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Chapter 6

Foods

THE foods group comprises almost all industries that manufacture foods and kindred products. It includes the related industries producing baking powder, manufactured ice, and feeds, but excludes beverages, which are classified separately, and drugs possessing food value, which are treated as chemical products. Thus defined, the foods group in 1937 ranked fourth among all manufacturing groups listed according to their contributions to total value added. It was exceeded in this respect by textile products, machinery, and iron and steel products.

TRENDS IN THE PHYSICAL OUTPUT OF THE FOOD INDUSTRIES¹

Indexes of physical output of processed foods and related products are presented numerically in Table 13 and graphically in Chart 8. Although there are as many as 29 food industries, only 26 are represented by quantity data even for that comparatively recent year. Of these, 12 have been covered by indexes for all four decades listed; one more by data for the second and third decades; and an additional 13 for the period 1929-37. Some of the most important food in-

¹The tables in this and later chapters contain data on the output of all industries for which figures are available in reasonably adequate form. The discussion in the text, however, is usually limited to those individual industries concerning whose development we could add information to supplement the indexes.

Substantial differences between the indexes presented here and those constructed by E. E. Day and Woodlief Thomas and their collaborators, and by the National Research Project, are noted in Appendix D.

TABLE 13

FOODS*

Physical Output: Indexes and Percentage Changes^b

YEAR	INDEX OF PHYSICAL OUTPUT (1929:100)										NET PERCENTAGE CHANGE IN PHYSICAL OUTPUT			
	Meat Packing n.e.m. ^c	Sausage, n.e.m. ^c	garine, n.e.m. ^c	Shorten- ings	Flour	Feeds	Cereals	Rice	Macaroni	Bread and Cake	Biscuits and Crackers	Fish, Canned	Fruits and Veg- etables, Canned	Milk, Canned
1899	56	..	..	..	94	..	..	21	..	..	..	53	17	6.7
1904	64	..	..	..	98	..	..	51	..	..	..	65	24	10.9
1909	72	..	..	..	102	..	..	52	..	..	..	78	29	18
1914	71	..	..	..	108	..	..	55	..	..	..	73	42	36
1919	93	..	..	..	114	..	..	88	..	..	..	85	55	84
1921	77	..	..	..	94	..	..	94	..	..	..	45	38	69
1923	97	..	..	..	106	..	..	95	..	..	..	81	59	67
1925	92	..	..	..	102	56	70	76	..	78	86	73	82	76
1927	95	..	..	..	79	99	80	100	91	90	91	77	82	88
1929	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1931	94	108	71	100	91	76	100	102	97	92	86	64	91	100
1933	95	..	63	98	80	70	79	90	..	74	78	69	88	98
1935	85	154	94	134	82	90	70	96	116	86	96	103	127	115
1937	94	182	126	148	86	111	77	106	123	96	106	104	151	128
PERIOD														
1899-1937	+66	..	..	..	..	..	..	+416	..	..	..	+96	+792	+1,812
1899-1909	+28	..	..	..	+9	..	..	+152	..	..	..	+47	+69	+167
1909-1919	+29	..	..	..	+11	..	..	+70	..	..	..	+9	+92	+371
1919-1929	+7	..	..	..	-12	..	..	+13	..	..	..	+18	+82	+19
1929-1937	-6	+82	+26	+48	-14	+11	-23	+6	+23	-4	+6	+4	+51	+28

YEAR	Butter	Ice Cream	Beet Sugar	Cane Sugar n.e.m. ^a	Cane-Sugar Refining	Confectionery	Chocolate Products	Corn	Flavorings	Baking Powder	Un-Adjusted	
											Ice	Adjusted
1899	26	50	6.7	115	44	..	..	..	..	..	9.8	40
1904	33	56	23	113	50	..	..	..	..	..	17	48
1909	40	55	45	168	55	..	47	..	..	..	30	57
1914	50	66	68	132	66	..	50	..	..	..	44	64
1919	60	86	67	125	79	..	69	..	..	..	60	79
1921	72	77	96	129	74	..	60	57	..	..	67	68
1923	84	101	68	88	87	..	82	76	..	..	77	82
1925	92	100	84	69	106	91	90	76	..	..	88	86
1927	97	97	84	36	100	94	96	92	..	88	88	90
1929	100	100	100	100	100	100	100	100	100	100	100	100
1931	102	92	83	107	91	87	80	98	76	101	96	91
1933	110	95	60	151	77	79	105	84	..	74	74	82
1935	104	126	82	111	174	83	100	140	68	103	73	92
1937	105	129	109	192	89	111	124	84	174	63	75	103
NET PERCENTAGE CHANGE IN PHYSICAL OUTPUT												
PERIOD												
1899-1937	+309	+158	+1,688	+67	+101	..	..	..	..	..	+668	+156
1899-1909	+55	+11	+578	+46	+24	..	..	..	..	..	+203	+41
1909-1919	+51	+56	+48	-26	+45	..	..	+48	..	..	+101	+40
1919-1929	+67	+16	+48	-20	+26	..	..	+44	..	..	+67	+26
1929-1937	+5	+29	+20	+92	-11	+11	+24	-16	+74	-37	-25	+3

^a Industries for which there are no adequate quantity data for any period listed above are: vinegar and cider; chewing gum; and food, not elsewhere classified. These industries are covered by the adjusted total.

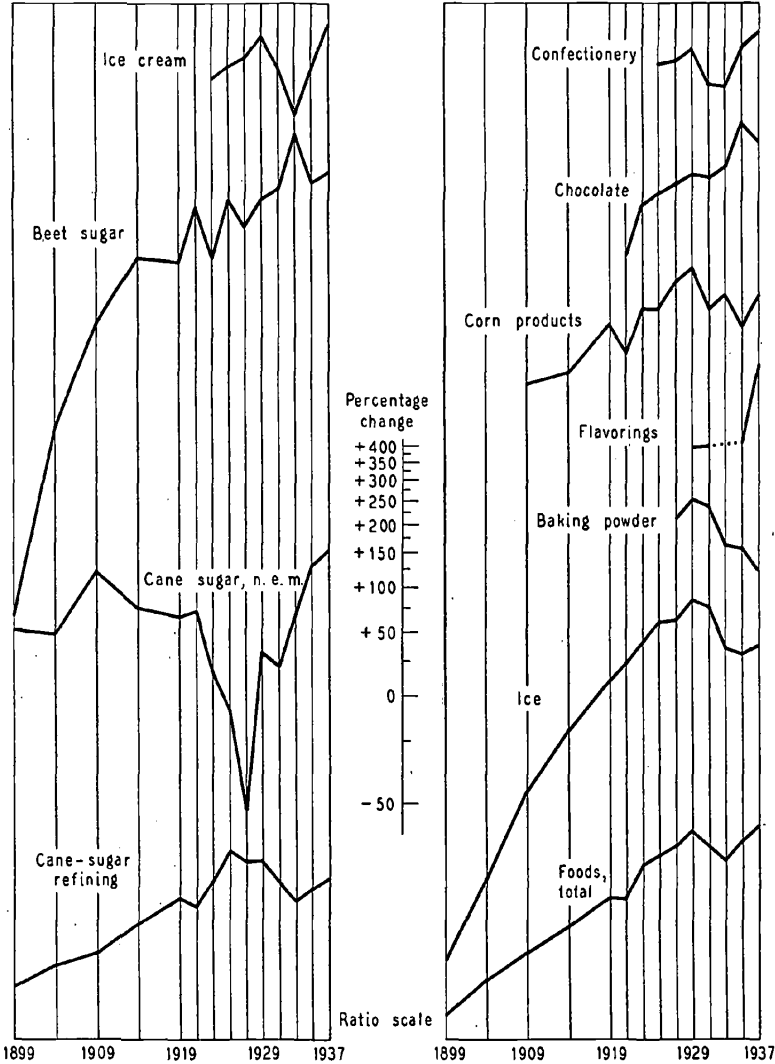
^b The indexes have been constructed from basic data in the U.S. Census of Manufactures and other sources, by methods described briefly in Chapter 2 and in detail in Appendix A. Appendix B presents these data, together with the indexes derived from them. The indexes cited here for individual industries have been adjusted to take account of changes in the coverage of the respective samples, except when such adjustment was impossible. The percentage changes are not always entirely consistent with the indexes given above because the changes were computed from the indexes in Appendix B, which are carried to one decimal place.

^c N.e.m. denotes not elsewhere made.

Chart 8 (concl.)

FOODS

Indexes of Physical Output



dustries—biscuits and crackers, bread and cake, confectionery, and ice cream—are those for which the indexes are incomplete; nevertheless, the foods group is more adequately covered by Census data than are most other groups of manufacturing industries.

Meat Packing. The physical output of the meat-packing industry, which includes slaughtering as well, rose by two thirds between 1899 and 1937, approximately at the same pace as the increase in population. During each of the first two decades output advanced fairly steadily, approximating 30 percent per decade. In the third period the gain was less than 10 percent, and between 1929 and 1937 there was an actual decline of 6 percent. Peak output, reached in 1929, exceeded that of 1923 by only 3 percent.

The output of the meat-packing industry changed not only

	Quantity (billion pounds)					Percentage Distribution				
	1899	1909	1919	1929	1937	1899	1909	1919	1929	1937
Fresh meat ^a	4.7	6.8	8.4	9.8	10.0	58	69	60	67	73
Cured, canned and other preserved meats	3.4	3.1	5.5	4.9	3.7	42	31	40	33	27
TOTAL	8.1	9.9	13.9	14.7	13.7	100	100	100	100	100

^a Includes fresh meat sold to packers to be manufactured into cured and other preserved meats. The resulting duplication is negligible; see Appendix B.

in volume but also in composition, as the tabulation above indicates.² The production of fresh meat (beef, veal, mutton, lamb, pork and edible organs) fluctuated in relation to the

² The percentage distribution portrays inadequately the composition of the industry's output because a pound of fresh meat is not equal in value to a pound of cured meat. However, no attempt was made, in this and similar text tabulations, to weight the various products in accordance with their value. Weights were used, of course, in the construction of the index numbers of output, and in the preparation of all tables showing relative contributions of component industries to group totals.

This and similar text tabulations relating to output are based on data given in Appendix B. Other tabulations and information incorporated in the text, and not otherwise reproduced in this volume, are derived from data in the Census of Manufactures unless a different source is mentioned.

output of cured meat (including canned and other preserved meats). Over the 38-year period as a whole, the output of fresh meat more than doubled, whereas the output of cured meat scarcely increased at all. The shift from preserved to fresh meats reflects in some degree improved methods of refrigeration in the factory, in transit and in the home. The large output of cured meats in 1919 suggests, however, that this improvement is not the sole explanation of the change in the composition of meat-packing products.

There were shifts not only in the composition of the industry's output but also in the composition of its input. The proportions of the several species of animals slaughtered in factory establishments varied as follows:

	<i>Weight on Hoof (billion pounds)</i>					<i>Percentage Distribution</i>				
	1899	1909	1919	1929	1937	1899	1909	1919	1929	1937
Cattle	5.9	8.3	9.9	9.0	10.9	44	50	46	38	49
Calves	0.1	0.4	0.8	0.9	1.4	1	3	4	4	6
Sheep and lambs	0.8	1.0	1.1	1.3	1.7	6	6	5	6	8
Hogs	6.7	6.9	9.7	12.3	8.1	49	41	45	52	37
TOTAL	13.5	16.6	21.5	23.5	22.1	100	100	100	100	100

Over the entire 38-year period there was a net decline in the relative importance of hogs. The relative importance of cattle, sheep and lambs increased moderately, while that of calves rose rapidly. Since the fraction of pork that is cured is greater than the fraction of beef, veal, mutton or lamb,³ these changes in the composition of the industry's input are not unrelated to the changes in the composition of its output. Because of differences in the anatomical characteristics of the various species of animals slaughtered, and particularly in the ratio of dressed to live weight,⁴ the shift in the character of input should be observable also in the amount and type of labor employed and in the processes utilized in the industry.⁵

³ The meat cured in 1909 consisted almost entirely of pork, with a small amount of beef and no cured veal, mutton or lamb reported.

⁴ The dressed weight yield, per pound of live weight, varies from one species to another: in 1929 it averaged 75 percent for hogs, 59 percent for calves, 54 percent for cattle and 47 percent for sheep and lambs.

⁵ Slaughtering plants are divided into highly specialized departments—

Although it is impossible from the data at hand to trace the causal relationship in detail, the changes in the types of commodities produced and in the species of animals slaughtered must have contributed to the divergence in trend between gross output and net output in the meat-packing industry.⁶ During the 38 years between 1899 and 1937 gross output (including not only the meat products but also lard, skins, etc.) appears to have risen more rapidly than the input of materials (animals to be slaughtered). As a consequence, net output (the difference between gross output and input, expressed in fixed prices) probably increased somewhat faster than gross output.⁷

The changes in the composition of both the input and the output of the meat-packing industry are undoubtedly related to differences in the rate of shift, from farm and retail establishment to the factory, of the slaughter of different species of animals. These variations are illustrated by the percentage distributions on the opposite page:

cattle killing, hog killing, fresh beef cutting, and fresh pork cutting. Within each of these there is a fine division of labor. See the bulletins of the Bureau of Labor Statistics on this industry, especially *Bulletin No. 252*, pp. 1075-1114.

⁶ See Chapter 2 above, for an explanation of net physical output.

⁷ A slight discrepancy between the change in gross output and in input has an important effect on net output, chiefly because the cost of materials in meat packing accounts for a very large percentage of the value of the final product (as much as 85 percent in 1937). As a consequence, the index of net output is highly sensitive even to small errors in either of the two indexes from which it is derived, and for this reason the following estimates of net output must be regarded as very rough approximations.

	<i>Percentage Change</i>				
	1899- 1937	1899- 1909	1909- 1919	1919- 1929	1929- 1937
Gross output (meat and other products)	+66	+28	+29	+7	-6
Input (animals slaughtered)	+61	+20	+28	+11	-5
Net output	+118	+110	+38	-13	-14

The index of input is a weighted index; it therefore differs somewhat from the index that might be derived from the figures given in the text relating to the total weight on the hoof of all animals slaughtered.

	<i>Percentage of Total Slaughter^a</i>	
	1899	1937
Cattle		
In wholesale establishments	61	83
In retail establishments and on farms	39	17
Total	100	100
Calves		
In wholesale establishments	28	77
In retail establishments and on farms	72	23
Total	100	100
Hogs		
In wholesale establishments	67	69
In retail establishments and on farms	33	31
Total	100	100
Sheep and lambs		
In wholesale establishments	87	91
In retail establishments and on farms	13	9
Total	100	100
Total (weighted average)^b		
In wholesale establishments	64	77
In retail establishments and on farms	36	23
TOTAL	100	100

^a See U.S. Department of Agriculture, *Agricultural Statistics* (1939), pp. 318, 329, 347.

^b Weighted by total live weight, in pounds.

The shift to factory slaughtering was most pronounced in the case of calves, which it will be recalled also rose more rapidly than other meat animals slaughtered within factories from 1899 to 1937. The transfer of hog slaughter to the factory was slight in comparison, a finding consonant with the decline in the relative importance of hogs in the total slaughter within meat-packing plants.

Even as early as 1899 the weight of animals slaughtered inside factory walls was close to two thirds of the aggregate weight of all animals slaughtered, so that the shift thereafter from retail establishments and farms to factory plants was necessarily moderate. It was, however, a continuing process: by 1937 factories accounted for more than three quarters of the total slaughter.

Although factory production of meats rose, between 1899

and 1937, about as rapidly as did population, the total domestic production of meats, in and out of factories, actually declined in relation to population. The drop in per capita production reflects primarily a decrease in per capita consumption of meats during the period under discussion. In 1899 each person consumed, on the average, 163 pounds of meat products (beef, veal, lamb, mutton, pork and lard) whereas in 1937 the average amount consumed was 136 pounds.⁸ But the decline in domestic per capita consumption did not exactly parallel the decrease in domestic per capita production. Because of a shift in the balance of imports versus exports, the former decline was less marked than the latter. In 1899 domestic consumption was less than domestic production because we exported more meat products than we imported. As the accompanying tabulation shows, exports in

	<i>Imports minus Exports as a Percentage of Domestic Production^a</i>	
	1899	1937
Beef	-9	+5
Veal	0	0
Lamb and mutton	0	+1
Pork	-15	+3
Lard	-44	-5

^a Derived from figures given in source cited in footnote 8, above.

that year exceeded imports of three meat products and equaled the imports of two. By 1937, however, the relationship was reversed. In that year we exported less than we imported, so that domestic consumption was greater than domestic production; the imports of three products exceeded exports, balanced exactly for one product and fell below exports only for the fifth.

Sausage, Oleomargarine and Shortenings. These industries are closely related to the meat-packing industry since they produce commodities made also to a great extent in meat-

⁸ U.S. Bureau of Agricultural Economics, *Livestock, Meats, and Wool Market Statistics and Related Data, 1939* (May 1940), p. 100.

packing plants. Of the total amount of sausage made in 1929, the sausage industry proper accounted for 30 percent, while meat packers produced 70 percent. In 1929, 56 percent of the total output of oleomargarine was manufactured in specialist plants, 29 percent in meat-packing plants and 15 percent elsewhere. Shortenings produced by the shortenings industry in 1929 constituted 66 percent of the total; most of the remainder came from meat-packing establishments.

The indexes presented in Table 13 for the three specialist industries relate only to their own output and not to the total production of sausage, oleomargarine or shortenings. The three industries increased their physical output in substantial proportions between 1929 and 1937: by 82, 26 and 48 percent, respectively.

The increase in the output of the sausage industry is by no means ascribable to sausage alone, which rose only 11 percent between 1929 and 1937. Other products of the industry, not specified in detail in the Census, advanced much more rapidly; they constituted 19 percent (by value) of the total output in 1929 and as much as 50 percent in 1937. There was a similar change in the composition of the output of the oleomargarine industry. Thus oleomargarine rose only 15 percent between 1929 and 1937, while total output, including salad dressing and shortenings made in the same industry, increased by 26 percent.

Despite the large percentage increases in the three small satellite industries, the combined physical output of all four industries—meat packing, sausage, oleomargarine and shortenings (each weighted by value added)—remained almost constant between 1929 and 1937: the net rise was less than 1 percent, for the 6 percent decline in meat packing almost counterbalanced the increases in the three smaller industries.

Flour. The flour industry consists of merchant mills which purchase the grain, mill it and sell the products. Custom milling is excluded from the data, except for the portion attribu-

table to mills engaged also in merchant milling.⁹ The industry decreased its physical output by 8 percent between 1899 and 1937. The drop was the net result of a moderate rise up to 1919, the peak year, and a decline thereafter. As in the case of meats, there was a definite decrease in the per capita consumption of flour-mill products, coupled with a decline in exports. Exports, minus imports, amounted to 18 percent of domestic flour production in 1899, but to only 4 percent in 1937.¹⁰

The output of the flour-milling industry changed in composition as well as in volume during the 38 years between 1899 and 1937, as may be observed from the data in the following tabulation:

		1899	1909	1919	1929	1937
Wheat flour	Mil. bbls.	99.8	105.8	132.5	120.1	105.3
Feeds, screenings, bran and middlings ^a	Mil. tons	7.2	9.2	9.3	7.2	5.8
Corn meal and flour	Mil. bbls.	27.8	21.6	10.7	11.1	7.3
Buckwheat flour	Mil. lbs.	143	176	90	38	27

^a Includes, for the period 1899-1919, "prepared feeds for stock" not separately reported.

The output of wheat flour, the most important component, rose slightly from 1899 to 1937, with a peak in 1919. Feeds, screenings, bran and middlings, also of importance, declined nearly 20 percent during the 38 years. The production of corn meal and flour fell off much more seriously; in 1937 it was little more than one-quarter of the output in 1899. The greatest decline, more than 80 percent, was in the production of buckwheat flour, which reached its peak in 1909. This product was, however, a relatively small component of the industry's output, even in 1899 and 1909.

⁹ Custom mills accounted for only 5.9 and 4.4 percent of the combined output of merchant and custom mills in 1909 and 1919, respectively, according to the Census data for these years. See Magdoff, Siegel and Davis, *Production, Employment, and Productivity in 59 Manufacturing Industries* (National Research Project, 1939), Part II, p. 74.

¹⁰ For 1899 see *Commerce Yearbook, 1929*, p. 227. The figure for 1937 was computed by us from data in the *Statistical Abstract*.

Feeds, an industry which specializes chiefly in the manufacture of prepared feeds for livestock and fowl from purchased materials or from grain ground by the industry itself, is covered by the Census data from the year 1925 on. Between that year and 1929 output increased by 80 percent. In the most recent period, 1929-37, the industry boosted its output 11 percent. The total gain from 1925 to 1937 was 100 percent. On the other hand, prepared feeds, made in this and other industries, rose less than 50 percent in the same period. A large portion of the increase in the output of the industry proper is attributable, therefore, to a change in the fraction that feeds made within the industry constituted of total feeds, and to an increase in the industry's output of products other than feeds.¹¹

Cereals. The output of the cereals industry, which produces prepared feeds as secondary products, rose more than 40 percent between 1925 (the first year for which we have data) and 1929, but declined 25 percent from the latter year to 1937. From 1925 to 1937 the output of breakfast foods made from oats declined 22 percent, while cereals made from corn rose 70 percent and prepared flour went up 85 percent.

Rice. This industry is a rather small one, when gauged by value added; it is engaged merely in cleaning and polishing threshed rice. Between 1899 and 1937 the industry's output quintupled, chiefly as a result of a large net increase up to 1919. After 1919 the gains were slight. In 1899 domestic requirements were satisfied only in part by domestic production of rice; imports, minus exports, came to nearly a quarter of domestic production. By 1927 the growth of the domestic rice industry had turned the balance in the other

¹¹ The 1925 index for feeds is unadjusted; i.e., because of lack of data, no account could be taken of changes in the coverage of the sample from 1925 to 1927; see Appendix B. Because the adjusted and unadjusted indexes of the industry do not correspond closely, the 1925 figure must be considered as merely a rough estimate of the industry's output.

direction, for in that year exports, minus imports, amounted to 47 percent of domestic production.¹²

Bakery Products. For these industries, highly significant in terms of value added, data on output are available only from 1923. Between that year and 1929 the physical output of bread and cake rose by as much as one third, but from 1929 to 1937 it declined 4 percent. The output of biscuits and crackers increased 25 percent in 1923-29, and another 6 percent in 1929-37. When these two bakery industries are considered together, their combined output is found to have risen 30 percent between 1923 and 1929 and to have dropped 3 percent between 1929 and 1937. The contrast with flour milling is striking. The latter industry decreased its output by 6 percent between 1923 and 1929, and by 14 percent between 1929 and 1937.

Canned Fish. This classification covers the canning and curing of fish, crabs, shrimp, oysters, clams and other sea foods. The physical output of the industry almost doubled between 1899 and 1937. In the first decade of the century it increased by one half, in the second by only about one tenth. There was a severe decline between 1919 and 1921, followed by recovery which more than counterbalanced the slump and resulted in a net gain of nearly a fifth for 1919-29. The rise from 1929 to 1937 was only 4 percent.

An outstanding change in the composition of the output of the industry resulted from the decline in cured fish (salted, pickled and smoked). The output of this commodity had dropped by 1937 to less than half the volume produced in 1899. Canned fish products rose as a group despite declines in the canning of salmon and oysters.

Canned Fruits and Vegetables, one of the most important industries in the foods group with respect to value added,

¹² U.S. Bureau of Foreign and Domestic Commerce, "Apparent Per Capita Consumption of Principal Foodstuffs in the United States," *Domestic Commerce Series, No. 38* (1930), pp. 10-11.

augmented its physical product at a very rapid rate. From 1899 to 1937 output increased by almost 800 percent; in the first decade it rose some 70 percent, in the second 90, in the third 80, and in the last period 50 percent. Although there was no serious slackening in the rate of growth of total output, there was a slowing down in the rate of growth of individual products of the industry. Deceleration in the rate of growth is observable for virtually all the products covered by comparatively long-term data. This does not mean, however, that the output of these products had actually begun to decline; few of them had even approached peak output. Thus in Census years preceding 1931 highest points were reached only in the production of canned hominy (1929), canned apples (1929), dried peaches (1919) and dried raisins (1925).

Much of the rise in the output of canned fruits and vegetables reflects a shift from home cooking and preserving to factory canning, though no statistical data concerning this change are available. There is little question, however, that total production of canned and preserved fruits and vegetables, prepared in both home and factory, rose rapidly in relation to population.

Canned Milk. Data on the canned milk industry, which produces condensed and evaporated milk, show that it rose even more rapidly than canned fruits and vegetables. Its output in 1937 was more than 19 times as large as that of 1899.¹⁸ Within the period there was a noticeable acceleration after 1909, and a pronounced retardation in the post-war years. Figures on the movement of individual products, available largely from 1925, reveal a drop between 1925 and 1937 in the output of sweetened condensed milk; a rise in the output of unsweetened condensed and evaporated milk, casein, dried and powdered milk, cream and buttermilk, and ice-

¹⁸ The 1899 index for canned milk could not be adjusted for changes in the coverage of the sample (see Appendix B). For this reason, it is not an altogether precise measure of the industry's output of that year.

cream mix; and a rather slight decline in the production of condensed and evaporated buttermilk.

Butter. The enterprises included in this classification (which does not cover farm production) increased their aggregate output by over 300 percent between 1899 and 1937. The industry's product gained over 50 percent in each of the first three decades, and 5 percent between 1929 and 1937. The largest output recorded by the Census for any single year through 1937 was that of 1933.

While factory butter production just about quadrupled, from 1899 to 1929, total production, including farm output, rose less than 50 percent. In other words, factories accounted for an increasingly greater share of a total which grew much less rapidly. The great shift from farm to factory is illustrated in part by the following figures, available only through 1929:

	<i>Butter Production^a</i>			<i>Factory Production as a Percentage of Total Production</i>
	<i>On Farms</i>	<i>In Factories</i> (million pounds)	<i>Total</i>	
1899	1,072	420	1,492	28
1909	995	627	1,622	39
1919	708	939	1,647	57
1929	542	1,618	2,160	75

^a *Statistical Abstract, 1931*, p. 686; *1935*, p. 603; and reports of the Census of Manufactures.

In 1899 little more than a quarter of all domestic butter was made in factories; by 1929 the fraction had risen to three quarters, and farm families were consuming most of their own product.¹⁴

Cheese. Among the industries manufacturing milk products, the cheese industry had the smallest increase in output—160 percent—between 1899 and 1937. Within those 38 years there were two periods, 1904–09 and 1923–29, during which there was no growth at all in cheese production. The

¹⁴ In 1929 only 135 million pounds were sold, out of the 542 million made on farms. (*Statistical Abstract, 1935*, p. 603.)

shift from farm to factory production of cheese (unlike that of butter) was almost complete by the opening of the present century; in 1899 over 90 percent of the total domestic production of cheese was ascribed to factories.¹⁵

Ice Cream made in factories rose 9 percent between 1929 and 1937. The Census records reveal a larger increase, amounting to 30 percent, between 1923 (the first year for which we have adequate data) and 1929. Ices, sherbets, and such specialties as cups and sticks, rather than plain ice cream, accounted for most of the added output.

Beet Sugar. The beet sugar industry, which is so closely connected with the cultivation of sugar beets that it is practically part of an agricultural industry, increased its output by almost 1,700 percent between 1899 and 1937 despite marked fluctuations within that period. During the first decade output rose almost 600 percent; in each of the next two decades the increase was about 50 percent, and in the last period 20 percent.

The rise in physical output is to be attributed only in part to an increase in the quantity of sugar beets treated, for it resulted in large measure from an increase in the amount of sugar extracted from each pound of beets. As a consequence, the net physical output of the industry (the output of beet sugar and by-products minus the input of sugar beets) rose more rapidly than its gross physical output (beet sugar and by-products).¹⁶

¹⁵ *Twelfth Census of the United States*, Vol. IX, pp. 437-38.

¹⁶ Percentage changes in these indexes follow:

	Percentage Change				
	1899- 1937	1899- 1909	1909- 1919	1919- 1929	1929- 1937
Gross output (beet sugar and by-products)	+1,688	+578	+48	+48	+20
Beets treated (tons)	+965	+400	+42	+23	+21
Net output	+3,360	+920	+56	+88	+18

The index of net output thus computed tends to overstate the rise since it takes no account of improvements in the quality of the beets. The increase in the sugar extracted per pound of beets reflects not only improved methods of

Cane Sugar. Both of the cane sugar industries distinguished by the Census were characterized by slower rates of advance than was beet sugar manufacture. Cane sugar, not elsewhere made, which covers the production of sugar from domestic sugar cane, increased in output by only two thirds between 1899 and 1937, the net result of a rise up to 1909, a serious fall from 1909 to 1927, and a rapid upswing from 1927 to 1937. The decline to the low point in 1927 has been attributed to the destructive effects of the mosaic disease, and the rise since then to a new development—the utilization of bagasse, a pulpy by-product of cane crushing, in the manufacture of celotex¹⁷—which incidentally stimulated the growth of domestic cane-sugar production.

The cane-sugar refining industry, which refines purchased, and for the most part imported, raw cane sugar, doubled its output between 1899 and 1937. This industry followed a pattern quite different from that of the industry treated in the preceding paragraph. It reached peak output, for example, in 1925, a year when cane sugar, not elsewhere made, was dropping rapidly.

The combined output of the three sugar industries, which we have obtained by weighting the output of each by its value added, rose 250 percent from 1899 to 1937, the net result of a gain of 93 percent between 1899 and 1909; of 34 percent between 1909 and 1919; of 30 percent between 1919 and 1929; and of 4 percent between 1929 and 1937. Most of the violent fluctuations in the three component series offset one another.

Corn Products, including sirup, sugar, oil and starch, increased in output between 40 and 50 percent during each of the second and third decades, and fell 16 percent in the most

manufacture but also new methods of cultivation which yield greater sucrose content. On this point see R. K. Adamson and M. E. West, *Productivity and Employment in Selected Industries: Beet Sugar* (National Research Project in co-operation with National Bureau of Economic Research, 1938), p. 38.

¹⁷ E. W. Zimmermann, *World Resources and Industries* (Harpers, 1933), pp. 771-72.

recent period. Among the important individual products of the industry, for which data are available in some detail beginning with 1923, increases are recorded for corn oil, and starch (corn, potato and other); and declines for corn sirup and mixtures of corn and other sirups, and corn sugar.

Baking Powder. Although not strictly a food industry (it is classified by the Census among chemicals), we have placed the baking powder industry in the foods group because it produces compounds, including yeast and baking powder, that are used for leavening purposes. It is one of the few industries in the group whose output declined substantially: between 1929 and 1937 there was a net drop of nearly 40 percent in the products in this industry.

Manufactured Ice, classified perhaps arbitrarily as a food industry, made large gains in physical output. The net increase between 1899 and 1937 was almost 700 percent. In the first decade output rose 200 percent; in the second 100 percent; and in the third 67 percent. After 1929 output fell, so that in 1937 it stood 25 percent below the level reached in 1929. The retardation in growth has materialized into a downward trend in recent years; mechanical refrigeration has undoubtedly been a primary factor in this decline.

Summary of Changes in Individual Industries. The trends in the physical output of the food manufacturing industries are summarized in Table 14. Out of 12 industries covered for the entire period 1899-1937, only one, flour, declined in output. Three industries rose less rapidly than population: flour, meat packing and cane sugar. These three, and canned fish, cane-sugar refining and cheese, rose less rapidly than all manufacturing industries combined.

If we compare the four periods, we find that the most recent, 1929-37, differed from the other three in several respects. Eight out of 26 industries declined in output between 1929 and 1937; in none of the earlier periods was the proportion as large. Ten of the 26 industries rose less rapidly than

population grew in the years 1929-37; in this respect, also, the latest period is outstanding. Eight of the 26 industries rose less rapidly than all manufacturing industries combined; a similar proportion is found for the period 1909-19.

TABLE 14

FOODS

Summary of Changes in Physical Output^a

	<i>Number of Industries</i>				
	1899- 1937	1899- 1909	1909- 1919	1919- 1929	1929- 1937
Industries for which there are indexes of physical output	12	12	13	13	26
Industries with rising output	11	12	12	11	18
Industries with falling output	1	0	1	2	8
Industries with output rising in relation to population	9	10	10	8	14
Industries with output constant in relation to population				1	2
Industries with output falling in relation to population	3	2	3	4	10
Industries with output rising in relation to total manufacturing output	6	5	9	3	18
Industries with output falling in relation to total manufacturing output	6	7	4	10	8

^a Derived from data in Table 13 and the following figures on changes in population and in total manufacturing output:

	<i>Percentage Change</i>				
	1899- 1937	1899- 1909	1909- 1919	1919- 1929	1929- 1937
Population of the United States	+73	+21	+16	+16	+6
Physical output of all manufacturing industries combined	+276	+58	+41	+64	+3

The Group Total. The unadjusted weighted average index for the food group, based on the available individual indexes, rose between 1899 and 1937 by 156 percent—the net result of an increase of two fifths in each of the first two decades, one

quarter in the third decade and 3 percent in the last period. The statistical coverage of this average is, however, incomplete. In 1899 it related to only 63.5 percent of the group's output (in terms of value added); and in 1937 to 92.8 percent. Further, the industries included in the sample appear, from the data on value added, to have grown at rates differing from those of the industries not covered by the index. When the index is corrected for bias of this sort it becomes an adjusted index.¹⁸ The adjusted index for the entire foods group rose 244 percent between 1899 and 1937, considerably more than the unadjusted index (156 percent). Moreover, the adjusted index shows a greater rise than the unadjusted index in each of the four periods into which we have divided the 38 years from 1899 to 1937.

The rise of 244 percent in the physical output of processed foods and related products, as compared with an increase of 73 percent in population, indicates a considerable gain in the per capita production of factory-made foods. It must be remembered, however, that there was a substantial transfer of production from the home, the farm or the retail establishment to the industrial plant. For this reason the consumption of processed foods would tend to rise less rapidly than factory production. On the other hand, exports of manufactured foods appear to have declined and imports to have risen, as is indicated by the indexes on page 144, available beginning with 1913. Such a change in our export-import balance would have caused consumption to rise more rapidly than production. It is difficult to determine the net effect of these opposing tendencies. It seems likely that the changes in the relation between exports and imports of processed foodstuffs were, on the whole, of less importance than the shifts to the factory. Exports of manufactured foodstuffs (including beverages) amounted to 305 million dollars in 1899 and 178 mil-

¹⁸ The assumptions and methods basic to the derivation of the adjusted index are described briefly in Chapter 2 and in detail in Appendix A.

Year	Manufactured Foodstuffs ^a Indexes of Physical Volume (1923-25:100)	
	Imports	Exports
1913	74	73
1919	^b	183
1921	74	114
1923	90	107
1925	118	88
1927	111	81
1929	137	87
1931	97	62
1933	102	49
1935	137	37
1937	172	39

^a Including beverages. Calculated by the Bureau of the Census. See *Statistical Abstract, 1938*, p. 448; 1935, p. 418; 1934, p. 404; 1933, p. 399.

^b Not available.

lion in 1937, and imports of manufactured foodstuffs (also including beverages) were valued at 123 million in 1899 and 440 million in 1937.¹⁹ These amounts are probably small in relation to the value of the output transferred to the factory; the latter must have been a substantial fraction of the domestic production of processed foods, valued at some 1,800 million dollars in 1899 and 8,000 or 9,000 million in 1937.²⁰ We may conclude, therefore, that the increase in the per capita consumption of processed foodstuffs is overstated by the change in the ratio of factory-made foods to population. It is scarcely to be doubted, however, that there was a considerable rise in the per capita consumption of processed foods.²¹

Little that is definite can be said about changes in the quality of processed foodstuffs. Insofar as the contribution of

¹⁹ *Statistical Abstract, 1938*, pp. 450-51.

²⁰ The 1899 figure is an average of maximum and minimum estimates published in *Statistical Abstract, 1938*, p. 435. The 1937 figure is based on the value added in 1937 and 1929, and the net value of processed foods produced in 1929. Both figures exclude duplication arising from the consumption of processed foodstuffs by factories engaged in further fabrication.

²¹ In order to combine the different types of foods, we multiplied their respective quantities by the appropriate value added per unit in the weight-base period. If caloric content, rather than value added per unit, had been used as the coefficient, it is possible that no increase in per capita consumption would have been found.

the fabricational process is concerned, it is probable that the net trend has been toward improvements. Perfection of preserving techniques and better control of them, as well as improved sanitary conditions, have certainly helped to raise the quality of factory-produced meats.²² Of greater importance, however, have been the innovations in packing, which have resulted in the preservation of flavor, in enhanced cleanliness and in reduction of breakage and damage. The increase in the output of paper products (see Chapter 12, below) is a reflection of this trend.

CHANGES IN THE INDUSTRIAL PATTERN OF FOOD PRODUCTION

The most outstanding feature of the industrial pattern of food manufacturing, as sketched in the foregoing pages, is the slow rate of growth in the output of the great staple food industries, flour and meat packing, and the rapid rate of growth in the output of canned milk, canned fruits and vegetables, and ice. It is because of this divergence in rates of development that the composition of the physical output of the food group became virtually transformed in the 38 years from 1899 to 1937. In order clearly to depict the composition of the group in various years we express the physical output of each industry as a percentage of the total physical output of the entire group (Table 15).²³

In 1899 the meat-packing industry contributed 28 percent of the physical output of the entire foods group. Flour accounted for 18 percent. Together, these industries made up more than two fifths of the total. Other industries, for which we have separate figures, constituted 18 percent, and the balance, 36 percent, came from the remaining food industries.

²² See V. S. Clark, *History of Manufactures in the United States* (McGraw Hill, 1929), Vol. III, p. 264.

²³ For an algebraic statement on the method of derivation of the percentages in Table 15 see footnote 10, Chapter 4.

TABLE 15

FOODS

Relative Contributions of Component Industries to the Physical Output of the Entire Group^a

Percentage Distribution, Comparable Pairs of Years

Industry	1899	1937	1899	1909	1909	1919	1919	1929	1929	1937
Meat packing	28.0	13.1	24.6	21.2	21.9	19.1	20.3	14.1	15.5	13.9
Flour	17.8	4.6	19.1	14.1	14.4	10.8	10.7	6.1	6.0	5.0
Rice	0.2	0.3	0.2	0.4	0.5	0.5	0.5	0.4	0.3	0.3
Fish, canned	1.8	1.0	1.5	1.5	1.4	1.1	1.1	0.9	1.0	1.0
Fruits and vegetables, canned	5.0	12.5	5.8	6.7	6.1	7.8	7.9	9.4	8.4	12.1
Butter	3.8	6.0	4.9	5.3	3.0	3.0	3.1	3.3	3.2	3.3
Cheese					0.6	0.6	0.7	0.5	0.5	0.7	0.7
Milk, canned	0.4	1.9	0.6	2.7	0.8	2.7	2.2	1.7	1.4	1.4
Beet sugar					2.6	2.6	2.0	1.9	1.2	1.4	1.7
Cane sugar, n.e.m. ^b	4.5	2.4	4.5	4.0	1.1	0.6	0.5	0.3	0.2	0.3
Cane-sugar refining					2.9	2.9	2.8	2.3	2.4	2.1	2.1
Ice	2.0	4.4	2.2	4.6	3.3	4.5	4.4	4.9	5.5	4.0
Corn products	2.0	4.4	2.2	4.6	2.0	2.1	2.2	2.1	1.9	1.5
Sausage, n.e.m. ^b					0.8	0.6	0.7	0.6	0.5	0.6	0.8
Oleomargarine, n.e.m. ^b	36.5	53.8	36.5	39.5	39.4	41.8	41.7	52.1	4.7	4.8
Shortenings											0.7	1.0	0.7	1.0	2.9	2.1	2.7
Cereals	36.5	53.8	36.5	39.5	39.4	41.8	41.7	52.1	2.5	2.7
Feeds											0.6	0.7	0.6	0.7	2.5	2.7	2.7
Macaroni	36.5	53.8	36.5	39.5	39.4	41.8	41.7	52.1	4.6	4.8
Biscuits and crackers										
Bread and cake	36.5	53.8	36.5	39.5	39.4	41.8	41.7	52.1	5.2	5.5
Ice cream											1.1	1.3	1.1	1.3	5.0	5.4	5.0
Chocolate	36.5	53.8	36.5	39.5	39.4	41.8	41.7	52.1	1.0	0.6
Confectionery										
Baking powder	36.5	53.8	36.5	39.5	39.4	41.8	41.7	52.1	100.0	100.0
All other products										
TOTAL ^c	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

^a Derived from Table 13. For an explanation of the derivation of the measurements see footnote 10, Chapter 4.

^c The columns do not in fact add up to 100.0 in every case, since rounding of the separate percentages has caused some

In 1937 the situation was quite different. Meat packing contributed only 13 percent to the total physical output of the group, and flour only 5 percent. The two together made up less than one fifth of the total, whereas in 1899 they accounted for over two fifths. Rice, butter, cheese and milk, and ice provided larger shares of the total than they had in 1899, and there was a substantial increase (almost 8 percent) in canned fruits and vegetables. The beet-sugar industry augmented its relative contribution, but the two cane-sugar industries decreased theirs, so that all three together declined slightly. Canned fish decreased its contribution also. The industries for which we do not have separate data, and which together accounted for 36 percent of the group's output in 1899, increased their relative contribution to 54 percent in 1937.

Similar data are provided in the table for other years. Two sets of figures are given for 1909, 1919 and 1929, one comparable with an earlier year, the other comparable with a later year. Continuous declines are to be noted in the relative contributions of the flour and meat-packing industries.

By employing data on value added (Table 16) we may obtain a rough notion of the changing contribution to the total made by the industries for which separate figures on physical output are lacking, and at the same time confirm the evidence of Table 15. Interesting differences between the changes in the figures in this table and the changes in the figures in Table 16 are explored elsewhere.²⁴ The similarities, too, are striking, and validate our use of the data on value added to indicate major changes in the pattern of physical output. The bakery industries—biscuits and crackers, and bread and cake—increased their contribution to value added from 19 percent in 1899 to 26 percent in 1937. All of the increase occurred, however, between 1919 and 1937. There was another fairly large increase in the combined contributions of food, not elsewhere classified, feeds, shortenings, ce-

²⁴ Chapter 5, above.

TABLE 16

FOODS

Relative Contributions of Component Industries to the Value Added by the Entire Group^a

Industry	Percentage Distribution					
	1899	1909	1919		1929	1937
			Comparable with earlier years	later years		
Meat packing	24.6	21.6	20.2	19.6	14.7	14.9
Sausage, n.e.m. ^b	0.3	0.5	0.6	0.5	0.9	1.2
Oleomargarine, n.e.m. ^b	1.2	0.2	0.6	0.6	0.5	0.5
Flour	17.5	15.2	11.0	10.7 ^c	6.1	4.9
Rice	0.3	0.4	0.6	0.6	0.3	0.3
Biscuits and crackers	19.2	20.8	4.4	4.2	5.4	4.1
Bread and cake			14.7	14.2	19.9	21.8
Fish, canned	1.7	1.4	1.1	1.1	0.9	1.1
Fruits and vegetables, canned	6.8	5.8	8.2	8.0	9.2	10.7
Vinegar and cider	0.7	0.5	0.4	0.4	0.1	0.1
Butter	5.2	3.3	3.0	2.9	3.5	3.0
Cheese			0.7	0.6	0.6	0.6	0.6
Milk, canned	1.1	1.1	2.5	2.4	1.4	1.6
Ice cream			^d 3.1	3.1	5.5	5.1
Beet sugar	0.6	2.7	2.7	2.6	1.2	1.4
Cane sugar, n.e.m. ^b	4.4	1.2	0.6	0.6	0.2	0.3
Cane-sugar refining			2.9	3.0	2.9	2.2	2.3
Chewing gum	6.0	7.0	1.1	1.1	1.2	1.5
Confectionery			8.5	8.2	5.7	4.6
Chocolate	0.7	0.9	1.6	1.6	1.3	1.0
Corn products	2.2	1.6	2.4	2.4	2.0	1.5
Food, n.e.c. ^b	3.6	5.4	2.3	2.2	2.4	2.9
Feeds			0.9	0.9 ^c	2.4	2.8
Shortenings	3.6	5.4	0.5	0.4	0.5	1.3
Cereals			1.8	1.8	2.4	2.6
Macaroni			0.5	0.5	0.6	0.6
Flavorings	0.9	1.1	1.2	1.1	2.4	2.6
Baking powder	1.8	1.5	0.9	0.8	1.0	0.6
Ice	2.5	4.1	4.1	4.0	5.5	4.0
TOTAL ^e	100.0	100.0	100.0	100.0	100.0	100.0

^a Basic data are given in Appendix C.^b N.e.m. denotes not elsewhere made; n.e.c. denotes not elsewhere classified.^c Between 1925 and 1927 certain establishments were shifted from the flour to the feeds industry.^d Not treated as a manufacturing industry prior to 1914.^e The columns do not add up to 100.0 in every instance because they contain rounded percentages.

reals and macaroni, from less than 4 percent in 1899 to 10 in 1937. (The increase is overstated somewhat because of a shift of establishments from flour to feeds following a revision of the definitions of the two industries.) The contribution of the flavorings industry rose from 1 percent in 1899 to 2.6 in 1937.

Changes in the industrial composition of the physical output of the foods group represent the net result of variation in the degree to which certain types of changes have affected the output of the several food-processing industries. These have already been noted above: first, a shift in the proportion of each food produced in and out of factories; second, a change in the proportion of imports or exports of each food; and third, a change in the amount of each kind of food consumed per capita.

The general tendency, of course, was toward greater factory production of foods and less processing on farms, in retail establishments or in homes. But the rate of shift varied from product to product, determined as it was by the relation between costs (including transport charges) in the factory and outside it, by changes in this relation, and by fluctuations in wants and in family incomes. In some food-processing industries, notably flour-milling and cheese, the shift to the factory had been virtually completed by the opening of the present century. In meat packing, the transfer was more moderate in extent, although it had a marked effect on the output of the foods group because of the importance of the industry itself. In the case of butter, the shift from farm to factory production was accomplished largely in the period under discussion. Other food industries that probably moved in the same direction, but in varying degree, were bakery products, cereals, macaroni, canned fruits and vegetables, ice cream, confectionery and ice.

There was variation also in the degree to which changes in foreign trade affected the different food industries. We have

already noted the increased export of rice, and the decreased export of flour and meat products.

Differences in the rate of change in the distribution of output as between factory and nonfactory production, and in the export-import balance as well, account only in part for the shifting composition of the food group. There were also appreciable modifications in the diet of the people of the United States, and these too helped to condition the composition of the output of the food manufacturing group. The per capita consumption of meats and grain products declined. The consumption of sugar, dairy products, and fruits, went up.²⁵ These trends, based on production, export and import data, are confirmed by studies of family budgets. The latter provide, in addition, information on another aspect of food consumption. They indicate that usually the same sort of change in diet occurred at each income level. Thus the annual consumption of meats, fish and poultry, per capita, was 123 pounds in 1885-1904 and 85 pounds in 1935-37 for persons spending between \$1.25 and \$1.87 per week on food; 169 and 106 pounds, respectively, for those spending \$1.88 to \$2.49; and 204 and 139 pounds, respectively, for persons in a position to expend \$2.50 to \$3.12 for food.²⁶ At each income level the per capita consumption of meat, fish and poultry declined rather considerably between 1885-1904 and 1935-37. The decline at each level, however, was at a rate greater than that indicated by the data on average per capita consumption of meat products.²⁷ The rise in incomes accounts for the discrepancy, for there was always more meat consumption at high income levels than at low. Since the high income

²⁵ See U.S. Bureau of Foreign and Domestic Commerce, *op. cit.*, p. 1.

²⁶ These expenditure levels are expressed in fixed (1935) prices. See U.S. Department of Agriculture, "Present-Day Diets in the United States," by H. K. Stiebeling and C. M. Coons, *Yearbook of Agriculture, 1939*, p. 313.

²⁷ For all income levels combined the average consumption of meat products (not including fish and poultry) declined per capita from 163 pounds in 1899 to 136 pounds in 1937. See above, p. 132.

groups had greater weight in 1935-37 as a result of upward shifts in income, the considerable declines that occurred at each income level were in part counterbalanced, and the net result was a more moderate decline in the average per capita consumption of meats than would have occurred if incomes had remained stable.