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LABOR PRODUCTIVITY IN FOOD DISTRIBUTION

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Labor productivity--output per man-hour--in food distribution increased about 2.7 percent per year during 1948-63. This was about the same as the increase for the private nonfarm sector of the economy, but less than for the farm sector. The increase for food distribution was the result of a 2.4 percent per year increase in net output and a small decrease in man-hours. Distribution costs per unit of net output increased 52 percent from 1948 to 1963; unit labor costs rose 23 percent; and unit nonlabor costs increased 97 percent. The implicit price deflator for the private economy increased 30 percent.

Comparison of productivity trends in various industries can partially explain trends in unit costs and prices. Moreover, productivity is one indicator of market performance for an industry.

Rapidly increasing productivity usually is accompanied by a relative decline in unit costs, while slowly increasing productivity generally is accompanied by rapidly increasing costs. In industries where competition is vigorous and where the supply is close to consumption, prices of the product and unit costs of production usually are closely related. Industries in which unit costs are rising less than average unit costs for all industries can be expected to show price increases smaller than average prices for the whole economy. In those industries where unit costs are rising faster than average, we can expect prices to rise faster than the average price level.

This article analyzes trends in net output, output per person, and output per man-hour in distributing foods of farm origin. Lack of adequate data on capital is the major reason for limiting the analysis to labor productivity rather than analyzing total productivity. Trends in labor productivity are affected by changes in economies of scale, changes in the quality of inputs, and quantity of other inputs associated with labor. The results presented here should be evaluated with these limitations in mind.

Most of the analysis presented here concerns data from 1948 to 1963. Adequate data are not yet available to make comparable estimates for 1964 to 1966. However, selected data for this recent period were analyzed to show preliminary trends. The data update those presented in an earlier publication. 1/ It was one of the first to contain estimates of net output per man-hour in food distribution. A more recent study which analyzed gross output in food retailing was published by Schwartzman. 2/ Fuchs also studied gross output of retail food stores as a part of a larger study of the service industries. 3/

1/ William H. Waldorf and Hazen F. Gale, Output Per Man-Hour in Distributing Foods of Farm Origin, Tech. Bul. No. 1335, Economic Research Service, USDA, 1965. This bulletin also presents a more detailed description of the data and methods used in this analysis.

2/ Schwartzman, David, "Productivity in Food Retailing," Productivity in Marketing, J. L. Heskett, Editor, Department of Business Organization, Ohio State University, 1965.

3/ Fuchs, Victor R., The Growing Importance of the Service Industries, Occasional Paper 96, 1965, National Bureau of Economic Research.

Food distribution is defined here to include food wholesalers, food retailers, and eating places. The data apply only to foods that are produced from products originating on U.S. farms. Gross output is the final sales value (in constant dollars) of food sold to consumers by retailers and eating places. Net output is an estimate of the services provided by the food distribution system and includes value added by distribution and expenditures for supplies, packaging materials, containers, and business services (all in constant dollars).

Output in Food Distribution

Net output in food distribution increased 44 percent from 1948 to 1963, a compound rate of 2.4 percent per year (tables 5 and 9). However, preliminary data indicate that net output has increased at a rate of about 4.2 percent per year since 1963.

Net output in the wholesaling and retailing sector increased less than the increase for all food distribution from 1948 to 1963 (table 5). Net output of eating places increased more than that in the wholesaling and retailing sector. From 1963 to 1966, preliminary data indicated that net output in wholesaling and retailing increased at a rate of 3.4 percent per year, compared with 2.0 percent per year during 1948 to 1963. During 1963-66, output in eating places also has increased substantially faster than in earlier years.

Net output in all food distribution increased at a slower rate than the increase in the quantity of food entering the system from 1948 to 1963. Taken together, these changes imply a decline in distribution services per unit of food handled. However, most of this decline occurred during 1948-54.

Labor Used in Food Distribution

The number of persons engaged in the distribution of farm food products increased 10 percent from 1948 to 1963 (table 5). All of the increase occurred in eating places; the number of persons employed in retailing and wholesaling of farm foods declined 5 percent from 1948 to 1963. However, preliminary data indicate that the number of persons employed in retailing and wholesaling increased at an annual rate of 3.6 percent between 1963 and 1966, compared with an annual decrease of 0.3 percent from 1948 to 1963. The number of persons employed in eating places during 1963-66 increased at an annual rate of 4.8 percent, compared with 2.0 percent from 1948 to 1963.

The total number of man-hours worked in food distribution declined about 4 percent from 1948 to 1963 (table 5). Man-hours worked in the food retailing and food wholesaling component declined 16 percent. The decline in total man-hours was the net result of a decrease in the number of proprietors (who work more hours per week than paid employees), a small decrease in hours worked per week by paid employees, and a partially offsetting increase in the number of paid employees.

Output Per Man-Hour

Output per man-hour in food distribution increased 48 percent between 1948 and 1963, an annual increase of 2.7 percent per year (tables 5 and 9). Preliminary data for 1964 and 1966 show further increases in labor productivity, but at a slower rate than for 1948 to 1963. The annual rate of growth in output per man-hour between census years ranged from 2.0 percent from 1948 to 1954 to 3.2 percent from 1958 to 1963.

Output per man-hour in the food retailing and wholesaling component rose 62 percent from 1948 to 1963, or about 3.3 percent per year. The annual rate of growth in output per man-hour between census years ranged from 2.1 percent from 1948 to 1954 to 4.3 percent from 1958 to 1963. Part of this increase can be attributed to a rapid decline in small establishments and the relatively small output per person prevalent in these establishments.

Costs Per Unit of Net Output

Hourly labor costs increased 82 percent between 1948 and 1963, while output per man-hour rose 48 percent; the result was a 23 percent increase in unit labor costs (tables 5 and 6). Practically all

Table 5.--Output, persons, man-hours, output per person and output per man-hour in distribution of farm-originated foods, United States, selected years, 1929-1963

(1929=100)

Items	1939	1948	1954	1958	1963
Food entering the distribution sector 1/	118	147	179	200	235
Food distribution 2/					
Net output	125	181	199	222	260
Persons 3/	108	135	138	143	148
Man-hours 4/	96	111	109	108	107
Output per person	116	134	145	155	176
Output per man-hour	130	163	183	207	242
Food wholesaling and retailing employment					
Net output	124	171	181	202	231
Persons	103	119	116	118	113
Man-hours	92	99	92	89	83
Output per person	120	144	156	171	205
Output per man-hour	134	173	196	227	280

1/ Value (in 1947-49 dollars) of finished processed and unprocessed foods of farm origin entering the food distribution sector and destined for domestic civilian consumption.

2/ Includes wholesalers, retailers, and away-from-home eating places in handling farm-originated foods. Excludes for-hire transportation and assembling of farm products.

3/ Includes all persons (paid employees, unpaid family workers and proprietors of unincorporated businesses) engaged in handling farm-originated foods in wholesaling, retailing, and away-from-home eating establishments. Excludes persons in food distribution agencies who are engaged in handling nonfood items and foods which are not destined for U.S. civilian consumption. Excludes for-hire transportation and assembling of farm products.

4/ Based on total number of persons and estimates of average number of hours paid for including paid vacation and sick leave. Estimates of average number of hours are based on published BLS data on average number of hours per week for production workers in retail food stores and in total wholesale trade; the same averages were assumed to apply to unpaid family workers and for proprietors of unincorporated businesses a constant 60 hour week was assumed.

of the increase in unit labor costs occurred between 1948 and 1954 (table 6). After a period of stable unit labor costs between 1954 and 1963, preliminary data indicate that unit labor costs have been rising slightly since 1963.

Nonlabor costs in food distribution (total distribution costs less labor costs) per unit of net output increased about 97 percent between 1948 and 1963. The faster increase in nonlabor costs reflects the substitution of capital for labor and increases in expenditures for advertising, maintenance, rent, interest, and other operating expenses. In 1963, nonlabor charges accounted for 51 percent of total distribution costs, compared with 39 percent in 1948.

Unit distribution costs (the sum of labor and nonlabor costs) increased 52

Table 6.--Hourly labor costs, unit labor costs, unit non-labor costs, and unit distribution costs in distribution of farm-originated foods, United States, selected years, 1929-1963

(1929=100)

Items	1939	1948	1954	1958	1963
Food distribution 1/					
Hourly labor costs 2/	107	250	344	380	456
Unit labor costs 3/	83	154	188	184	189
Unit non-labor costs 4/	69	88	117	145	173
Unit distribution costs 5/	75	119	151	163	181
Food wholesaling and retailing component					
Hourly labor costs 2/	107	234	341	386	476
Unit labor costs 3/	80	135	174	170	170
Unit non-labor costs 4/	71	80	110	144	189
Unit distribution costs 5/	76	109	144	158	179

1/ For food wholesaling, retailing, and away-from-home eating places. Excludes for-hire transportation and assembling of farm products.

2/ Obtained by dividing index of labor cost by index of total man-hours. Man-hours are based on total number of persons and estimates of average number of hours paid for, including paid vacation and sick leave.

3/ Obtained by dividing index of labor cost by index of net output.

4/ Obtained by dividing index of non-labor costs (total distribution costs minus labor costs) by index of net output.

5/ Obtained by dividing index of total distribution costs by index of net output.

percent from 1948 to 1963. During 1958-63, the increase was 11 percent (table 6). The implicit price deflator--an index of prices for all goods and services--for the total private economy increased 30 percent between 1948 and 1963. The larger increase in unit distribution costs than in prices in the total private economy reflects the slower than average increase in output per man-hour in food distribution. The increase in the cost of distribution services contributed to a 39 percent increase in the spread between the farm value and retail cost of the market basket of farm foods. However, since farm prices declined from 1948 to 1963, retail prices of food products did not increase as much as many other items.

Factors Affecting Increases in Output Per Man-Hour

Important factors in increasing output per man-hour in distributing foods of farm origin were changes in the organization of establishments and increases in capital equipment.

The change in the organization of retail stores between 1948 and 1963 is most apparent. Nearly all food stores are now self-service operations, whereas in 1948 only about 63 percent of the sales were in self-service stores.

In effect, there has been a substitution of customer labor for paid labor. Part of this substitution has been accompanied by a corresponding decrease in net output of services per unit of food handled since many services formerly provided by employees are now performed by customers. However, part of this decrease was offset by new services such as parking lots, larger stores, and wider selection of products.

Sales per worker (constant dollars) in retail food stores increased 47 percent from 1948 to 1963 (table 7). This increase was due to: (1) an increase in sales per worker for each size of store, and (2) an increase in importance of large stores where sales per worker were greatest. From 1948 to 1963, increases in sales per worker ranged between 7 percent for stores with annual sales of $300,000 to $499,000 and 36 percent for stores with annual sales of $1,000,000 or more. Since the increase for all stores was greater than for any subgroups, it is apparent that the shift in relative importance was a more important factor in raising overall productivity than were increases in sales per worker for each size category. The increases within each size accounted for 44 percent of the increase in sales per worker in all stores, while the change in relative importance among groups accounted for 56 percent.

These data indicate that economies of scale exist in retail food stores and that the industry has been moving toward larger stores to take advantage of these economies. However, stores with 50 or more employees consistently had lower sales per worker than those with 20-49 employees (table 8). This indicates that there is a limit to economies of scale in retail food establishments. However, the optimal size probably is moving upward and establishments with 50-60 employees now may be more efficient than those with 20-49 employees. Internal organization and efficiency are not the only factors determining optimal size. External factors such as population density, proximity to major highways, and consumer acceptance of larger geographical shopping areas are also important.

Food wholesaling has also undergone organizational changes. Specialty and affiliated wholesalers have increased in number, while the number of independent general line wholesalers has decreased. These specialized wholesalers often are more efficient because they handle larger orders, have specialized equipment, and are more knowledgeable in their specialty.

Although data are lacking, the amount of capital employed in wholesale and retail food establishments probably increased in the 1948-63 period. Palletized storage, conveyors, and mechanical trucks have reduced labor requirements in warehouses. Delivery to central warehouses of chainstores and redistribution by one stop delivery has reduced the number of delivery men and trucks needed to service retail stores. In retail stores, conveyors and other innovations in merchandise handling have reduced labor requirements.

A factor that tends to retard output per man-hour is worker injuries. The number of days lost in retail food stores resulting from disabling work injuries for each million employee hours worked averaged 11 percent higher during 1962 to 1965 than during 1958 to 1961. 4/ During these same periods, the work injury rate in eating and drinking places increased 13 percent. These increases were partially offset by a decrease of 19 percent in the work injury rate for wholesaling establishments. Time lost because of disabling work injuries usually were less than 1 percent of the total hours worked.

Comparisons With Other Sectors

Trends in output per man-hour vary widely among sectors of the economy. The annual increase in labor productivity was higher for the total private economy (3.3 percent) than for food distribution (2.7 percent) during the 1948-63 period (table 9). However, the increase in the nonfarm sector (2.8 percent) was about the same as for food distribution. Output per man-hour in the farm sector increased 5.7 percent per year.

Labor productivity in food retailing and food wholesaling increased faster than labor productivity in all retail trade from 1948 to 1963. Output per person in food retailing and wholesaling increased at an annual average rate of 2.4 percent.

4/ Bureau of Labor Statistics, Handbook of Labor Statistics, Bulletin 1555, U.S. Department of Labor, 1967.

Table 7.--Sales per worker, distribution of establishments, and distribution of employees in all grocery and combination stores by sales class, United States, 1948, 1954, 1958, and 1963 1/

Annual sales per establishment	Sales per worker (constant 1947-49 dollars) 2/			
	1948	1954	1958	1963
	Dollars	Dollars	Dollars	Dollars
$2,000,000 or more	3/30,787	35,240	38,981	42,511
$1,000,000 to 1,999,000		36,469	38,294	41,122
$500,000 to 999,000	33,719	34,595	35,313	36,998
$300,000 to 499,999	31,438	31,889	31,710	33,562
$100,000 to 299,999	26,483	27,373	27,063	29,511
Under $100,000	16,975	19,633	18,157	19,404
All stores	23,229	28,397	30,382	34,199
	Distribution of establishments			
	Percent	Percent	Percent	Percent
$2,000,000 or more		---	1	2
$1,000,000 to 1,999,000	3/1	2	3	4
$500,000 to 999,000	2	3	4	5
$300,000 to 499,999	2	3	4	4
$100,000 to 299,999	11	15	16	18
Under $100,000	84	77	72	67
Total	100	100	100	100
	Distribution of workers 2/			
	Percent	Percent	Percent	Percent
$2,000,000 or more		10	16	19
$1,000,000 to 1,999,000	3/9	16	20	24
$500,000 to 999,000	11	13	13	15
$300,000 to 499,999	8	8	7	7
$100,000 to 299,999	22	21	18	15
Under $100,000	50	32	26	20
Total	100	100	100	100

1/ The grocery store data for 1958 and 1963 include delicatessens, the data for 1948 and 1954 do not.

2/ Includes total paid employees and active proprietors.

3/ For 1948, the Census of Business listed this category as $1,000,000 or more.

Compiled from Census of Business data.

Table 8.--Sales per worker, distribution of establishments, and distribution of employees in all grocery and combination stores by employee size, 1948, 1954, 1958, and 1963 1/

Paid employees per establishment	Sales per worker (constant 1947-49 dollars) 2/			
	1948	1954	1958	1963
	Dollars	Dollars	Dollars	Dollars
50 or more	22,099	30,548	32,212	36,600
20-49	28,578	34,986	37,540	40,604
10-19	29,908	33,046	34,621	37,477
8-9	28,102	29,596	30,521	32,794
6-7	24,453	26,379	28,330	30,713
4-5	21,568	24,013	25,794	28,965
Less than 4	18,560	23,336	22,421	24,235
All stores 3	22,306	28,397	30,382	34,199
	Distribution of establishments			
	Percent	Percent	Percent	Percent
50 or more	--	1	1	1
20-49	1	3	4	6
10-19	2	4	5	6
8-9	1	2	2	2
6-7	3	3	3	3
4-5	6	6	6	6
Less than 4	87	81	79	76
Total 3	100	100	100	100
	Distribution of workers 2/			
	Percent	Percent	Percent	Percent
50 or more	4	11	14	13
20-49	12	21	27	34
10-19	11	14	14	15
8-9	4	4	4	3
6-7	7	6	5	4
4-5	11	9	7	6
Less than 4	51	35	29	25
Total 3/	100	100	100	100

1/ The grocery store data for 1958 and 1963 include delicatessens, the data for 1948 and 1954 do not.

2/ Includes total paid employees and active proprietors.

3/ Data are for stores that were operated entire year except for 1948. The 1948 data are for stores that were operating November 15 of that year.

Compiled from Census of Business data.

Table 9.--Average annual percentage increase in net output, employment, man-hours, output per person, output per man-hour in food distribution and other sectors of the economy, United States, selected periods, 1929-63

Items	1948 to 1963 1/	1939 to 1948 1/	1929 to 1939 1/	1929 to 1963 2/
	Percent	Percent	Percent	Percent
Food distribution 3/				
Net output	2.4	4.2	2.2	2.9
Persons	.6	2.5	.8	1.2
Man-hours	-.3	1.6	-.4	.3
Output per person	1.8	1.6	1.4	1.6
Output per man-hour	2.7	2.5	2.7	2.6
Food wholesaling and retailing component				
Net output	2.0	3.6	2.2	2.5
Persons	-.3	1.6	.3	.5
Man-hours	-1.2	.7	-.8	-.4
Output per person	2.4	2.0	1.8	2.0
Output per man-hour	3.3	2.9	3.0	3.0
Output per man-hour				
Farm sector 4/	5.7	2.8	1.8	3.8
Private non-farm sector 4/	2.8	2.0	1.6	2.2
Total private economy 4/	3.3	2.8	1.5	2.7

1/ Based on a geometric rate between the two years only.
2/ Based on a semilogarithmic trend equation, using least squares and data for 1929, 1939, 1948, 1954, 1958, and 1963.
3/ For food wholesaling, retailing, and away-from-home eating places.
4/ Based on BLS estimates of net output per man-hour, computed on an establishment basis and based on approximate hours paid (including paid vacations, sick leave, and so on) rather than hours worked.

Fuchs estimated that gross output per person in 10 selected retail trades increased at an annual rate of 1.7 percent. 5/

Productivity increases in wholesale and retail food trades and in agriculture have resulted from similar causes. Small units have been replaced by larger and more efficient units, with a resulting improvement in output per man-hour. However, the substitution of capital for labor and the adoption of new technologies probably have been greater in agriculture than in food distribution.

Outlook

Future increases in productivity in food distribution will depend mostly on the introduction of labor saving equipment, especially in wholesaling and retailing. New methods of packaging meat

5/ Fuchs, Victor R. and Jean Alexander Wilburn, Productivity Differences Within the Service Sector, Occasional Paper 102, National Bureau of Economic Research, 1967.

and produce, and new checkout systems may lead to improved output per man-hour. A large part of the increase in productivity in the past have been the result of a shift to large self-service stores from small, clerk-service stores where underemployment was great. However, further increases in productivity due to elimination of small, relatively inefficient stores are likely to be small, because a major proportion of stores already are self-service.

The situation in eating places is less clear. Here the consumer will play a major role by indicating which type of establishment he prefers. A shift towards large, cafeteria style eating places might improve productivity substantially; however, growth in the proportion of eating places offering table service may retard increases in output per man-hour for all eating places. Selling of prepared foods (hot canned foods, sandwiches, pastry, complete hot meals) through vending machines is likely to increase in the future. This trend will be due in part to new vending technologies such as microwave ovens which heat frozen foods in seconds. It should be pointed out, however, that although automated merchandising eliminates the need for sales personnel, it does create a need for more workers to stock, repair, and service these vending machines.