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Chapter Title: Income Elasticity of Demand

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tween the two sectors has been slightly larger, 1.7 per cent per annum.

Until 1920, the shift to services could be explained entirely by the movement from agricultural to non-agricultural pursuits; employment in the goods sector, excluding agriculture, rose as rapidly as in services. After 1920, however, the rates of growth diverged; and, as we saw in the first section of this paper, in recent years employment in the non-agricultural goods sector has begun to decline absolutely as well as relatively.

REASONS FOR THE RELATIVE GROWTH OF SERVICE EMPLOYMENT

Allan G. B. Fisher was one of the first economists in this century to emphasize the strength of the trends we are examining in this paper. His book, *The Clash of Progress and Security*, published in 1935, is perceptive and contains much that is relevant to the problems of 1965.[5]

Colin Clark's writings on this point are better known, particularly his often-quoted conclusion, "We may well now turn to examine what much careful generalization of available fact shows to be the most important concomitant of economic progress, namely, the movement of working population from agriculture to manufacture, and from manufacture to commerce and services."[6]

Neither Fisher nor Clark offered a systematic analysis of the factors respon-

sible for the growth of services; both tended to stress sector differences in income elasticity and changes in productivity. Professors Kuznets and Stigler have questioned the existence of significant differences in income elasticity,[7] and a recent econometric analysis questions the alleged difference in productivity.[8] This section considers some evidence concerning both matters.

INCOME ELASTICITY OF DEMAND

When the income of a family or a nation rises, so does its demand for most goods and services.[9] The ratio of the percentage increase in demand to the percentage increase in income is referred to as the "income elasticity." When the percentage increase in demand is equal to the percentage increase in income, the income elasticity is unity. Individual items of consumption that have elasticities greater than unity are said to have elastic demand, while those with elasticities below unity are characterized as inelastic. The question at issue here is whether services, in the aggregate and at the individual industry level, face demands that are more elastic than the demand for goods.

A clear-cut answer to this question is difficult to obtain for a number of reasons. Some of the most important are:

1. To calculate elasticities, we need

[5] London: Macmillan & Co., 1935. E.g., "When we reach a level of wealth where the provision of personal services becomes economically important, the importance of the limitations of physical natural resources in the narrow sense steadily diminishes. We are then much more concerned with the exploitation of human capacity (which is also perfectly 'natural') and the maintenance of a moving equilibrium in a progressive economy comes to depend more and more upon the effective organization and education of human capacity" (p. 38).

[6] *The Conditions of Economic Progress* (1st ed., London: Macmillan & Co., 1940), p. 176.

[7] Cf. Simon Kuznets, "Quantitative Aspects of the Economic Growth of Nations, II, Industrial Distribution of National Product and Labor Force," *Economic Development and Cultural Change*, Supplement, July, 1957; and George J. Stigler, *Trends in Employment in the Service Industries* (Princeton, N.J.: Princeton University Press [for the National Bureau of Economic Research], 1956), p. 161.

[8] Phoebus Dhrymes, "A Comparison of Productivity Behavior in Manufacturing and Service Industries," *Review of Economics and Statistics*, XLV (February, 1963), 64–69.

[9] The exceptions are often referred to as "inferior" goods, e.g., potatoes.

measures of real output or consumption; but for many service (and some goods) industries, accurate measures of real output are not available.

2. Many industries produce intermediate outputs (sold to other firms) as well as final outputs (sold to consumers). Changes in income will affect intermediate demand as well as final demand in ways that depend upon the relative proportions of services and goods used in production.

3. Changes in relative prices, tastes, and technology also affect demand.

4. Substantial changes in income are often closely associated with changes in urbanization, making it difficult to determine whether the observed change in demand is related to income or urbanization.

5. The demand for some goods and services seems to depend upon the distribution of income as well as its average level: e.g., furs, domestic servants.

6. The adjustment of spending patterns to changes in income may require time; thus, the pattern observed at any given moment may depend upon past levels of income as well as present levels: e.g., state and local government expenditures.

7. Elasticities change; what is true at one moment in time may not be true at another.

Despite these difficulties, it is possible to form some judgment concerning relative elasticities for goods and services. Let us look first at the differential rate of change of sector real output between 1929 and 1963, a period when real income per capita was rising appreciably. Other things remaining equal, a more rapid rise in real output for the service sector compared with the goods sector would imply a more elastic demand for services.

Many questions arise concerning the accuracy of available data on real output; therefore two alternative measures are presented. The first takes the Office of Business Economics series GNP in constant (1954) dollars as the measure of real output. This measure has frequently been criticized on the grounds that the implicit price deflators exaggerate the rise in the price of services relative to goods. This bias is attributed in part to the fact that for government and certain other service industries prices are *assumed* to rise as rapidly as wages and no possibility of an increase in real output per man is admitted. If this criticism is valid, then measures of real output based on gross product in constant dollars would tend to overstate the growth of goods output relative to that of services.

The second measure of real output that I use is based on gross product in current dollars. This assumes that the prices of goods and services changed at the same rate.[10] This measure probably overstates the growth of real output in services relative to goods, since it seems to me unlikely that the price of goods did in fact rise by as much or more than the price of services. One cannot be certain of this, however, given the difficulty of obtaining true prices for services such as education and health, where quality improvement may have been very great.

Because the probable bias runs in one direction for one measure and in the other direction for the other, the two

[10] Because industry differences in rates of change of gross product in current dollars provide a good measure of relative changes in factor inputs, this second version implies that real output per unit of total factor input changed at approximately the same rate in both sectors (see Edward F. Denison, *The Sources of Economic Growth in the United States and the Alternatives before Us* [Supplementary Paper No. 13] [New York: Committee for Economic Development, 1962], pp. 218, 219).

measures of relative changes in output may be regarded as outer boundaries within which the true measure probably falls.

Table 6 shows the sector differentials in rates of change of real output under each assumption. The differential rate of change of employment is included for comparison. The most striking conclusion that can be drawn from this table is that differential rates of change of real output were very small relative to those for employment. This suggests that sector differences in income elasticity of demand were probably also small.

It can be seen that the results for the four comparisons are similar; the principal differences can be explained by the relatively slow growth of agriculture and rapid growth of government. The following discussion is based on the full-sector comparison shown in the first row. Under the first assumption (I) about output, demand for goods rose slightly faster than for services, but this might be the result of the change in relative price of goods and services rather than a difference in income elasticity. Under this assumption (gross product in constant dollars), the implicit sector deflators show that the price of goods declined relative to the price of services. The fact that service ouput rose almost as rapidly as goods output, over a period when the price effect alone would have caused a shift to goods, suggests that the income elasticity for services may have been slightly higher than for goods.

Under Assumption II (gross product in current dollars), real output in services rose 0.4 per cent per annum faster than in goods. This implies a slightly higher income elasticity for services because under this assumption prices rose at the same rate in both sectors, and there is no price effect to be considered. Thus

both assumptions about real output point to the same conclusion concerning relative income elasticities.

Moving from the sector aggregate to the industry group level increases the uncertainties concerning the measurement of output and the possible effects of price changes, but the following rough qualitative judgments seem warranted. Income elasticity of demand for agriculture was probably appreciably below average. Output in this industry grew much more slowly than in other industries,

TABLE 6

SECTOR DIFFERENTIALS IN RATES OF GROWTH OF EMPLOYMENT AND REAL OUTPUT, 1929-63

(Per Cent per Annum)

Sector Differential[a]	Employ-ment $(E_s - E_g)$	Output Assumption I[b] $(O_s - O_g)$	Output Assumption II[c] $(O_s - O_g)$
Service minus goods...	1.7	−0.1	0.4
Service minus goods*..	1.0	−0.3	0.1
Service* minus goods..	1.4	−0.3	0.4
Service* minus goods*.	0.7	−0.6	0.1

[a] For sector definitions, see note to Table 1. E and O = average annual rates of change of employment and output; s and g = service and goods sectors.

[b] Output measured by GNP in constant (1954) dollars.

[c] Output measured by GNP in current dollars.

Source: Output—1963, Office of Business Economics, "GNP by Major Industries, 1963," *Survey of Current Business*, September, 1964; 1929, based on Martin L. Marimont, "GNP by Major Industries," *Survey of Current Business*, October, 1962. Employment—same as Table 1.

and this cannot be attributed to adverse price movement. The elasticity for government services was probably appreciably above average, as evidenced by a rapid rise in output. For most of the other industry groups, there is no strong indication of an elasticity significantly different from unity. Trends in real output suggest that transportation may have been below average, while communications and public utilities and government enterprise may have faced a somewhat elastic demand. On balance, the behavior of the individual industry groups suggests that the elasticity for the service sector may have been slightly

higher than for goods, principally because of a low elasticity for agriculture.

It would be preferable to apply the concept of income elasticity to individual consumer goods and services rather than to a heterogeneous collection of sector and industry group outputs, which include many that are intermediate rather than final. I have, therefore, attempted to compare the relative elasticities for goods and services by regressing changes in receipts or expenditures per capita on changes in income per capita across the forty-eight states. The periods chosen were 1939–58 for retail sales and sales of selected services, and 1942–57 for selected expenditures of state and local governments. Comprehensive data were available by state for those years.

The form of the regression equation was

$$\log Q = a + b \log Y + E,$$

where Q = expenditures or receipts per capita in terminal year divided by expenditures or receipts per capita in initial year, and Y = income per capita in terminal year divided by income per capita in initial year.

Because the regressions were run in double log form, the regression coefficient b may be regarded as a measure of the elasticity between income and expenditures. The latter are measured in current dollars and are used as a proxy for real consumption. Price does not enter into the equation because it is assumed that the *change* in price was the same in all states. If this was true, then the change in expenditures in current dollars gives exactly the same regression coefficient as would the change in real consumption. To the extent that prices rose faster in some states than in others, the bias is likely to be in the direction of a positive correlation between changes in price and

changes in income. The regression coefficients may be slightly biased upward for this reason.

The equations were fitted in both weighted (1958 state populations) and unweighted form. The results were similar. I regard the weighted form as the more appropriate because the underlying process (except in the case of government expenditures) has nothing to do with states as such. These are merely statistical conveniences for grouping the behavior of individuals. Moreover, weighting reduces the chances that a random event or reporting error in a small state can significantly influence the coefficients.

The results of this preliminary inquiry into a very complex econometric problem are consistent with the conclusions based on sector trends in output. Income elasticities appear to be slightly higher for services than for goods, but the difference is not statistically significant. The estimated elasticity for total retail sales of goods is 1.00, for total personal services 1.15, and for total state and local government expenditures 1.10.[11]

Interpretation of the results is complicated by the fact that changes in income were very highly correlated with changes in urbanization ($r = .90$ weighted and .79 unweighted). The latter may have affected expenditures for some goods and services independently of changes in income; because the correlation between the two variables was so high, it is very difficult to distinguish one effect from the other. Each regression was also run in multiple variable form, with changes in both income per capita and per cent urban as the inde-

[11] The standard errors of the regression coefficient are .06, .08, and .13, respectively. If one reverses the form of the equation and regresses change in income on change in expenditure, the indicated elasticities are 1.18, 1.44, and 1.90, respectively. I am grateful to Milton Friedman for calling this to my attention.

pendent variables, but in most cases there was no additional explanation of the dependent variable after allowing for the loss of one more degree of freedom. In general, it may be said that part of what we here call income elasticity may reflect increased urbanization.

CHANGES IN PRODUCTIVITY

In Table 6 we saw that given the assumptions stated earlier, little or none of the shift of employment in services could be explained by differential rates of growth of output. It follows, therefore, as a matter of accounting, that most or all of it must be associated with differential rates of change of output per man. Table 7 shows these differentials under both assumptions about real output.

It should be noted that the simple arithmetical partition of changes in employment into changes in output and output per man has certain limitations. There are causal relations between changes in output and changes in output per man; they cannot, therefore, be treated as completely independent factors. Relative gains in output per man may result in changes in relative prices. This will affect output shares because the quantity demanded is not likely to be completely inelastic with respect to price. On the other hand, relative shifts in output can affect output per man through economies of scale and the stimulus to technological change. The large difference between the differentials for these two variables, however, suggests that additional information about possible interactions between them would not alter the major conclusions.

That output per man grew much faster in goods than in services is clear beyond doubt, and that this differential largely or entirely accounts for the differential change in employment is also clear. Per-

haps the most interesting implication of Table 7 comes from the last column, which shows that there was a very substantial difference in sector rates of growth of output per man even when we use a measure of real output that assumes output per unit of total factor input to have grown at about the same rate in both sectors.[12] The large differential in output per man that remains under this assumption must be explained by factors other than "productivity" (defined as efficiency in the use of all resources).

TABLE 7

SECTOR DIFFERENTIALS IN RATES OF GROWTH
OF EMPLOYMENT AND REAL OUTPUT
PER MAN, 1929–63

(Per Cent per Annum)

Sector Differential	Employment $(E_s—E_g)$	Output per Man Assumption I $(A_s—A_g)$	Output per Man Assumption II $(A_s—A_g)$
Service minus goods...	1.7	—1.8	—1.3
Service minus goods*..	1.0	—1.3	—0.9
Service* minus goods..	1.4	—1.7	—1.0
Service* minus goods*.	0.7	—1.3	—0.6

Notes and source: Same as Table 6. A = average annual rate of change of real output per man.

These other factors include differential changes in hours per man, in the quality of labor, and in capital intensity. In 1929, workers in the service sector tended to work longer hours than those in the goods industries. By 1963 this difference had disappeared. Assuming that the extra hours made some contribution to output, this change must account for part of the differential trend in output per man.

There is considerable evidence that after 1929 the ratio of capital to labor and the average quality of labor rose faster in the goods sector than in the

[12] See p. 9.