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Volume Author/Editor: Victor R. Fuchs

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Chapter Author: Victor R. Fuchs

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Quality of Labor

Portions of the preceding analysis suggest that differential change in the quality of labor may have been an important factor accounting for sector differences in the rate of growth of output per man.

Although it is difficult to define "labor quality" with precision, a few words concerning the use of the term in this paper may be helpful. We know from casual observation that man-hours of labor are not homogeneous with respect to productivity. The effect of a given number of man-hours on output, holding technology and other inputs constant, is likely to vary depending upon such factors as the knowledge, intelligence, and strength of the persons supplying the hours of work. All of the factors that contribute to such variation are subsumed under the term "labor quality."

It is possible to measure some of the characteristics that we believe contribute to labor quality, such as age and number of school years completed. We can never specify all of the characteristics that might be related to quality, however, nor have we measures for many that we can name.

Formally, we have defined labor quality as equal to labor input divided by man-hours, when all are expressed as index numbers. As a first approximation of relative change in labor input, we use relative change in labor compensation. To obtain the sector differential in annual percentage change of labor quality, we subtract the differential change in man-hours from the differential change in labor input. For the period 1929-61 this quality differential was approximately .4 to .5 per cent per annum. This is the rate at which compensation per man-hour in the goods sector rose relative to the service sector.

The inference about quality depends upon the assumed relation between quality and labor compensation. If we are to reject this assumption, we should be able to offer alternative explanations for the rapid rise of compensation per man-hour in the goods sector. We will, therefore, consider several possible explanations. In order to accept the

assumption with confidence, we should have some independent evidence concerning the quality of labor, as well as some explanatory hypotheses for the observed differential change in quality. These points will be discussed also.

Factors Affecting Labor Compensation

How valid is it to infer relative quality change from relative change in labor compensation? What factors, other than labor quality, might affect the rate of growth of compensation per man-hour? One possibility is union power. We know that the fraction of the labor force represented by unions has grown significantly since 1929. We know also that unions have been heavily concentrated in the goods sector. Can union power explain the differential rate of growth of compensation per man-hour? We cannot answer this conclusively, but the available indications are negative. The sector differentials in unionization and the probable wage effect of unions do not appear to be large enough to produce sector differentials in the rate of change of compensation of the magnitude that we have observed.

Table 8 shows union members as a percentage of persons engaged in each sector in 1929 and 1960. These estimates are based on industry data which H. Gregg Lewis has assembled from a variety of sources.[1] Between 1960 and 1961 there was not much change in unionization; we assume the same sector differential in unionization in 1961 as in 1960.

Lewis provides also an estimate of the effect of unions on wages. He writes, "apart from periods of unusually rapid inflation or deflation, the average relative wage effect of unionism . . . was 0.10-0.20 per cent

[1]*Unionism and Relative Wages in the United States,* Chicago, University of Chicago Press, 1963, p. 250. The most important sources are the Bureau of Labor Statistics for 1960 and the work of Leo Wolman and Leo Troy at the National Bureau of Economic Research for 1929.

TABLE 8

UNION MEMBERS AS PERCENTAGE OF PERSONS ENGAGED, GOODS AND SERVICE SECTORS, 1929 AND 1960

	1929	1960
Goods	10.7	48.5
Service	1.3	7.3
Goods minus service	9.4	41.2
Goods*	15.3	57.6
Service*	1.7	10.3
Goods* minus service*	13.6	47.3

Note: For sector definitions, see note to Table 1.
Source: Lewis, Unionism and Relative Wages, p. 250.

per percentage point difference in extent of unionism."[2]

We do not know if Lewis is correct or not. For illustrative purposes we take the midpoint of the Lewis estimate, .15 per cent, and apply it to both 1929 and 1961. The union effect on wage differentials in 1929 is given by the differential in extent of unionization (9.4 per cent) multiplied by .15, or 1.4 per cent. The effect in 1961 is 6.2 per cent (41.2 × .15). The effect of the differential change in unionization is 4.8 per cent (6.2 − 1.4). This says that wages in the goods sector relative to the service sector in 1961 were 4.8 per cent higher than they would

[2]"The Effects of Unions on Industrial Wage Differentials," in *Aspects of Labor Economics,* Princeton University Press for National Bureau of Economic Research, 1962, p. 332. Note that neither Lewis nor we are concerned here with the effect of unions on the general wage level. To the extent that the presence of unions in the economy raises wages generally, union power cannot be the source of a sector differential. Note also that Lewis and we are concerned with wages for a given quality of labor. If unions (or efforts to avoid them) produce higher wages in an industry, this may result in higher-quality labor being attracted to it, and may permit employers to be more selective in hiring. If a higher wage is offset by higher quality, it is not greater compensation in the relevant sense.

have been if the degree of unionization in each sector had remained the same as it was in 1929. Spread over thirty-two years, this represents an annual rate of .15 per cent. The corresponding figure for the modified sectors is also .15 per cent per annum. Therefore, if we accept Lewis's estimates, union power probably did raise wages in the goods sector relative to the service sector, but the magnitude of this effect was only about a third of the observed differential rate of change of compensation.

A second factor, possibly working in the opposite direction, is nonpecuniary advantages not included in labor compensation. If these increased more rapidly in the goods industries than in the service industries, compensation data understate the quality differentials; if they increased more rapidly in services, the reverse is true. The data on changes in unionization imply the former, given Lewis's judgment that "the relative gains won by unions probably consist partly of relative improvements in the nonpecuniary aspects of employment."[3] But we have no quantitative evidence on this point, and unionization is only one variable affecting nonpecuniary advantages. The question remains for further study.

Another factor to be considered is the different educational attainment of workers in the two sectors. Industries in the service sector make greater use of workers with more formal education than do the goods industries, as may be seen in Table 9.[4] If there were pronounced differences in wage trends for workers with different amounts of formal schooling, the trends would bias the quality estimates based on compensation per man-hour.

Conclusive evidence on this point is not available, but most economists believe that there was a trend toward narrowing education-wage differentials from 1929 to about 1947. The trend in the postwar period is uncertain, and is probably not very strong either way. If, as seems likely, there was some narrowing between 1929 and 1961, then the differential trend in compensation must be adjusted downward on that account.

[3]*Unionism and Relative Wages*, p. 46. Note also Reder's generalization that "as industries have shifted away from unskilled labor they have also improved working conditions and reduced nonpecuniary disutilities." Melvin W. Reder, "Wage Differentials: Theory and Measurement," in *Aspects of Labor Economics*, p. 278.

[4]Direct education by industry tabulations are not available for years prior to 1960; Harry Gilman is attempting to estimate them from occupational data.

TABLE 9

DISTRIBUTION OF EMPLOYMENT BY NUMBER OF SCHOOL YEARS COMPLETED,
GOODS AND SERVICE SECTORS, 1960

Years of Schooling		Percentage of Sector Employees			
		Goods	Service	Goods*	Service*
Elementary	0-4	6.0	3.0	4.7	2.9
	5-8	30.9	18.8	29.5	20.7
High school	1-3	23.2	21.3	24.1	24.3
	Completed	27.1	29.6	28.1	31.5
College	1-3	7.6	13.3	8.0	12.6
	Completed	5.2	14.0	5.6	8.0

Note: For sector definitions, see note to Table 1.
Source: U.S. Bureau of the Census, 1960 Census of Population, 1/1,000 sample.

A fourth factor that may affect wages is differential industry rates of growth. Economists have argued that rapidly growing industries may be forced to offer more than the prevailing wage in order to attract workers from the rest of the economy. Declining industries, on the other hand, may be able to retain sufficient numbers of employees at wage rates below the normal for a given quality. We know that employment in the service industries in 1961 was growing at a far more rapid rate than in the goods industries. But this would not bias the trends in wage rates if a similar differential was present in 1929 also. An examination of industry employment trends indicates that a sector differential similar to that of recent years was present in the late 1920's; it therefore appears doubtful that this factor has had a significant effect on wage trends between 1929 and 1961.

To sum up, the growth of unions probably does bias the estimate of quality based on compensation in the goods sector, although there is a possible offset related to nonpecuniary advantages. Sector differ-

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ences in education and differing wage trends for different educational groups would almost certainly affect the estimates for 1929-47, but the effect on the 1929-61 comparison may be small in magnitude. Industry employment trends probably had little effect. If the assumptions and inferences described above are at all close to the mark, they suggest that the sector differential trend in labor quality may have been of the order of .3 per cent per annum, rather than the .4 or .5 implied by the compensation data.

To be sure, the preceding discussion does not exhaust the list of factors that might affect sector wage trends. Other variables that should be considered in a more detailed study include size of city, size of firm, region, and product market structure. We simply note that the factors we have considered do not eliminate the possibility of a true differential trend in labor quality.

Labor-Force Characteristics

One way to test the inference about quality is to look at the composition of the labor force in the two sectors. If there has been a differential rate of quality change it should be evident in such demographic characteristics as age, sex, education, and color.[5] Cross-sectional studies have consistently revealed significant relations between these demographic variables and earnings. Economists have generally attributed these differences in earnings to differences in labor quality, although, in the case of race, a portion is the result of market discrimination.[6] These characteristics, therefore, are frequently used as indicators of skill or quality. Unfortunately, the data required for such analyses are not readily available. The decennial Censuses of Population are the logical source, but limitations in coverage and changes in concept make comparisons over time extremely difficult. The following data are suggestive rather than conclusive.

According to data on earnings, workers in the age group 25-64 are of higher quality than those below 25 or 65 and over. Males have higher earnings than females, whites have higher earnings than nonwhites, and

[5]Color is relevant because it is believed that, at given levels of education, nonwhites receive poorer-quality schooling and less on-the-job training than do whites.

[6]See Gary S. Becker, *The Economics of Discrimination*, Chicago, University of Chicago Press, 1957.

TABLE 10

DEMOGRAPHIC CHARACTERISTICS OF WORK FORCE IN GOODS
AND SERVICE SECTORS, 1930, 1950, 1960

Class of Worker	Percentage of Sector Work Force					
	1930[a]		1950[b]		1960[b]	
	Goods	Service	Goods	Service	Goods	Service
Ages 25–64	70.6	72.7	78.5	78.9	82.4	75.7
Male	87.5	61.3	83.5	59.5	81.4	55.8
White	81.7	87.4	90.6	88.7	91.5	88.9
12 years or more of education[c]	n.a.	n.a.	28.1	46.8	37.4	52.8
	Goods*	Service*	Goods*	Service*	Goods*	Service*
Ages 25–64	73.4	68.4	80.7	76.3	84.1	76.4
Male	85.2	72.4	81.0	64.4	79.7	58.9
White	83.4	92.7	92.6	92.5	92.6	91.5
12 years or more of education[c]	n.a.	n.a.	32.0[d]	43.6[e]	39.5[d]	48.6[e]

Note: For sector definitions, see note to Table 1.
Source: U.S. Bureau of the Census, <u>Census of Population</u>, 1930, 1950, 1960; years of education, Harry Gilman, NBER unpublished estimates.

[a]Gainful workers.

[b]Employed persons.

[c]Males 25 years old or older.

[d]Includes government enterprises.

[e]Includes real estate, private households, and some institutional employment.

quality is positively correlated with number of school years completed. Table 10 shows for each sector the percentage of the sector work force that is in the "high quality" category.

The data are far from perfect, but the tendency for the workers in the goods sector to become more concentrated in the "high quality" groups seems clear, and it is doubtful if better data will reverse this conclusion. It is evident that the service-sector work force has been increasingly drawn from females, nonwhites, the young, and the old, and that education has risen more rapidly among workers in the goods industries.

These impressions have been given preliminary confirmation by studies of a few individual industries. Food retailing, for example, now depends heavily on the labor of teenagers. Barbering, on the other hand, has been characterized by an aging labor force; in 1960, 35 per cent of the barbers were over 55 compared with 19 per cent for all employed males. Samples of goods and service industries were compared to see what happened to the ratio of professionals, technicians, and managers to operatives, service workers, and laborers from 1950 to 1960. In most goods industries this ratio increased over the decade, and the median index (1950 = 100) was 129. By contrast, more than half the service industries showed a decrease in this ratio; the median index was 89.

It should be emphasized, however, that these are impressions; a more definitive test must await the estimation of industry employment for each census year by age, color, sex, and education separately, and the weighting of this employment by appropriate earnings weights to calculate standardized labor input.

Possible Explanations of Quality Differential

If the differential trend in labor quality actually occurred, to what can it be attributed? One possible answer concerns the nature of the production process or, more formally, the shape of the production function. The observed trend could have resulted if the goods industries found it easier to substitute skilled labor for unskilled, or to substitute physical capital for labor, than did the service industries.[7]

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[7]The first follows if, as seems likely, there has been a tendency for unskilled wages to rise relative to skilled wages since 1929. The second follows if capital is more easily substituted for unskilled labor than for skilled labor, and if the price of labor has risen relative to the price of capital.

Technological change, or shifts in the production function, may also have contributed to the observed trend. It may be that technological change tended to eliminate unskilled labor more than skilled, and that it was more rapid in the goods industry. Even if technology advanced at the same rate in the two sectors, its impact on unskilled labor may have been different because of differences in capital intensity or for other reasons.

The role of unions should also be considered. Apart from their effect on wage levels, it is alleged that unions have used their bargaining power to narrow the differentials between skilled and unskilled labor. We have seen that their influence has been manifested primarily in the goods sector. If the allegations are correct, we would expect employers in that sector to try to substitute skilled for unskilled labor even more rapidly than in the service sector.

Special obstacles to improvement of quality in government may have played a role. In periods of inflation, government wages (determined by legislation) may tend to lag behind the competitive level and thus tend to depress labor quality. Similar forces may have been at work in private nonprofit organizations.

Finally, we might consider the possibility that self-employment in service industries is now the last resort of the marginal worker. When union power, legislation, or social pressure forces relatively high minimum-wage scales, some low-quality workers may find that their best chance of employment is in self-employment. The major outlet for this self-employment was formerly in agriculture, but now it may be primarily in trade or services.[8]

The preceding hypotheses do not, to be sure, prove the existence of a differential trend in labor quality. They do serve to indicate, however, that such a trend could have occurred and they provide a starting point for research aimed at explanation and analysis.

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[8]As recently as 1950, the number of males with four years or less of education employed in agriculture was 1,050,000, compared with 675,000 employed in trade and services. In 1960, the comparable figures were 560,000 in agriculture and 590,000 in trade and services.

TABLE 11

DISPERSION OF AVERAGE HOURS PER WEEK ACROSS ELEVEN MAJOR INDUSTRY GROUPS,
SELECTED YEARS, 1869-1957

	Arithmetic Mean (hours per week)			Standard Deviation (11 groups) (hours per week)	Coefficient of Variation (11 groups) (per cent)
	Goods (7 groups)	Service (4 groups)	All Industries (11 groups)		
1869	55.2	58.3	56.3	10.7	19.0
1879	55.2	57.5	56.1	10.2	18.2
1889	54.1	56.7	55.0	9.9	18.0
1899	52.3	55.9	53.6	9.4	17.5
1909	50.1	53.4	51.3	7.6	14.8
1919	45.7	49.0	46.9	5.6	11.9
1929	45.5	48.0	46.4	5.1	11.0
1937	39.5	44.8	41.4	5.6	13.5
1948	41.4	40.6	41.1	3.5	8.5
1953	40.3	40.2	40.2	2.8	7.0
1957	39.9	39.1	39.6	3.1	7.8

Note: For sector definitions, see note to Table 1.
Source: Kendrick, Productivity Trends, p. 310.

Differential Trends in Average Hours

An important part of the sector differential growth of output per man may be the result of a much larger decrease in average hours worked per full-time employee in the service sector than in the goods sector. This decrease appears to be part of a more general trend toward uniformity in hours across industries—a trend which is evident as far back as 1869. (See Table 11.) We do not have any explanation to offer for this trend. Recent studies of the general decrease in hours and of cross-sectional differences in hours do not throw much light on the differential cross-sectional changes over time, and the question should be explored further. Also, a better understanding of the relation between the length of the work week and output per man-hour would significantly enhance the analysis of productivity change.

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The accuracy of the hours data themselves has also been called into question. A recent paper by Ethel B. Jones presents new series for manufacturing and coal mining which show much sharper decreases since 1929 than do the series used in this paper.[9]

If Dr. Jones is correct, and if there are not similar biases in the hours series for the service industries, some of the preceding inferences should be modified. The differential trend in hours per man becomes less important and labor quality becomes more important in explaining sector differences in rates of change of output per man.

[9]Ethel B. Jones, "New Estimates of Hours of Work Per Week and Hourly Earnings, 1900-1957," *Review of Economics and Statistics*, November 1963.