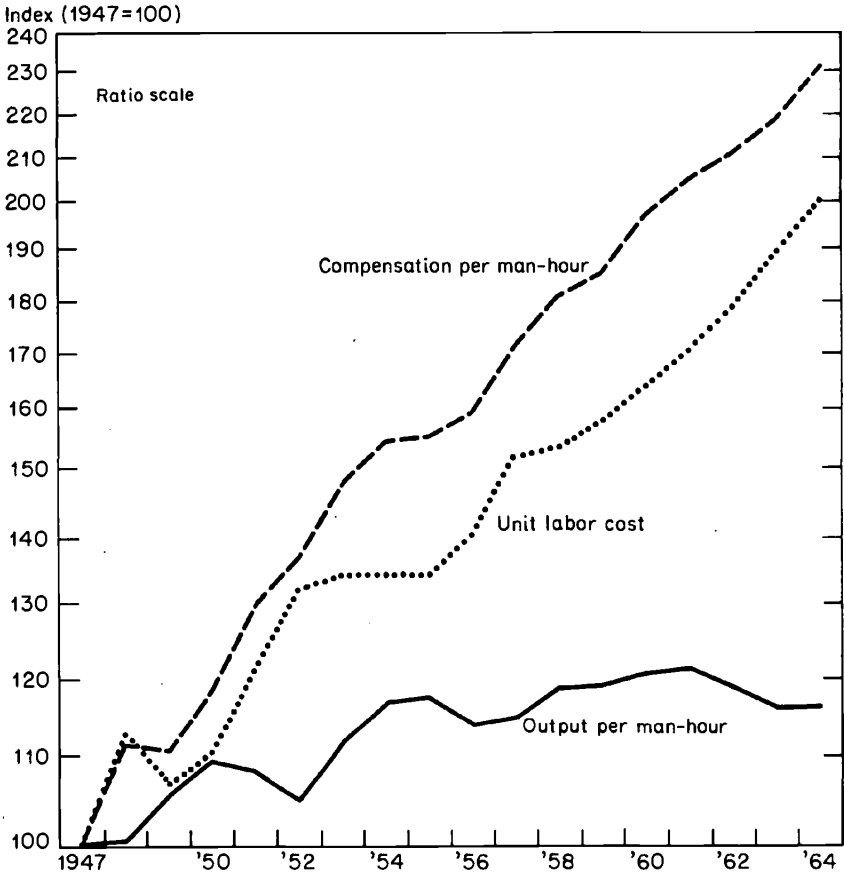
The output measure for this sector undoubtedly has a downward
bias. Some of the components of the price index used to deflate the
value data are based on costs which do not take adequate account of
the decline in man-hours per unit of output.[11] Therefore, the produc-

[11] See Martin L. Marimont, "GNP by Major Industries," *Survey of Current
Business,* October 1962, p. 10.

tivity and the unit labor-cost changes must be viewed critically. Other estimates, not necessarily consistent with the GNP framework of measures, would indicate that the increase in unit labor costs for this sector was substantially less than the figures derived from data on GNP originating in construction.[12]

Government Enterprises

As mentioned earlier, general government activities have been excluded from the examination of sector movements because of the nature of the output measure for these activities. However, one group of government activities is included in the "private" nonfarm economy—those whose major function involves the sale of a product or service. These activities—government enterprises—include, for example, the Post Office, Tennessee Valley Authority, publicly owned local utilities, and similar enterprises.

In 1947, government enterprises accounted for a little over 1 per cent of nonfarm output and almost 2 per cent of nonfarm man-hours. These proportions increased somewhat over the postwar period and by 1964 they were about 1.5 per cent and 2.5 per cent.

Unit labor costs of government enterprises rose substantially over the period—at a rate of 4.2 per cent per year. However, all of the increase occurred in the earlier part of the period, particularly from 1951 to 1956. Since 1960 they have declined about 0.2 per cent per year.

The break in the trend again reflects primarily the sharp increase in productivity in recent years. From 1947 to 1960 output per man-hour declined 0.4 per cent per year, reflecting a large gain from 1947–53 which was all but wiped out by a sharp and steady decline from 1953 through 1956. But since 1960 the rate has soared to 4.0 per cent per year. Hourly compensation also rose less in recent years, dropping from 4.6 per cent per year from 1947–60 to 3.7 per cent from 1960–64 (Chart 14).

[12] Estimates of construction output and output per man-hour for postwar years prepared by Dacy and others indicate at least a 3.0 per cent annual increase in output man-hours for this sector. See Douglas C. Dacy, "Productivity and Price Trends in Construction Since 1947," *Review of Economics and Statistics,* November 1965, pp. 406–411.

CHART 14

Indexes of Unit Labor Costs: Hourly Compensation and Output per
Man-Hour for Employees in Government Enterprises, 1947–64
(1947 = 100)

Index (1947=100)
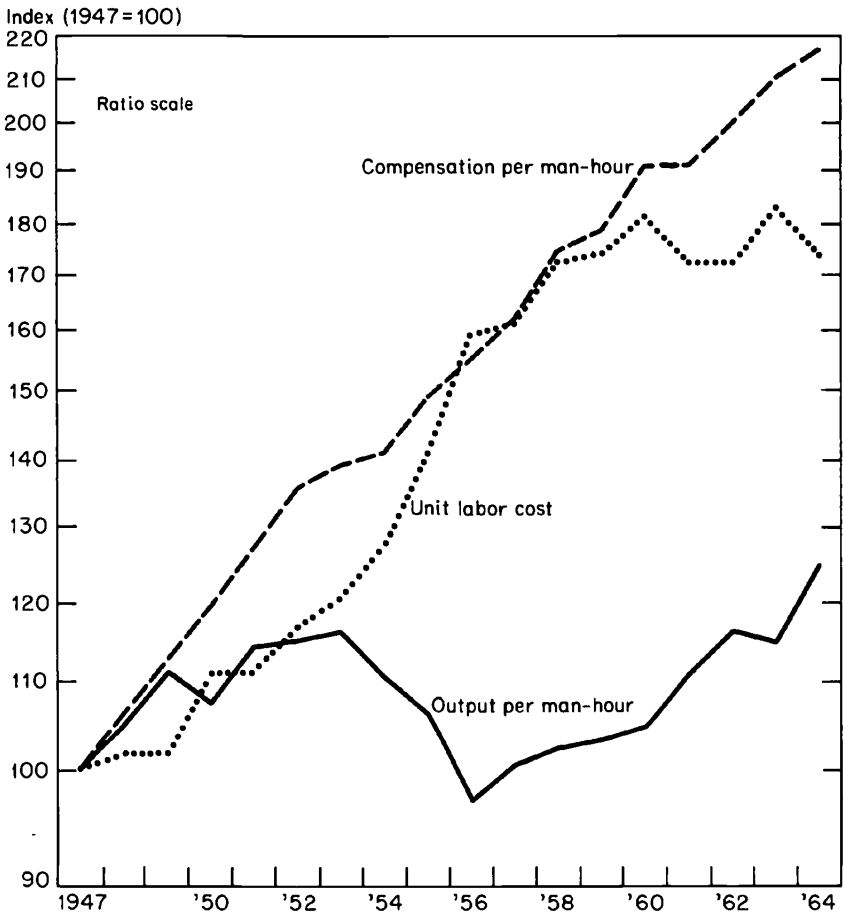
Common Intersector Elements

The above description of the trends for the individual sectors to some
extent highlights the diversity of movement in unit labor costs, hourly
compensation, and hourly output among the sectors. There are, how-
ever, some common elements which do emerge. First of all, with the
exception of the services and construction sectors (where the data are

perhaps less adequate), a distinct break in the trends in unit labor costs occurred around 1960 in each sector. This break was usually reflected by a substantial reduction in the rate of increase. (In one sector it reflected an actual decline.) Second, greater year-to-year fluctuations occurred in almost all sectors in the period from 1947–60 than from 1960–64.

Finally, in most sectors the relative decline in the rate of increase in unit labor costs was a reflection both of relative declines in the rates of hourly compensation and of relative increases in the average gain in output per man-hour. In general, however, the relative increase in the productivity rate exceeded the relative decline in the rise in hourly compensation.

Unit Labor Costs in the Total Private Economy

So far, the discussion of unit labor costs has related to the nonfarm economy. While this may be adequate for an understanding of the relationship between productivity and costs, there is still sufficient interest in the trends for the total private economy to warrant further computations and analysis in which both the farm and nonfarm sectors are included.

Inclusion of the farm sector in cost calculation forces us to deal with the question of proprietor income and wages. Employees constitute less than one-third of the work force in the farm sector so that estimates of "unit labor costs" based on employees only would be misleading, particularly for trend analyses since the proportion of employees to total work force has been increasing.

The importance of proprietors as a segment of the work force has long been recognized in the computation of productivity trends—they have been included in the denominator of the gross national product per man-hour ratio. A matching of these productivity figures with estimates of compensation per man-hour requires the inclusion of a comparable proprietor component in the denominator of the latter ratio as well. Proprietors could, of course, be excluded from both ratios but this would result in another, and possibly misleading, productivity figure. It may be elementary to note here that output per *employee* (proprietors excluded) could decrease merely because individual or partnership enterprises incorporated, and those who had been proprietors were,

by legal definition, transformed into employees. Such transformation would have a similar effect on trends in unit costs.

If proprietors are included in the farm sector then, for comparability, they must be included in all other sectors. For most sectors, the proportion of proprietors in the work force is small and makes little or no difference in the productivity and cost trends.

There are no statistics of wage income of proprietors but several methods of determining or imputing a wage income share to proprietors have been developed. While they all have some logical basis, they are all also, unfortunately, open to criticism.[13] There appears to be no best or unique solution to the problem of estimating the wage income of proprietors. The method employed in this paper is to assume that compensation per man-hour of proprietors is the same as that of employees for each of the major sectors for which productivity and unit employment-cost estimates have been developed.[14]

Unit labor costs (for all persons) in the private economy rose 1.8 per cent a year in the postwar period 1947–64. The average gain was 0.3 per cent for the recent period 1960–64, compared with 2.1 per cent for the period 1947–60 (Tables 3 and 4).

These differential trend movements in unit costs were again the product of different trends in productivity and labor payments. Productivity rose faster in the latter period than in the earlier one (3.9 versus 3.2 per cent); compensation per man-hour rose more slowly (4.2 versus 5.3 per cent).

The trends for the private economy were substantially influenced by the large relative and absolute decline of proprietors, especially in the farm sector, during the period covered. This does not, of course, mean that the productivity of proprietors increased more and that of employees less, in the sense of physical output per worker. It is a con-

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[13] For a discussion of this problem, see Stanley Lebergott, "Factor Shares in the Long Term, Some Theoretical and Statistical Aspects," in *The Behavior of Income Shares,* Studies in Income and Wealth 27, p. 80, Princeton for NBER, 1964.

[14] This method does lead to an implied negative nonlabor share (or return on investment) for a few sectors during isolated years. While not necessarily wrong it is not what might be reasonably expected. Using an alternative method of imputing proprietor wage income (e.g., using the trends in corporate labor-nonlabor shares to allocate noncorporate proprietor income) indicates that, for the total private economy, the trends in unit labor costs for all persons in the postwar period would not be substantially different from that obtained by the method used.

TABLE 3

Indexes of Unit Labor Costs, Hourly Compensation, and Output Per Man-Hour
for All Persons in the Private Economy and Major Sectors, 1947–64
(1947 = 100)

Years	Private Economy[a]			Farm			Nonfarm			Mining		
	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour
1948	104.7	109.1	104.4	89.2	103.5	116.9	105.9	109.1	103.1	109.4	114.3	104.8
1949	102.8	110.6	107.5	82.4	93.0	114.3	104.8	111.9	106.9	109.4	117.5	107.9
1950	101.5	118.2	116.3	77.0	100.0	129.9	104.0	118.3	113.9	106.3	127.9	118.9
1951	108.2	129.7	119.8	82.4	107.0	129.9	110.8	128.6	116.2	112.5	139.6	125.1
1952	112.6	137.3	122.0	79.7	114.0	141.6	115.7	135.5	117.0	115.6	146.1	127.6
1953	114.7	146.1	126.9	73.0	117.5	161.0	118.9	143.2	120.5	115.6	155.2	135.7
1954	115.5	150.3	130.0	70.3	119.3	168.8	119.7	147.4	123.2	109.4	156.5	142.9
1955	113.4	154.1	135.7	58.1	98.2	170.1	118.6	152.6	128.6	106.3	161.0	150.0
1956	120.5	163.9	136.1	58.1	101.8	177.9	126.4	161.6	127.8	112.5	173.4	152.5
1957	124.6	174.5	140.1	59.5	110.5	188.3	130.6	170.9	130.9	115.6	180.5	153.9
1958	125.9	181.8	144.1	58.1	121.1	207.8	132.4	177.3	134.0	115.6	183.8	159.3
1959	127.2	190.2	149.3	58.1	122.8	211.7	133.6	185.1	138.6	112.5	185.1	163.7
1960	130.0	197.6	151.5	50.0	112.3	223.4	137.1	192.5	140.2	112.5	191.6	172.0
1961	130.4	204.7	156.8	51.4	124.6	240.3	137.4	198.2	144.4	109.4	198.7	183.2
1962	130.1	213.7	164.3	52.7	131.6	246.8	136.7	206.4	151.0	106.3	205.8	191.7
1963	130.6	222.2	170.0	50.0	133.3	268.8	137.5	213.9	155.6	106.3	209.1	198.3
1964	132.1	233.5	176.2	50.0	135.1	268.8	139.0	224.0	161.0	106.3	215.6	203.3

(continued)

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TABLE 3 (continued)

Years	Construction			Manufacturing			Transportation			Communications		
	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour
1948	109.2	111.6	102.0	104.0	109.4	105.1	110.2	109.5	100.4	104.3	107.1	103.0
1949	102.6	111.0	107.8	106.0	114.4	108.7	120.4	117.5	97.9	104.3	115.7	110.4
1950	106.6	118.7	111.8	104.0	120.1	115.9	116.3	127.0	108.2	104.3	122.1	118.2
1951	110.5	129.7	117.6	112.0	132.4	119.2	122.4	137.2	112.5	102.1	129.3	126.3
1952	117.1	136.8	117.2	118.0	141.0	119.2	130.6	145.3	110.7	108.5	140.0	129.6
1953	118.4	147.7	124.5	122.0	148.9	122.8	136.7	152.6	111.1	108.5	147.1	135.4
1954	115.8	154.2	133.8	126.0	155.4	124.6	138.8	157.7	113.6	112.8	154.3	137.4
1955	111.8	154.8	139.2	122.0	161.2	132.2	132.7	162.8	121.8	110.6	160.0	146.1
1956	115.8	159.4	137.7	132.0	171.9	130.8	138.8	173.7	124.6	112.8	165.7	147.5
1957	123.7	171.0	137.7	138.0	182.0	133.3	146.9	184.7	124.6	110.6	175.0	157.2
1958	126.3	181.3	142.6	144.0	189.9	133.3	153.1	194.2	127.1	108.5	184.3	171.7
1959	127.6	185.2	144.6	142.0	197.8	140.9	153.1	202.2	131.4	106.4	196.4	186.5
1960	135.5	196.8	145.6	144.0	205.8	143.1	157.1	210.9	134.3	106.4	204.3	194.3
1961	140.8	205.2	145.6	146.0	212.2	146.7	155.1	216.1	138.2	104.3	215.7	209.1
1962	147.4	211.0	143.1	142.0	220.9	155.8	153.1	223.4	145.0	100.0	224.3	224.6
1963	155.3	218.7	141.2	142.0	228.8	162.0	151.0	229.9	153.2	97.9	232.9	239.7
1964	163.2	231.6	142.2	142.0	238.8	169.6	149.0	238.0	159.3	97.9	245.7	251.2

(continued)

TABLE 3 (continued)

Years	Public Utilities			Trade			Finance, Insurance, and Real Estate			Government Enterprises		
	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour
1948	100.0	109.0	109.2	107.3	107.0	100.0	113.3	106.9	99.2	101.9	106.3	105.1
1949	97.3	115.2	117.0	107.3	107.8	101.0	113.3	110.8	102.3	101.9	112.6	110.6
1950	97.3	121.4	123.4	103.6	113.9	109.0	113.3	119.2	107.8	111.1	119.7	107.7
1951	94.6	131.7	138.4	112.7	121.7	108.1	120.0	126.2	108.1	111.1	126.8	114.5
1952	97.3	141.4	146.8	114.5	125.2	109.0	126.7	131.5	107.2	116.7	135.4	115.3
1953	97.3	150.3	154.2	118.2	132.2	111.9	133.3	138.5	107.7	120.4	139.4	116.2
1954	94.6	158.6	168.4	120.0	135.7	112.9	133.3	145.4	109.4	127.8	140.9	110.2
1955	91.9	165.5	178.1	116.4	140.9	120.0	140.0	150.8	112.1	140.7	148.8	106.4
1956	94.6	175.2	187.3	123.6	148.7	120.5	146.7	161.5	114.6	159.3	155.1	97.4
1957	94.6	184.1	195.9	127.3	157.4	123.3	146.7	170.8	118.6	161.1	162.2	100.4
1958	97.3	199.3	205.1	129.1	162.6	124.8	153.3	177.6	120.5	172.2	174.8	102.1
1959	94.6	210.3	221.6	129.1	169.6	131.4	160.0	187.7	122.1	174.1	178.7	103.0
1960	91.9	218.6	234.4	134.5	176.5	131.0	160.0	195.4	123.9	181.5	190.6	104.7
1961	94.6	230.3	246.3	134.5	181.7	135.2	166.7	206.9	127.7	172.2	190.6	110.6
1962	91.9	239.3	260.8	132.7	189.6	142.9	166.7	210.0	130.3	172.2	200.0	116.2
1963	91.9	249.0	269.7	132.7	198.3	148.6	166.7	216.2	131.9	183.3	210.2	114.9
1964	91.9	261.4	281.2	132.7	206.1	154.3	173.3	225.4	135.5	174.1	217.3	124.7

(continued)

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TABLE 3 (concluded)

Services

Years	Unit Labor Costs[b]	Hourly Compensation	Output Per Man-Hour
1948	103.8	108.1	104.2
1949	105.8	111.6	105.4
1950	109.6	114.0	104.8
1951	115.4	123.3	106.0
1952	121.2	130.2	106.0
1953	126.9	137.2	106.6
1954	132.7	141.9	107.2
1955	132.7	146.5	109.6
1956	140.4	155.8	110.8
1957	144.2	165.1	113.3
1958	150.0	173.3	115.7
1959	151.9	182.6	118.7
1960	159.6	190.7	118.7
1961	163.5	197.7	119.9
1962	167.3	205.8	122.3
1963	173.1	214.0	122.9
1964	182.7	227.9	124.7

Source: Output and compensation data are from the U.S. Department of Commerce, Office of Business Economics. Man-hour data are from the U.S. Department of Labor, Bureau of Labor Statistics.

[a]Excludes general government.

[b]Compensation of all persons per unit of output.

TABLE 4

Average Annual Rates of Change[a] in Unit Labor Costs, Hourly Compensation, and Output per Man-Hour for All Persons in the Private Economy and Major Sectors, Selected Periods 1947–64

Sector	1947–64			1947–60			1960–64		
	Unit Labor Costs	Output Per Man-Hour	Hourly Compensation	Unit Labor Costs	Output Per Man-Hour	Hourly Compensation	Unit Labor Costs	Output Per Man-Hour	Hourly Compensation
Private economy[b]	1.8	3.2	5.0	2.1	3.2	5.3	0.3	3.9	4.2
Farm	-4.0	5.9	1.7	-4.6	6.1	1.3	-0.3	5.0	4.5
Nonfarm	2.1	2.6	4.7	2.5	2.6	5.1	0.3	3.6	3.9
Public utilities	-0.4	6.2	5.8	-0.5	6.7	6.2	-0.3	4.7	4.5
Communications	-0.2	5.5	5.3	0.5	5.0	5.5	-2.3	6.7	4.6
Mining	0.1	4.2	4.2	0.6	4.2	4.9	-1.4	4.2	2.9
Trade	1.7	2.5	4.3	2.1	2.2	4.4	-0.4	4.3	4.1
Transportation	2.3	2.7	5.1	3.1	2.4	5.7	-1.3	4.5	3.1
Manufacturing	2.4	2.7	5.2	3.1	2.6	5.7	-0.6	4.5	3.8
Finance, insurance, and real estate	3.1	1.8	5.0	3.5	1.7	5.3	1.6	2.1	3.4
Services	3.6	1.3	4.9	3.7	1.2	5.0	3.3	1.2	4.5
Construction	2.5	2.3	4.9	1.9	3.1	5.1	4.8	-0.8	4.0
Government enterprises	4.2	0.4	4.6	-5.3	-0.4	4.8	-0.2	4.0	3.7

Source: Output and compensation data are from the U.S. Department of Commerce, Office of Business Economics. Man-hour data are from the U.S. Department of Labor, Bureau of Labor Statistics.

[a] All rates computed from the least squares trend of the logarithms of the index numbers.

[b] Excluding general government.

sequence of the changing occupational and employment structure of the economy; in fact, some of the farm proprietors probably went into nonfarm employment.

The inclusion of proprietors in the nonfarm sector had very little impact on the productivity and unit labor-cost trends in that sector, as might be expected since proprietors are a relatively small part of the nonfarm labor force. However, the all-person–employee trends in con-

CHART 15

Indexes of Unit Labor Costs: Hourly Compensation and Output per Man-Hour for All Persons in the Total Private Economy, 1947–64
(1947 = 100)
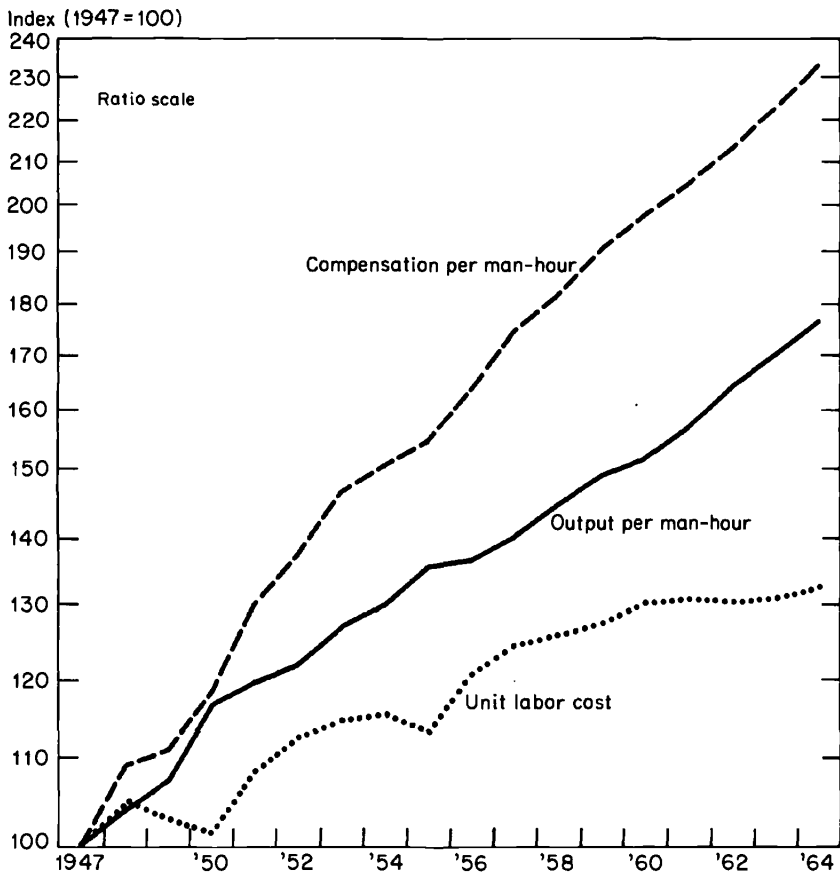
struction and trade were different; in both sectors proprietors have declined in relative importance.

THE FARM SECTOR

The importance of this sector has declined substantially during the postwar period, both in terms of man-hours and output. Man-hours dropped from 18 per cent of the total private economy in 1947 to 8 per cent in 1964. The relative share of output declined from 6 per cent in 1947 to 4 per cent in 1964.

Unit labor costs in the farm sector declined at the record rate of 4.0 per cent since 1947 (Chart 16). This decline by far exceeds the decline in any of the nonfarm sectors. The major part of the over-all decline occurred during the eight years before 1956. During this period, the annual rate of decline averaged 5.2 per cent. Since 1956, the decline amounted to 2.4 per cent per year with a slight decline of 0.3 per cent since 1960. On an annual basis there were four years with unit labor-cost increases, thirteen years with decreases, and six trend reversals.

The farm output per man-hour increased, on average, 5.9 per cent per year since 1947. During the first eleven years before 1958 the increase was somewhat higher (6.4 per cent). Since 1960 output per man-hour increases amounted to 5.0 per cent.

The movement in compensation shows a basically different pattern. The over-all increases average 1.7 per cent, with very low increases (1.0 per cent) until 1957 and a substantially higher rate of increase (4.5 per cent) since 1960. The farm sector shows two major reversals in the compensation trends. One major decline occurred in 1955 (7.7 per cent) and one in 1960 (8.6 per cent). This pattern contrasts sharply with the compensation movement in the nonfarm sectors, where compensation steadily moved upward from year-to-year for every single year.

ROLE OF SHIFTS AMONG SECTORS

The indexes of unit labor costs for the private economy and for the nonfarm economy were derived by dividing the total compensation of all component sectors by total output. These indexes would show changes, even if there were no change in the unit labor costs in each sector, if any of the sectors with higher (or lower) unit labor costs

CHART 16

Indexes of Unit Labor Costs: Hourly Compensation and Output per
Man-Hour for All Persons in the Farm Sector, 1947–64
(1947 = 100)
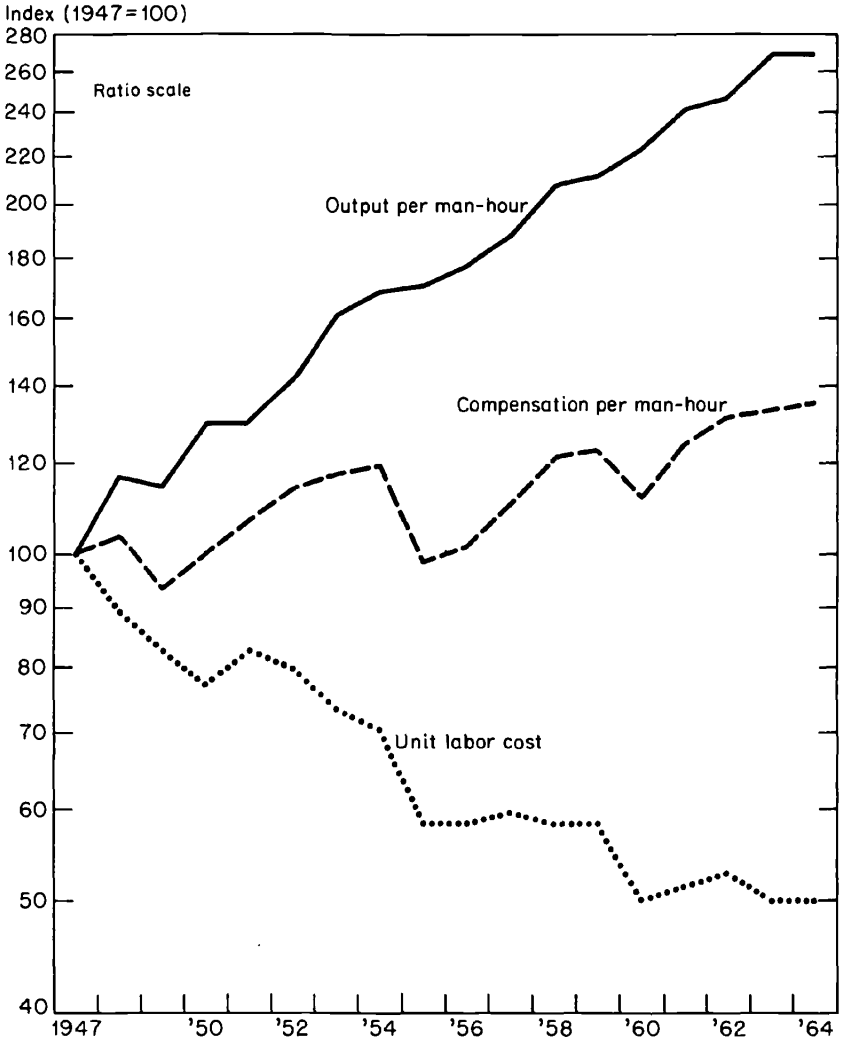
were to become more important. That is, the over-all changes in unit labor costs reflect both changes in the unit labor costs of component sectors and shifts in the relative importance of sectors with different levels of unit labor costs.

The relative importance of a sector can be measured either in terms of output or in terms of compensation—i.e., shifts can reflect either changes in output "mix" or changes in compensation "mix." The relevant measure depends on the analytical purpose of the unit labor-cost trend. One of the main purposes is to compare unit labor costs with price movements. Average price changes for the private economy are affected by sector changes in price and by shifts in the relative importance of sectors. In this case, the relative importance of the sectors can be measured in terms of output or value. The one dimension which is common to price and unit labor cost is output, so it seems appropriate to use the output proportions for measuring shift effects for both.

Similarly, with regard to output per man-hour, shifts in importance can be measured in terms of output or in terms of man-hours. Since the output per man-hour measure is examined in relation to the measure of compensation per unit of output, the mix in terms of output is relevant. In the case of hourly compensation, the relevant mix would appear to be in terms of compensation rather than man-hours.

In order to examine the movements of unit labor cost excluding the effect of shifts, the procedure employed was first to derive indexes of unit labor cost holding the output proportions of each sector constant; second, to derive indexes of shift by holding sector unit labor costs constant, allowing output proportions to change; and finally to allocate the interaction to each of the two elements.[15] A similar approach was followed with regard to output per man-hour and hourly compensation.

Table 5 shows for the entire postwar period and selected years the average annual rates of change in unit labor costs, hourly compen-

[15] The interaction amounted to less than 0.1 per cent per year and this was allocated equally to the two components. For a discussion of this problem of the transformation of the multiplicative relation into the additive one, see Irving H. Siegel, "Concepts and Measurement of Production and Productivity," Working Paper of National Conference on Productivity, 1952, p. 88; also H. Osborne and J. Epstein, "Corporate Profits Since World War II," *Survey of Current Business,* January 1956, p. 20.

TABLE 5

Average Annual Changes in Unit Labor Costs, Hourly Compensation, and Output Per Man-Hour in Private Economy and Nonfarm Sector

Item	Average Annual Percentage Change					
	Private Economy (All Persons)			Nonfarm Sector (Employees)		
	1947–64	1947–60	1960–64	1947–64	1947–60	1960–64
Unit Labor Costs						
Actual change	1.8	2.1	0.3	2.2	2.6	0.5
Change excluding sector output shifts[a]	2.0	2.3	0.4	2.4	2.8	0.5
Compensation per Man-Hour						
Actual change	5.0	5.3	4.2	4.8	5.2	3.8
Change excluding sector compensation shifts[a]	4.7	5.0	4.0	4.9	5.2	3.9
Output per Man-Hour						
Actual change	3.2	3.2	3.9	2.5	2.5	3.3
Change excluding sector output shifts[a]	2.9	2.9	3.6	2.3	2.2	3.2

[a] Excludes effects of shifts plus allocated interaction.

sation, and output per man-hour excluding the effects of these shifts. As can be seen the effect was small. The 1.8 per cent annual increase in unit labor costs for the private economy resulted in part from the 0.2 per cent decline in unit labor costs because of shifts among the sectors (including the allocated interaction). In other words, if no shifts had taken place unit labor costs in the private economy would have increased 2.0 per cent per year.

The results are primarily a reflection of the shifts within the nonfarm economy. The decline in the importance of the farm sector with its higher-than-average unit labor costs added less than 0.1 percentage points.

Within the nonfarm sector the effect was similar whether or not unit employment costs or unit labor costs of all persons are considered. Shifts among these sectors reduced the trend from 1947–64 by 0.2 percentage points.

Over the whole period shifts in sector importance had a similar effect on hourly compensation trends for the private economy. The over-all 5.0 per cent rate from 1947–64 reflected 0.3 per cent per year from shifts and 4.7 per cent per year from changes in component sectors. Since 1960 the annual rate reflected 0.2 percentage points from shifts.

Finally, with regard to output per man-hour, the effect of shifts in output proportions was also small. Over the whole period, the average annual gain in productivity for the private economy reflected plus 0.3 percentage points from shifts.

COMMENT

ALBERT REES, Princeton University

The Greenberg-Mark paper is, as we would all have expected, a very competent paper. The results seem generally reasonable (if by reasonable we mean consistent with earlier work), particularly in the ranking of industrial sectors by changes in unit labor cost.

The major methodological innovation is the inclusion in unit labor costs of the value of labor supplied by proprietors, partners, and their families. Conceptually, the case for this innovation is unassailable, and empirically it produces differences that are not negligible. While the procedures used to impute a value to proprietors' labor are admittedly

somewhat arbitrary, the authors point out that the results do not appear to be sensitive to alternative imputation procedures.

The authors also emphasize that some of the results are improbable; for example, the apparent decline in output per man-hour in construction from 1960 to 1964. The most improbable results seem to arise from the lack of reliable output measures for construction and services. The case of construction is particularly noteworthy because it would not be difficult to improve present methods substantially. Suggestions for improving the index of construction prices were made by the Stigler Committee in 1960.[1] An improved construction price index would, of course, lead to improved real-output measures when the price index was used to deflate construction expenditures.

On the input side, an important data deficiency noted in the paper is the lack of establishment data on the hours and earnings of non-production workers. Again such data would not be difficult to collect, and their value, even on an occasional basis, would be great.

The authors, as befits good civil servants, have refrained from drawing any broad implications from their data. Not being similarly situated, I shall be a little bolder.

One of the most general findings of the paper is that the increase in unit labor costs was much slower in the period 1960–64 than in the period 1947–60, a difference that arises in part because the rise in compensation per man-hour was smaller in the later period. Of course, a slower increase in unit costs is in and of itself a good thing. However, it occurred in part because the unemployment rate in the period 1960–64 averaged 5.8 per cent. If this is the price of more nearly stable measured unit labor costs, the price is, in my judgment, too high.

It is also of interest to note that if the nonfarm sectors are ranked by the size of the rise in unit labor cost over the whole period 1947–64, we find in the last three places, widely separated from the rest, three heavily unionized sectors: mining, communication, and public utilities. Among the top three places, where measurement errors may be more important, we find two weakly unionized sectors, services and finance. These findings should surprise those who accept the simpler versions of the wage-push inflation hypothesis—those who argue that strong

[1] Price Statistics Review Committee, *The Price Statistics of the Federal Government,* New York, NBER, 1961, Appendix B, pp. 87–94.

unions cause wages to rise faster than labor productivity in their juris-
dictions.

To avoid being misunderstood, I should add that these findings are
not inconsistent with more subtle forms of the wage-push inflation
hypothesis. It may be that in the absence of union pressures, unit labor
costs in the industries with large productivity gains would have risen
still less or fallen still more, and that these industries could then have
made a larger contribution to stability of the general price level.