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SCOPE, DEFINITIONS, AND SOURCES

THE LEVELS of employment in the service industries discussed in this paper are shown in Table I-2. They include all of retailing, divided into ten *retail trades,* and eight *services,* mostly of the "personal service" category. Together, they account for 17 per cent of total U.S. employment in 1963, 30 per cent of service sector employment,[1] and 51 per cent of the service sector excluding government, households, and institutions.

The industries chosen were those for which it was possible to obtain from available data reasonably comparable measures of output and input for selected years during the period 1939–63. Also, they are industries for which it is possible to calculate a measure of real output that is not based on labor input. It is widely recognized that where real output is estimated from labor input, as in government and much of the households and institutions sector, analysis of productivity change is scarcely possible.

A summary of the definitions, methods, and sources follows. Detailed information, as well as the actual data, are provided in the Appendix.

[1] The service sector is defined to include wholesale and retail trade; finance, insurance, and real estate; general government; and the services proper, including personal services, professional services, business services, and repair services. This somewhat arbitrary definition was chosen because of our interest in a group of industries that have not received much attention in the past from economists interested in productivity analysis. The boundary between service and goods production is very difficult to draw, and probably no division based on industrial classification would be completely satisfactory, because some workers employed in goods industries produce services and some in service industries produce goods. Note that Table I-2 is based on the *1963 Census of Business,* which became available in 1965. These figures are somewhat different from those in Table I-1, which are based on earlier data published by the Office of Business Economics.

TABLE I-2

Level of Employment and Percentage of Total U.S. Employment in 18 Selected Service Industries, 1963

Industry	Level of Employment (thousands)	Percentage of U.S. Total
Services		
Auto repair	414	.60
Barber shops	180	.26
Beauty shops	345	.50
Dry cleaning	268	.39
Hotels and motels	544	.78
Laundries	346	.50
Motion picture theaters	106	.15
Shoe repair	34	.05
Total	2,238	3.22
Retail trades		
Apparel stores	659	.95
Automobile dealers	860	1.24
Drug stores	365	.52
Eating and drinking places	1,933	2.78
Food stores	1,490	2.15
Furniture and appliances	459	.66
Gasoline stations	682	.98
General merchandise	1,434	2.06
Lumber dealers	466	.67
Other	870	1.25
Total	9,217	13.28
Total, 18 selected service industries	11,455	16.50

Source: U.S. Bureau of the Census, *1963 Census of Business*. Coverage details are in the Appendix. U.S. employment is the number of persons engaged in production from U.S. Department of Commerce, *Survey of Current Business*, July 1964.

REAL OUTPUT

For the eight services, real output was defined as receipts in constant (1954) dollars. These were estimated from receipts in current dollars, as reported in the *Census of Business,* deflated by price indexes published by the Bureau of Labor Statistics (BLS).[2] To the extent that the price indexes take account of changes in the quality of services rendered, the real output measures do also.

For the ten retail trades, real output was assumed to be equal to the volume of sales of goods in real terms. This was estimated from receipts by type of store in current dollars, as reported in the *Census of Business,* deflated by price indexes prepared by David Schwartzman at the National Bureau. These indexes were based on detailed commodity components of the BLS consumer price index weighted by the importance of each commodity in each store type as reported in the *1948 Census of Business.* The BLS price indexes for retail sales of commodities do not attempt to allow for changes in quality of service rendered by retailers.

The real output measures for the eighteen industries should be considered only as approximations; they are not exactly equivalent either to the gross measures of physical output that are possible for some goods industries or to the estimates of real gross product originating that would be obtained through separate deflation of outputs and inputs.

EMPLOYMENT

The basic employment concept used is "persons engaged" as defined by the Office of Business Economics of the U.S. Department of Commerce. This is estimated from *Census of Business* data on employment and payrolls, with part-time wage and salary employees converted to full-time equivalents by assuming that their share of total wage and salary employment is equal to their share of total payroll. In addition to wage and salary workers, persons engaged includes self-employed proprietors, as reported in the *Census of Business,* all of whom are counted as employed full-time.

The estimates of the number of self-employed may be subject to con-

[2] Prices for hotels and motels were obtained from Horwath and Horwath, *Hotel Operations in 1963.*

siderable error because it is difficult to obtain complete coverage of numerous small firms and because the Bureau of the Census definitions of the minimum-sized firm to be included have varied from one census to another. Some attempt was made to adjust for changes in coverage (see the Appendix). Also, it is some comfort to note that the number of self-employed reported in the *Census of Business* for 1948 corresponds closely to the number reported in the *Census of Population* for 1950 for the eighteen industries.

The importance of obtaining an accurate count of the self-employed is considerable; they account for a significant fraction of total employment in many of the service industries, as may be seen in Table I-3. The employment estimates for these industries are probably not as reliable as those that can be obtained for manufacturing and other industries in which the self-employed play a much less important role.

Doubts may arise concerning the accuracy of the figures on self-employment, but the situation with respect to unpaid family workers is far worse. The *Census of Business* does not regularly report the number of such workers, and no attempt was made in this paper to include them in the measure of total employment. Some data for the eighteen service industries reported in the *1948 Census of Business* indicate that unpaid family workers (adjusted to full-time equivalents) amounted to about 8 per cent of total employment. The *Census of Population* for 1950, on the other hand, presents figures showing that unpaid family workers accounted for less than 2 per cent of employment in these industries.[8]

LABOR INPUT

Industry trends in effective labor input may diverge from trends in employment (full-time equivalents) because of differences in rates of change in hours per full-time worker or in the quality of labor as reflected in intelligence, strength, training, and so on. In the study of productivity, it is useful to have a measure of labor input that does

[8] The exclusion of unpaid family workers probably biases the estimates of the growth of output per man downward, because paid employment probably rose more rapidly than unpaid employment over the period studied. David Schwartzman, in the study of productivity growth in distribution that he is preparing for the National Bureau, estimates that the annual rate of growth of output per man in retailing, 1929–58, would be raised .08 per cent if unpaid family workers were included.

TABLE I-3

Number of Self-Employed as a Percentage of Total Employment in 18 Service Industries, Selected Years, 1939-63

Industry	1939	1948	1954	1958	1963
Services					
Auto repair	48.6	41.3	40.4	34.9	33.1
Barber shops	66.9	61.8	62.3	60.7	61.4
Beauty shops	47.4	47.8	46.6	46.7	44.8
Dry cleaning	37.9	24.4	24.4	23.6	22.1
Hotels and motels	10.4	12.2	12.3	14.1	11.6
Laundries	8.2	10.2	9.2	10.0	12.8
Motion picture theaters	5.8	5.0	6.1	7.7	7.0
Shoe repair	71.9	69.1	68.4	64.8	65.2
Retail trades					
Apparel stores	19.5	16.0	16.1	15.3	13.8
Automobile dealers	11.7	11.2	10.2	10.7	9.0
Drug stores	22.1	17.2	17.1	14.8	12.4
Eating and drinking places	29.3	23.9	23.7	21.7	16.9
Food stores	44.8	38.2	32.1	27.2	21.6
Furniture and appliances	17.7	18.6	23.5	22.7	20.8
Gasoline stations	52.0	44.1	39.3	36.0	31.2
General merchandise	8.8	5.4	6.3	6.6	3.2
Lumber dealers	21.8	16.9	19.5	20.2	16.5
Other	34.8	29.3	33.9	31.8	28.5

Source: U.S. Bureau of the Census, *Census of Business*. Coverage details are in Appendix B.

more than simply "count heads," i.e., that tries to take into account these other factors. Given certain assumptions, it is possible to estimate industry *differentials* in rates of change of labor input from rates of change in labor compensation. If we assume that the price of a composite unit of labor of a given quality changes at the same rate in all branches of the economy, then the change in total labor compensation in a particular industry relative to the change in some other industry is equal to the relative rates of change of labor input in those two indus-

tries.[4] Labor compensation for wage and salary workers was calculated from payroll data in the *Census of Business*. Compensation per man for self-employed was assumed to be the same as for employees in the same industry.[5]

OUTPUT PER MAN

This is real output divided by employment.

OUTPUT PER UNIT OF LABOR INPUT

This is real output divided by labor input. Absolute percentage rates of change for this measure have not been calculated because of the way in which the relative percentage rates of change of labor input are estimated. Relative values were obtained and used to rank the industries.

OUTPUT PER UNIT OF TOTAL INPUT

If one is interested only in ranking the industries according to their relative rates of change of output per unit of total input, an estimate can be obtained for the eight services by using the reciprocal of the rates of change of price. The rationale is that under competitive conditions, rates of change of price of service industries that have very little material input will tend to be inversely correlated with the rates of change of productivity. The implicit assumption is that the price of a composite unit of total input changes at the same rate in all industries. This is an extension of the assumption underlying the calculation of relative rates of change of labor input.

ANNUAL PERCENTAGE RATES OF CHANGE

The average annual percentage rate of change between 1939 and 1963 for each variable is calculated by fitting a least-squares equation of the form $lnX = a + bT + u$ on observations for 1939, 1948, 1954, 1958,

[4] Note that this formulation does not require that a dollar's worth of compensation buy the same amount of labor input in all industries. There may be variations based on nonpecuniary factors, monopoly or monopsony power, and so on. The relative change in compensation will still be equal to the relative change in labor input, provided these other factors do not change differentially by industry over time.

[5] Analysis of annual earnings of self-employed and wage and salary workers in these industries, as reported in the *1960 Census of Population*, indicates that this procedure probably results in an underestimate of the level of self-employment earnings.

and 1963. The regression coefficient b yields the annual percentage rate of growth compounded continuously. The annual rates for 1948–63 are obtained in a similar fashion by omitting the observation for 1939. It should be noted that the percentage rate of change of a variable formed by dividing one variable by another (e.g., real output per man) is approximately equal to the percentage rate of change of the numerator minus the percentage rate of change of the donominator.

An alternative way of calculating average percentage rates of change would be to use the initial and terminal years only. The difference in results obtained from the two methods is slight in most instances, but there are several industries where differences of .2 to .3 percentage points per annum are observed. Use of all the observations appears to be preferable in order to minimize the influence of the cyclical position of the initial or terminal year, or the influence of random events or errors in the data for one of those years.

The question of cyclical effect as opposed to trend is most important for comparisons based on 1939 because the economy had not yet fully recovered from the Depression and the unemployment rate was 17.2 per cent. The years 1948, 1954, 1958, and 1963 were all at a much higher level of activity than 1939, although 1954 and 1958 were marked by mild recessions. The unemployment rates for the four years were 3.8, 5.6, 6.8, and 5.7 per cent respectively.