Volume Title: Productivity Trends in the United States

Volume Author/Editor: John W. Kendrick, assisted by Maude R. Pech

Volume Publisher: Princeton University Press

Volume ISBN: 0-87014-070-1

Volume URL: http://www.nber.org/books/kend61-1

Publication Date: 1961

Chapter Title: Appendix F: Trade

Chapter Author: John W. Kendrick

Chapter URL: http://www.nber.org/chapters/c2251

Chapter pages in book: (p. 499 - 506)

APPENDIX F

Trade

THIS segment is composed of establishments in both wholesale and retail distribution. In terms of the Standard Industrial Classification, wholesale trade consists of Major Group 50, "Merchant wholesalers," broken down by line of trade, and Major Group 51, comprising other wholesalers, such as sales branches and sales offices of industrial concerns, petroleum bulk stations, agents and brokers, and assemblers (mainly of farm products). The retail trade divisions consist of Major Groups 52 through 59, and we follow the Commerce Department in including also automobile services and garages (Major Group 75). It should be noted that retail trade includes eating and drinking places, such as restaurants and bars, as well as establishments distributing commodities of various types for consumption elsewhere. The basic study upon which we have relied heavily is Harold Barger's *Distribution's Place in the American Economy since 1869*.[1]

Output

We have employed the index of output in wholesale and retail distribution prepared by Barger[2] for 1869–1929, with some minor adjustments, and extended it by similar methods to 1953. Barger's method involved several major steps: the estimation by type of commodity of the physical volume of finished goods for domestic use; the application of ratios representing the portions of each class of goods sold through retail stores in each key year; and the weighting of finished goods sold through retail stores by the gross distributive markup (combined wholesale and retail gross costs of distribution) for each class of commodity.

The estimates of the physical volume of finished goods for domestic use and of construction materials are those of William H. Shaw,[3] together with an allowance by Barger for firewood.[4] The Shaw estimates are in terms of 1913 producer prices; for consistency with the other output indexes we reweighted the Shaw estimates in terms of average prices in each pair of key years. The result of reweighting by the Marshall-Edgeworth formula[5] is to produce a significantly smaller increase in output between 1909 and 1929.

[1] Princeton University Press (for NBER), 1955.
[2] *Ibid.*, Table 10, pp. 22–3.
[3] *Value of Commodity Output since 1869*, New York (NBER), 1947.
[4] *Op. cit.*, pp. 22–23.
[5] *Ibid.*, p. 23, note g.

Ideally, Barger would have liked to have included sales of unfinished goods by wholesalers to industrial consumers, but data were not at hand. Although such sales accounted for possibly one-fourth of the value of goods sold through distributive channels in 1929, they were much less important as a fraction of value added by distribution—possibly one-twentieth or so.[6] Insofar as vertical integration and savings of materials have cut the ratio of the volume of intermediate-product sales to finished-goods sales, the Shaw index may have some upward bias as a basis for the measure of trade throughout.

The fractions of finished-goods output, by type, estimated to be sold through retail stores are shown in Barger.[7] These proportions are based largely on those estimated for 1929 by Simon Kuznets in *Commodity Flow and Capital Formation.*[8] In several cases, changing proportions were used for decennial years back to 1869, based on scattered evidence.[9] Although there was a decline in the proportion of construction materials sold through retail outlets, on net balance the proportion of finished goods passing through the distribution system increased from 1869 to 1929. This development reflects the increased complexity of the economy; and Barger believes that the fraction may have increased more than his calculations show since he changed the ratios prior to 1929 only when evidence supported the change. It should also be noted that sales by wholesalers directly to consumers do not enter the index. These transactions are relatively small.

Barger allocated the various groups of finished commodity output entering trade to thirty-one different types of store and weighted them by the "gross cost of distribution," or margin, in each type of store.[10] Whereas distributive markups generally rose to some extent over the period, it is the relative changes in markups in conjunction with the relative changes in input into distribution that affect the aggregate index. Barger used an average of 1869 and 1929 distributive margins as weights. The later set of weights yields a somewhat smaller rate of increase in the distributive output index after 1909, due in part to the laggard growth in sales of food, on which margins increased relatively, and the dynamic growth in sales of automobiles up to 1929, on which margins were low and relatively stable. Ideally, to fit our weighting scheme, the average of markups in the first and last years of each decade should have been used. Actually, the decennial changes in the markup estimates were not sufficiently precise to warrant frequent changes in weight. But if the accuracy

[6] *Ibid.*, p. 25.
[7] *Ibid.*, Table B-2.
[8] New York (NBER), 1938.
[9] Barger, *op. cit.*, Appendix B.
[10] *Ibid.*, Table 26, and discussion of sources in Appendix B.

of the general drift in margins revealed by Barger's researches is assumed, weighting by the bounding years of the longer period seems desirable. The final index of output in distribution appears as the last line in Barger's Table 10, with our revisions for 1919 and 1929 caused by the alternative weighting of finished goods shown there in footnote i.

The Barger procedure is predicated on the assumption that the volume of services rendered per unit of goods handled by wholesale and retail establishments has not changed significantly over time. Barger considered this question in the light of considerable historical evidence bearing on the various types of services rendered by distribution: "We conclude that distribution probably accompanies the handling of commodities with somewhat more service on the average than in 1869 but that, everything considered, the change is not large."[11] In other words, the index of distributive output may be subject to some downward bias on this score, but it is not substantial. In any case, commodity output indexes are also subject to some downward bias insofar as they fail to reflect quality changes.

For the period since 1929, we have changed somewhat the method of estimating output in distribution, although the basic concept remains the same. We have used the deflated values of final purchases of consumer goods and producers' durable equipment, by type, weighted by the corresponding distributive markups, 1929–39 and 1939–48, based on estimates by the Commerce Department. This shift in procedure was dictated by several considerations. Barger himself shifted to the Commerce estimates for 1939–49, but the estimates he used were subsequently revised by the Department. In addition, the Shaw estimates for 1929–39 used by Barger have been reworked by the Department, and the revised real values show a greater increase than the earlier figures.

Further, Barger continued to use the 1929 ratios of goods flowing through distributive channels, the earlier price weights for finished goods, and the 1869–1929 average distributive margins. Based on the detail supplied us for this purpose by Commerce, we were able to use the Marshall-Edgeworth weighting formula both with respect to the prices of the underlying finished goods and the gross margins. The margin weights also reflect changes in the proportions of final goods passing through trade channels, as shown in the *Census of Distribution* for 1929, 1939, and 1948 and used for the Commerce margin estimates.[12]

To the Commerce final purchase series were added real outlays for construction materials. To this series and to the several commodity groups that Commerce estimated by the retail valuation rather than the com-

[11] *Ibid.*, pp. 28–36.
[12] The Department's sources and methods are described in *National Income Supplement, 1954, Survey of Current Business*, pp. 103–117 and 126–135.

modity flow method,[13] we have applied Barger's trade ratios of 1929 and his margin estimates for 1929, 1939, and 1948.

Use of the Commerce estimates results in a somewhat broader coverage of trade output than prevails in the Barger estimates. Commerce includes markups for commodities sold directly by wholesalers to final purchasers as well as to retail establishments. This affects primarily producers' durable equipment, which thus has a somewhat greater weight in our index than in Barger's.

Labor Input

EMPLOYMENT

From 1929 forward, establishment employment data are available. The Commerce estimates, which we use, are based primarily on the *Census of Retail Trade* and the *Census of Wholesale Trade* for 1929, 1933, 1935, and 1939, and thereafter on Social Security Administration data. Interpolations prior to 1939 were by Bureau of Labor Statistics indexes based on sample data.

The number of proprietors was estimated on the basis of the Census reports (including the 1948 *Census of Business*), with interpolations and extrapolations by estimates of the number of establishments in the various branches of trade. Both the National Income Division and the Bureau of the Census count proprietors only if they spend a major portion of their time in the industry. Our estimates of unpaid family workers are based on the Census figures.

Prior to 1929, it was necessary to rely for benchmark estimates on occupation data for gainful workers from the decennial population censuses. Barger used this type of series, as prepared for the trade segment by Daniel Carson for the decennial years over the entire period 1870–1940.[14] He lists the chief defects of this series as being (1) its coverage—eating and drinking places and possibly manufacturers' sales branches are excluded, while advertising and miscellaneous business services are included, and (2) the inclusion of unemployed workers attached to the industry.[15] These points are in addition to the difficulties of classifying occupation data according to industry.[16] Barger's conclusion is that the Carson manpower estimates may be subject to some downward bias, particularly since the groups omitted have probably grown in relation to the total.

We extrapolated the OBE estimates of persons engaged, plus unpaid family workers, by Carson's labor force estimates for the segment (including

[13] Cf. *ibid.*, Exhibit 1, p. 104.

[14] Barger, *op. cit.*, Table 1.

[15] *Ibid.*, pp. 7, 43, and 105.

[16] See the discussion by Solomon Fabricant and Daniel Carson in *Studies in Income and Wealth, Volume 11*, New York (NBER), 1949, pp. 3–134.

garages) adjusted to an employment basis. Annual estimates from 1900 to 1929 were interpolated by means of the employment series prepared by Lebergott.[17] Of necessity, the Lebergott estimates are also benchmarked on the occupation statistics of the *Census of Population*. For his annual interpolations, Lebergott rejected the National Industrial Conference Board (NICB) method of interpolating between Census benchmarks by employment in commodity-producing industries, since it produces too volatile a series. He likewise rejected the Kuznets use of state data, since trade employment in the three states chosen by Kuznets did not parallel national employment movements in the segment since 1929. Instead, Lebergott interpolated essentially by real domestic sales of finished commodities by line of trade, which are based on the Shaw estimates. Obviously, the annual employment estimates prior to 1929 cannot be used for productivity analysis in the segment. We therefore show in Table F-I the ratios only for the decennial years in which the employment estimates are independently derived. The annual estimates prior to 1929 are used as part of the economy employment total.

Annual interpolations prior to 1900 were made on the basis of ratios of employment to output (key-year ratios interpolated along a straight line) applied to the output index. Here, again, the annual estimates are used only in obtaining national aggregates.

AVERAGE HOURS AND MANHOURS

In 1929 and earlier years, our estimates of average hours worked per week are essentially those of Barger, but since 1929 we deviate somewhat from his procedure with respect to hours worked by proprietors. The Barger estimates are presented in his Table 5 and explained in the footnotes to that table.[18] Our estimates for key years are included in Table A-IX.

From 1935 forward, BLS estimates of average hours worked per week by nonsupervisory employees in wholesale and retail trade are available. These were weighted together by employment, and extended from 1935 to 1934 by BLS estimates for retail trade alone. Annual interpolations between 1934 and the 1929 estimate of Barger (an extension forward of the King data for 1920–22)[19] were made on the basis of average hours in manufacturing, the indicated change in both segments being close to nine hours a week.

A special tabulation by the Census Bureau of average hours worked by proprietors and unpaid family workers in trade for May 1953 revealed

[17] Stanley Lebergott, "Estimates of Labor Force, Employment, and Unemployment, 1900–1950," unpublished MS., Tables 2 and 3.

[18] *Op. cit.*, pp. 11–12.

[19] Willford I. King, *Employment, Hours and Earnings in Prosperity and Depression, United States, 1920–1922*, 2nd ed., New York (NBER), 1923.

a level approximately 30 per cent above that worked by employees at the same period. In absolute terms, the level of approximately fifty-two hours is significantly below the sixty which had been assumed by Barger for recent decades. We have assumed the same proportionate difference as in 1953 between the average hours worked by employees and self-employed for earlier years back to 1930, when this extrapolation results in an average workweek for proprietors of sixty hours. From 1930 back, we shift to the Barger estimates, according to which the hours of proprietors are held at sixty until the first decade of the century, when hours of both proprietors and employees rise above the sixty mark.

Barger used the King estimates of average actual hours worked per week in 1920–22 to obtain his 1919 figure. He extrapolated this figure of 52.2 hours per week for employees by the average standard workweek, obtained from an intensive survey of available state reports for decennial years back to 1880. He also used the 1880 estimate of sixty-six hours for 1870. Our own survey of state sources strongly suggests that the average workweek in trade establishments was probably higher in 1870 than in 1880; but we have not deviated from the published Barger figures in the early years since the evidence is fragmentary.

In order to arrive at manhours, the average hours worked per week by employees have been multiplied by the average number of full- and part-time employees and by weeks per year. In 1940 the BLS series on average hours, which relates to full- and part-time employees, is substantially below the Census average, which is closer to a full-time hours basis. This is to be expected in view of the large number of part-time workers in this industry.

To employee manhours are added manhours worked by proprietors and unpaid family workers. The average hours estimates, benchmarked on the Census figures, are comparable with the estimates of numbers employed.

Capital Input

Approximately one-half of all real capital employed in wholesale and retail trade in 1929, and a somewhat larger proportion in 1953, consisted of inventories. Estimates of the real stock of inventories were obtained by cumulating real changes in wholesale and retail trade inventories, as estimated by the Commerce Department and converted to a 1929 price base, starting from an estimate of the total current value of trade inventories at the beginning of the base year 1929.

Estimates of the real stock of durable capital were based on book value estimates derived from Internal Revenue Service, *Statistics of Income* data.[20]

[20] Unpublished data collated by Lillian Epstein in connection with the Capital Formation and Financing Study.

The estimates cover 1929–49 and were extended to 1953 using the same source and methods. Data reported for durable depreciable assets, net of depreciation and depletion reserves, from corporate returns with balance sheets, were raised by the ratio of compiled receipts of all corporations to compiled receipts of corporations with balance sheets. The 1931 ratio of 103.5 was used for 1929.

Estimates of net depreciable assets in the noncorporate sector were derived by a somewhat complex procedure. Briefly, for 1939 and 1948, asset ratios to sales were taken from *Statistics of Income* data for corporate groups comparable in size to the noncorporate groups and applied to Census data for noncorporate wholesale and retail sales. The 1939 noncorporate ratio was extrapolated to 1929 by the corporate ratio and applied to 1929 noncorporate sales. Noncorporate durable assets comprise about two-fifths of the total.

Book value deflators are those implicit in the Goldsmith original-cost and constant (1929)-dollar estimates for nonfarm, nonresidential plant and equipment, weighted three and one, respectively.

To cover the real value of site land, the constant-dollar plant and equipment estimates were raised by the ratio 1.282, which represents the 1929 proportions as reported in the corporate returns with balance sheets.

Relative Weights of Capital and Labor

Real labor and capital inputs for key years from 1929 forward were combined by weights based on the Commerce Department national income estimates. Compensation of employees was raised by the ratio of total to employee manhours in order to arrive at total labor compensation, including compensation for the labor of proprietors and unpaid family workers based on the imputation of the same average hourly earnings as received by employees. Capital compensation was obtained by deducting labor compensation from national income originating in trade. Each type of compensation in key years was divided by the real input indexes to obtain unit factor compensations, on the basis of which the percentage weights were computed. The weight of capital was about 13 per cent of the total in each of the subperiods 1937–48 and 1948–53, but was considerably less in 1929–37.

TABLE F-I

Trade: Output, Inputs, and Productivity Ratios, Key Years, 1869–1953
(1929 = 100)

	Output	Persons Engaged[a]	Output per Person	Manhours[a]	Output per Manhour	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1869	7.6	12.8	59.4	15.9	47.8				
1879	15.9	17.1	93.0	21.2	75.0				
1889	23.9	29.1	82.1	36.2	66.0				
1899	36.2	40.0	90.5	49.1	73.7				
1909	53.3	55.9	95.3	62.1	85.8				
1919	66.3	71.6	92.6	74.0	89.6				
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1937	104.2	104.4	99.8	91.8	113.5	73.9	141.0	91.1	114.4
1948	167.3	142.9	117.1	116.0	144.2	120.0	139.4	118.6	141.1
1953	190.2	152.8	124.5	120.9	157.3	143.5	132.5	126.0	151.0

[a] Absolute numbers of persons engaged and manhours are given in Tables A-VII and A-XI.