Progress of the Domestic Rayon Industry

By J. A. Van Sweringen, Division of Economic Research

COMMERCIAL development of the rayon industry in the United States started in 1911, and since then progress has been steady. Even in 1932, the worst of the depression years, when most industries were forced to curtail operations sharply, rayon manufacturing experienced only a minor set-back. In only 2 other years, the war year 1918 and 1934, has there been a decline in production. The small recession in the latter period followed a year when production registered an unusually large gain. In 1935 all previous production records were broken, and the expansion has continued in 1936.

Industry Experienced Rapid Growth

When the brief history of the rayon industry is reviewed, it becomes apparent that its development has been somewhat different from that of most other new industries. A large-scale, closely controlled enterprise from the outset, the "weeding out" process and the consequent dissipation of capital and productive effort which has been so marked in other young and rapidly growing industries was not so evident. At the same time, however, the major benefits normally resulting from the growth of a young industry under competition, i. e., the development of a constantly improving product at a decreasing price, have been obtained through competition with the other textile fibers.

Although rayon was introduced commercially some 25 years ago, activity for a period of about 10 years was largely along experimental lines, with one company accounting for the total domestic output. The rapid growth of the industry began in 1920. Rayon prices reached a record high of $6 a pound in that year, and with this factor as a major incentive three more companies started operations. During the next few years sharp declines in prices were experienced, but by 1924 the price situation had become relatively stable, the demand for rayon was increasing, and business in general was on the upswing. Under these favorable influences, a number of additional companies were organized in the next 6 years. According to the Bureau of the Census data shown in table 1, 29 establishments were manufacturing rayon in 1929, against 14 in 1925. During this period, the development of "crepe twist" rayon yarn suitable for dress goods opened up a new market. Many silk and cotton operators turned to the production of rayon fabrics,

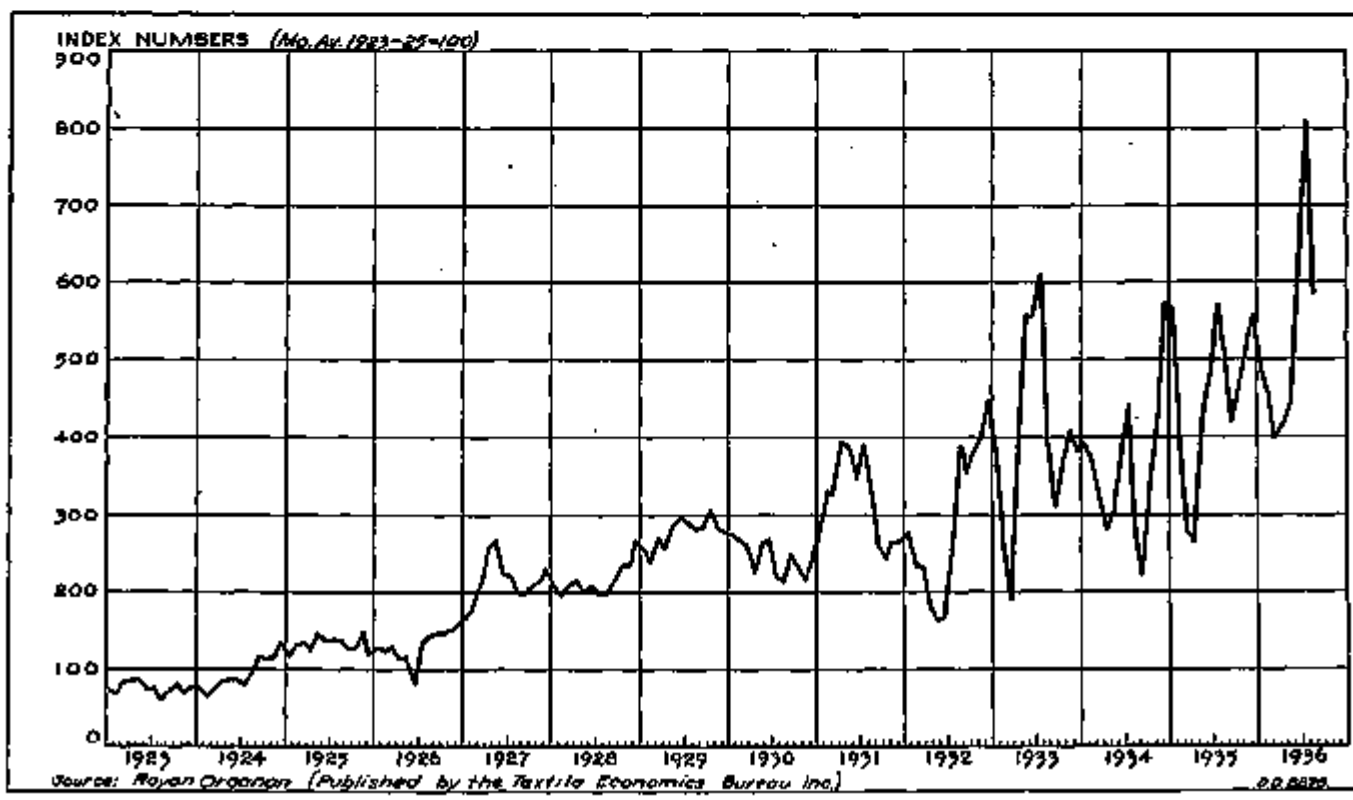

Figure 1.—Index of Rayon Deliveries, adjusted for seasonal variations, 1923-35.

with the result that the demand for the new rayon yarn became firmly established.

The 1935 Census reports showed 31 establishments in operation, or two more than in 1929. Rayon yarns and allied products manufactured in 1935 were valued at $181,155,000. Of the total value of all products $148,727,000 represented rayon yarns and the remainder allied products, such as transparent wrapping tissue, rayon staple fiber, horsehair and waste, and a small quantity of nonrayon products. Production of yarn in 1935 was more than 7 times as large as that of 1923, and value of yarns manufactured increased about 2½ times. Yarn prices dropped from $2.80 per pound to $0.57 in this 12-year period.

Table 1.—Rayon and Allied Products: Summary for the Industry [1]

Item	1926	1927	1929
Number of establishments	14	19	20
Wage earners (average for the year) [2]	19,129	26,341	29,106
Wages	$22,075,005	$28,049,441	$44,067,129
Cost of materials, containers, fuel, and purchased electric energy	$18,477,905	$25,747,702	$33,394,763
Production:			
Yarns:			
Total pounds	51,002,491	75,556,420	110,032,378
Total value	$88,007,879	$106,408,782	$149,840,[illegible]
Allied products (sheers, waste, etc.), value	$53,080	$3,410,584	$8,000,512
Other products, value			
Value added by manufacture [3]	$60,582,007	$84,140,544	$116,214,[illegible]

Item	1931	1933	1935 [4]
Number of establishments	32	34	31
Wage earners (average for the year) [2]	38,735	44,300	50,165
Wages	$38,231,499	$38,013,000	$50,328,641
Cost of materials, containers, fuel, and purchased electric energy	$38,189,855	$44,031,000	$61,678,110
Production:			
Yarns:			
Total pounds	149,579,406	213,409,000	267,567,347
Total value	$112,282,407	$120,202,000	$148,720,516
Allied products (sheers, waste, etc.), value	$29,750,000	$27,729,000	[illegible]
Other products, value			[illegible]
Value added by manufacture [3]	$96,481,653	$112,000,000	$116,[illegible]

[1] No data previous to 1925 available except as follows: 1923, yarn production, pounds, 36,475,025; value, $52,051,395.
[2] Not including salaried officers and employees. Average of number reported for the several months of the year, with equal weighting for full-time and part-time employees.
[3] Value of products less cost of materials, containers, fuel, and purchased electric energy.
[4] Preliminary.
[5] Included with "Allied Products" prior to 1935 census.
Source: Bureau of the Census, U. S. Department of Commerce.

The manufacture of rayon staple fiber is becoming increasingly important, although as yet the amount produced is small, relative to rayon yarn production. The staple, which is made by spinning the rayon filaments and then cutting them into short uniform lengths, has been found useful in simulating wool and cotton fabrics, rather than the silk-like effects obtained when filament rayon yarns are used. According to the Textile Organon, rayon staple fiber production amounted to about 5 million pounds in 1935, as compared with only one-half million pounds in 1929.

An idea of the extent and rapidity of the growth of the industry, as well as comparative data for the relative changes in the other branches of the textile industry, may be obtained from figure 2, which shows the trends of consumption of the basic textile fibers. In order to show relative or percentage changes from year to year, rather than absolute changes, the data are plotted on a ratio chart. Equal vertical distances show equal percentage changes, hence in comparing the trends shown, the significant factor is the degree of slope of each of the plotted lines.

Consumption of rayon first exceeded that of silk in 1927, and by 1935 the former was more than four times as large as the latter. In 1934 the amount of rayon consumed approached that of wool consumption, but in 1935 the spread widened; the increase in wool consumption, which had fallen rather sharply in the preceding year, was greater than the increase in rayon. It may be noted that the rayon poundage figures plotted here are for yarn, whereas those for cotton, wool, and silk are for the raw material.

Though growth in the rayon industry in this country has been exceedingly rapid, expansion in world production facilities, particularly in Japan, during the last few years has resulted in some decline in the proportion of the world's total production accounted for by the United States. Through 1935, however, the United States continued as the world's leading rayon producer, a position which it has held since 1919. In the last 2 years plants in this country produced about one-fourth of the world's total yarn and staple fiber, as compared with 31 percent in 1933, according to the Rayon Organon. Japanese producers accounted for 14 percent of all rayon produced in 1933, and by 1935 this

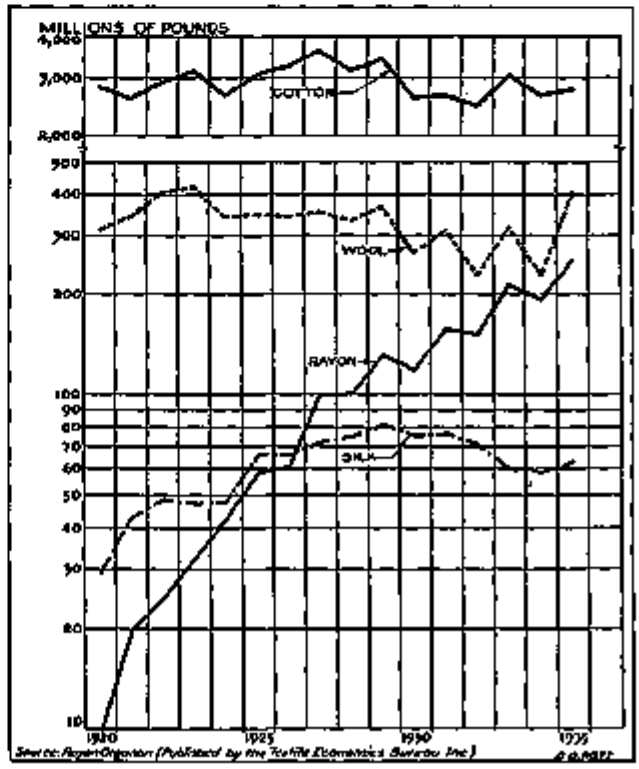

Figure 2.—Annual Consumption of Textile Fibers, 1920-35.

percentage had increased to 22. Great Britain, Germany, Italy, and France are the other leading producers, but in these countries, as in the United States, the increases in production in recent years have not been so large as that recorded in Japan.

In 1936 it is possible that the United States may yield first place to Japan. In the first half of the current year, members of the Japan Rayon Association, which account for a large part of the Japanese output, produced 32 percent more rayon yarn than in the corresponding period last year. In the United States production increased 6 percent for this comparative period. The comparative situation in the two countries has been somewhat more favorable for the United States in the second half of the year.

Rayon Deliveries

Consumption of rayon, i. e., deliveries from the producer, varies widely from month to month. Such changes have a distinct seasonal pattern, but even after adjustment for this factor the fluctuations are extremely sharp, as shown in figure 1. Data used in this chart are for non-acetate rayon deliveries only and it may be noted that the relative gain over the 1923–35 period is somewhat smaller than that shown in figure 2. This is due to the fact that the annual data on consumption include the figures for acetate rayon, which are not available on a monthly basis. Acetate rayon has become increasingly important in recent years; in 1935, 21.8 percent of all rayon was produced by the acetate process, as compared with 7.7 percent in 1930 and only 3.2 percent in 1925.

Distribution of Rayon Yarn

Census data indicating the trends of production of rayon textiles are not yet available for 1935. Earlier census data, together with certain estimates published in the Rayon Organon, give an indication of the distribution of rayon yarn and the position which it occupies in various textile industries producing articles of advanced manufacture.

Using a broad classification, rayon is consumed by three major trades—the hosiery industry, other knitgoods manufacturers, and the woven goods industry. Table 2 shows rayon shipments, according to this classification, together with the percentage of the total shipped to each group in the years from 1912 to 1935.

Here it is seen that in the early years the hosiery industry was the largest buyer of rayon. By 1921, however, the woven goods industry became the rayon producers best customer, with the "other" knit goods industry assuming second place. In the last 6 years the woven goods industry has consumed an increasingly large proportion of the total rayon output, the share taken by the "other" knit goods manufacturers has remained fairly constant, and purchases by the hosiery manufacturers have declined, relative to the total. Consumption of rayon by the hosiery industry has also shown a tendency to decline on a poundage basis in the last few years. Rayon, however, continues as a major source of raw material in the hosiery industry; more than one-fourth of all hose manufactured in 1934 and 1935 were made either wholly or principally of rayon, according to data compiled by the National Association of Hosiery Manufacturers. Almost one-half of all men's hose manufactured in those years were either wholly or partly of rayon, while for women's hose these percentages were 10 percent in 1934 and 8 percent in 1935.

Table 2. Shipments of Rayon Yarn to Major Consumers, 1912–35

[In millions of pounds and percent]

Year	Knit goods manufacturers				Broad woven goods manufacturers		Miscellaneous [1]		Total shipments	
	Hosiery		Other knit							
	Quantity	Percent	Quantity	Percent	Quantity	Percent	Quantity	Percent	Quantity	Percent
1912	0.3	30	0.1	7	0.3	22	0.4	40	1.1	100
1913	.8	40	.1	5	.4	25	.5	30	1.6	100
1914	1.1	47	.1	8	.7	28	.5	22	2.4	100
1915	2.7	65	.2	5	.9	22	.3	8	4.1	100
1916	3.2	50	.6	11	1.3	22	.6	11	5.7	100
1917	3.0	45	1.0	15	1.9	29	.7	11	6.7	100
1918	1.8	40	.8	17	1.4	31	.6	12	4.6	100
1919	2.3	28	1.5	18	2.0	23	1.8	21	8.2	100
1920	2.0	26	1.7	22	1.9	24	2.3	29	7.9	100
1921	3.8	23	5.1	31	5.6	33	3.9	24	16.4	100
1922	5.8	26	6.5	29	5.3	24	4.8	21	22.4	100
1923	6.0	22	7.9	27	9.0	33	5.3	18	29.4	100
1924	8.3	21	11.0	27	15.8	39	5.1	13	40.2	100
1925	10.7	20	19.5	28	26.1	50	5.5	10	52.8	100
1926	10.8	20	16.0	29	21.2	42	4.8	9	51.3	100
1927	10.7	20	20.9	34	31.6	37	7.0	9	85.0	100
1928	14.7	17	33.9	37	32.5	37	7.9	9	88.0	100
1929	18.8	16	43.7	37	45.4	39	8.5	8	116.4	100
1930	16.5	15	38.0	34	49.5	44	7.9	7	111.9	100
1931	21.1	14	48.7	31	75.0	49	10.2	6	155.5	100
1932	19.0	13	38.0	25	94.0	56	10.2	6	151.8	100
1933	17.1	8	40.9	20	141.5	67	11.0	5	211.1	100
1934	14.1	7	41.2	22	120.6	67	8.6	4	184.7	100
1935	14.7	6	47.8	19	178.9	71	10.3	4	251.7	100

[1] Includes shipments to narrow goods weavers.

Source: Rayon Organon.

Of the shipments to "other" knitgoods manufacturers, the knit underwear trade accounts for between 80 and 90 percent of the total, the remainder going to manufacturers of knit dress goods, neckties, sweaters, bathing suits, and knitted elastic goods. According to census data, roughly 30 percent of all underwear produced in 1934 and in 1935 was made wholly or chiefly from rayon yarn.

There are no detailed data on the consumption of rayon by the woven goods manufacturers, but according to the best estimates available, about 60 percent of all rayon consumed by the broad goods mills is taken by the dress goods and novelties manufacturers. Others using large quantities of rayon are manufacturers of taffetas and linings.

HOURS OF WORK AND WEEKLY AND HOURLY EARNINGS (25 INDUSTRIES) [1]

Month	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Average Actual Hours, Per Week, Per Wage Earner, All Wage Earners (Number of Hours)																		
January	.....	.....	44.2	.....	50.0	48.2	48.5	48.4	48.1	48.8	48.6	46.2	42.2	36.9	35.1	34.0	36.3	38.4
February	.....	.....	44.2	.....	49.7	48.2	48.5	49.0	48.4	48.4	49.1	46.7	42.3	37.7	35.0	33.6	37.2	38.1
March	.....	.....	45.0	.....	50.1	47.0	48.6	48.8	48.3	48.2	49.0	45.0	43.3	36.1	32.1	34.4	36.5	38.7
April	.....	.....	44.7	.....	50.2	47.7	48.1	48.1	47.9	47.4	48.3	45.6	41.0	34.2	34.0	35.4	36.7	39.5
May	.....	.....	44.5	.....	49.9	46.6	48.0	47.9	48.2	47.7	48.0	44.9	42.8	33.7	37.6	35.5	36.3	40.4
June	.....	49.4	45.6	.....	49.5	48.7	47.4	47.9	47.7	48.0	48.4	44.5	41.3	32.8	41.6	35.4	36.0	39.4
July	51.5	49.5	45.2	48.9	49.2	48.0	47.4	47.6	47.0	47.0	48.4	42.9	40.1	31.9	42.0	34.0	36.5	39.2
August	.....	49.8	45.8	48.7	48.6	48.5	47.6	47.5	47.6	47.9	48.3	42.4	39.7	32.1	38.2	38.5	37.4	40.0
September	.....	48.7	46.0	49.0	48.0	48.4	48.4	48.5	47.7	48.3	48.8	42.4	39.4	36.3	36.8	33.4	37.7	.....
October	.....	48.8	47.7	49.6	48.5	47.5	48.4	48.7	47.4	47.9	49.3	42.6	38.1	36.5	36.1	33.9	38.5	.....
November	.....	46.4	47.1	49.7	48.8	46.9	48.6	47.6	47.1	47.7	49.2	41.0	37.8	36.5	33.8	34.0	38.0	.....
December	.....	45.9	47.0	49.9	48.3	48.0	49.0	47.7	47.3	48.0	49.0	41.4	38.4	36.1	33.8	36.0	38.7	.....
Monthly average	.....	[2] 48.2	46.6	[2] 49.2	49.2	48.0	48.2	48.1	47.7	47.9	48.3	43.9	40.4	34.8	36.4	34.7	37.2	.....
Average Weekly Earnings All Wage Earners (Dollars)																		
January	.....	.....	25.53	.....	25.15	27.03	27.20	27.12	27.50	27.43	28.70	27.33	23.20	18.01	16.23	13.77	21.59	23.48
February	.....	.....	25.03	.....	25.26	27.14	27.15	27.03	27.00	27.31	28.84	27.68	24.15	19.03	16.23	19.65	22.14	23.14
March	.....	.....	24.01	.....	25.87	26.20	27.33	27.67	27.70	27.39	28.79	27.15	24.13	18.59	14.53	20.54	21.70	23.67
April	.....	.....	24.41	.....	26.44	26.88	27.18	27.33	27.08	27.57	28.85	27.28	23.93	17.33	15.49	20.00	21.94	24.33
May	.....	.....	23.65	.....	27.38	26.22	27.10	27.33	27.83	27.62	28.81	26.00	24.26	17.02	16.83	20.60	21.73	24.41
June	.....	28.93	23.37	.....	27.21	25.01	26.83	27.38	27.02	27.81	28.59	26.27	23.25	16.10	18.69	20.71	21.51	24.46
July	12.68	29.94	23.04	22.91	26.97	25.27	26.83	27.08	27.11	27.48	28.41	25.26	22.46	15.39	19.94	19.90	21.85	24.33
August	.....	30.05	23.12	23.52	26.87	25.49	26.02	27.02	27.84	27.82	28.49	26.03	22.32	15.20	19.34	19.58	22.48	24.66
September	.....	28.98	22.56	24.22	26.98	26.33	27.17	27.85	27.00	28.32	29.01	24.06	21.90	16.44	19.41	19.65	22.54	.....
October	.....	29.70	23.81	24.82	27.24	26.74	27.29	27.07	27.48	28.10	29.27	24.82	20.99	16.81	19.50	20.00	23.13	.....
November	.....	28.45	22.97	25.00	27.05	26.40	27.21	27.49	27.04	27.77	27.33	23.80	20.34	16.91	18.44	20.12	23.33	.....
December	.....	27.79	23.03	24.24	27.08	27.08	27.00	27.29	27.30	27.81	27.82	23.35	20.80	16.22	18.57	20.74	23.39	.....
Monthly average	.....	[2] 28.36	23.77	[2] 24.39	26.61	26.49	27.09	27.46	27.53	27.69	28.46	25.84	22.62	17.05	17.71	20.12	22.00	.....
Average Weekly Earnings, Male, Skilled and Semiskilled (Dollars)																		
January	.....	.....	29.76	.....	29.15	31.06	31.47	31.43	31.37	31.48	32.54	31.02	25.72	21.85	18.71	20.92	23.03	25.40
February	.....	.....	28.72	.....	29.42	31.40	31.25	31.99	31.96	31.80	33.09	31.34	26.57	22.43	18.05	21.80	24.68	25.06
March	.....	.....	28.07	.....	29.77	31.10	31.61	32.04	31.81	32.05	32.97	30.83	28.56	21.15	16.03	23.00	24.28	25.43
April	.....	.....	28.17	.....	30.93	31.30	31.30	31.46	31.79	31.83	33.07	31.01	26.87	19.85	17.72	23.15	24.66	27.18
May	.....	.....	26.91	.....	31.46	31.31	31.34	31.49	31.99	31.80	32.93	30.17	27.26	19.63	19.05	23.20	24.30	27.33
June	.....	34.70	26.71	.....	31.42	30.85	30.95	31.52	31.75	31.90	32.55	29.88	25.92	18.30	21.37	23.30	24.15	27.31
July	14.99	34.77	26.31	25.20	31.46	30.08	30.68	31.12	30.96	31.20	32.63	28.48	24.89	17.50	23.27	22.24	24.70	26.89
August	.....	34.96	25.57	27.37	30.85	29.46	30.59	31.50	31.52	31.93	32.73	28.30	24.77	17.46	22.20	21.72	24.15	27.49
September	.....	34.41	25.28	26.69	30.92	30.01	31.44	32.00	31.50	32.50	33.20	28.21	23.92	18.07	22.65	21.63	24.08	.....
October	.....	34.37	25.88	25.79	31.42	30.33	31.00	32.20	31.32	32.52	33.36	27.74	23.06	19.17	22.35	22.45	25.83	.....
November	.....	32.97	26.50	23.98	31.71	30.51	31.40	31.30	30.81	31.93	31.00	26.48	22.02	19.42	21.65	22.69	26.03	.....
December	.....	32.28	26.58	26.15	31.48	31.25	31.88	31.39	31.35	32.30	31.11	26.71	22.50	18.00	21.10	23.03	26.32	.....
Monthly average	.....	[2] 34.19	27.36	[2] 28.11	30.81	30.59	31.29	31.41	31.41	31.94	32.60	28.17	25.05	18.48	20.37	22.49	24.98	.....
Average Weekly Earnings, Male, Unskilled (Dollars)																		
January	.....	.....	22.80	.....	20.88	22.71	22.90	23.10	23.73	23.08	24.46	23.16	19.71	15.03	13.94	13.47	17.49	19.01
February	.....	.....	21.84	.....	20.93	22.63	22.91	23.02	23.84	24.18	24.71	23.43	20.79	16.75	13.80	16.24	18.30	19.46
March	.....	.....	21.80	.....	21.32	23.00	22.09	23.53	23.85	24.03	24.85	23.23	20.86	15.00	12.28	16.70	17.80	19.14
April	.....	.....	21.14	.....	22.10	22.81	23.00	23.10	23.74	23.42	24.64	23.13	20.47	14.60	13.32	17.19	17.85	19.00
May	.....	.....	23.00	.....	23.06	22.42	23.00	23.00	23.73	23.87	24.46	22.43	20.77	14.58	14.51	16.91	17.54	19.67
June	.....	26.10	20.02	.....	22.68	21.78	22.89	23.15	23.00	24.12	24.45	22.34	19.54	13.78	15.87	17.00	17.87	19.74
July	10.71	26.48	19.17	19.24	22.34	21.56	22.33	22.87	23.33	23.60	24.34	21.24	18.83	13.19	16.48	16.43	17.74	19.56
August	.....	26.71	19.47	19.00	22.68	21.80	22.77	23.02	23.34	23.97	24.95	21.08	19.01	13.19	16.14	15.92	18.80	20.04
September	.....	26.09	19.11	20.24	22.81	22.27	22.81	23.22	23.47	24.27	24.04	21.11	18.26	13.03	16.03	15.98	18.06	.....
October	.....	26.09	19.40	20.76	23.06	22.67	23.11	23.76	23.48	23.86	25.19	21.26	18.10	14.40	16.34	16.29	19.33	.....
November	.....	25.40	19.95	20.78	22.18	22.38	23.13	23.13	23.03	23.64	23.19	20.14	16.84	14.21	14.87	16.23	19.48	.....
December	.....	24.34	19.03	21.18	22.80	22.81	23.42	22.91	23.24	23.69	23.33	20.32	16.95	13.07	15.97	16.59	19.40	.....
Monthly average	.....	[2] 25.06	20.22	[2] 20.69	22.25	22.41	22.94	23.21	23.54	23.69	24.49	21.80	19.13	14.46	14.81	16.42	18.28	.....
Average Weekly Earnings, Female (Dollars)																		
January	.....	.....	16.49	.....	16.65	17.24	17.05	16.86	17.33	17.30	17.49	16.71	14.70	12.05	10.22	13.59	16.18	16.23
February	.....	.....	16.85	.....	16.64	17.19	17.56	17.22	17.42	17.30	17.77	17.06	15.41	13.30	11.04	14.48	15.45	16.38
March	.....	.....	16.74	.....	16.96	17.43	17.57	17.27	17.53	17.30	17.62	16.08	15.75	12.71	10.64	14.79	15.43	16.34
April	.....	.....	16.70	.....	17.26	17.02	17.25	17.29	17.43	16.58	17.73	16.30	15.12	11.60	10.11	14.71	15.21	16.15
May	.....	.....	16.95	.....	17.58	16.01	17.40	17.11	17.30	16.71	17.59	16.10	15.40	11.01	11.12	14.61	14.74	16.93
June	.....	18.61	16.72	.....	17.06	16.81	16.74	17.30	17.32	16.98	17.67	15.96	15.11	10.70	12.32	14.47	14.73	15.00
July	7.75	18.26	16.18	15.22	17.28	15.65	16.58	17.25	16.94	16.90	17.30	15.62	14.08	10.83	12.09	14.33	14.75	15.14
August	.....	17.82	16.47	15.16	17.54	15.92	16.78	16.88	17.30	17.08	17.57	15.80	14.76	10.05	13.91	14.23	15.36	15.93
September	.....	18.06	16.50	16.69	17.49	16.94	16.91	17.45	17.48	17.27	17.05	15.25	14.57	11.70	14.31	14.10	15.55	.....
October	.....	17.75	16.27	16.02	17.47	17.13	17.03	17.75	17.03	17.58	18.00	15.75	13.92	12.22	14.24	14.43	15.60	.....
November	.....	16.89	16.59	16.35	17.49	16.93	17.11	17.60	17.44	17.27	17.14	15.29	13.26	11.86	13.74	14.39	15.60	.....
December	.....	16.68	16.63	16.61	17.03	17.09	17.41	17.45	17.41	17.43	17.23	15.09	13.61	11.52	13.49	15.08	15.72	.....
Monthly average	.....	[2] 17.71	16.66	[2] 16.34	17.24	16.75	17.17	17.27	17.37	17.15	17.41	15.96	14.68	11.72	12.85	14.44	15.20	.....

See footnotes on p. 18.