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APPENDIX

CONSTRUCTION AND EVALUATION OF ESTIMATES OF MONTHLY SHOE SALES, 1926-1941

Monthly estimates of retail shoe sales in the United States were constructed in two segments – before and after 1935. Originally, the method used for the earlier segment was extended through 1940. But after this work had been largely completed, the Department of Commerce developed a new series for the sale of shoes by independent and chain shoe stores. These data greatly increased the number of outlets for which reports were available, and therefore it seemed clearly desirable to use these new figures beginning with the middle of 1935. Accordingly, the following description is in two parts.

The first part of the index was developed in five major steps. They consisted of (1) constructing a national index of shoe sales of department stores; (2) developing an index of sales of shoe chains; (3) combining into a single index the department store and chain store indexes of shoe sales and, by estimating total sales of these outlets in 1939, converting the index to estimates of dollar sales; (4) deriving preliminary estimates of total annual sales of shoes in the United States based on statistics of shoe production and fitting an exponential equation to the annual ratios between these hypothetical total shoe sales and shoe sales of chain and department stores; (5) applying monthly trend correction ratios obtained from the equation to the monthly chain and department store data to obtain monthly estimates of total shoe sales in the United States.

For the second period the national index of shoe sales of department stores is linked to a dollar figure representing total shoe sales of department, general merchandise, and general stores and mail order houses in 1939. A series giving monthly sales of chain and independent shoe stores compiled by the Department of Commerce starting in 1935 is linked to a base figure representing shoe sales of shoe and apparel stores in 1939. The two series are then added to give total monthly sales of shoes from 1935 to 1941.

It will be useful to review in detail the method used in constructing the 1926-1935 segment of the series (and the 1935-1941 segment as well, in its preliminary form, which is called the first series) before describing the method used for the final version of the 1935-1941 segment, which, when combined with the 1926-1935 data for the first series, is called the second or final series.

Incidentally, at a later point in the study we also made annual estimates for postwar years, but these are not part of the main body of the work.

Jacob Mincer assumed most of the burden of rewriting this Appendix on the basis of a cumbersome first draft.

PART I
CONSTRUCTION OF THE INDEX

SALES OF SHOE DEPARTMENTS

The construction of an index of sales of shoe departments of department stores involved, first, deriving an index for shoe sales of department stores for the seven Federal Reserve districts for which such data are available and, second, combining these series into a single index representative of sales of shoes in the department stores of the country.

The District Samples

Seven Federal Reserve district banks – Boston, New York, Richmond, Chicago, Cleveland, Dallas, and San Francisco – collected information on sales of departments of department stores. The first year for which shoe department data were available varies from district to district within the period 1924-1927.

To represent the Federal Reserve District of Philadelphia, for which no statistics of department store sales were available, we used an index of sales of shoe stores for the Philadelphia district which is based on sales of thirty-one shoe stores.[1]

The sample of stores submitting departmental data is smaller than those reporting their total sales and included in the Federal Reserve Board index of department store sales. Moreover, since all stores reporting sales by departments do not necessarily have or report sales of shoe departments, our shoe data may well be obtained from somewhat fewer stores than are listed below. In 1940 approximately the following number of stores in each district submitted departmental sales statistics: Boston, 27 – 12 of which are in the city of Boston; New York, 18 – almost entirely stores in New York and Brooklyn; Richmond, 14 stores in Washington and Baltimore; Chicago, 40 stores with the city of Chicago deemed underrepresented; Cleveland, 56 in 1941 and probably less in 1940 – the sample ranged between 31 and 56 during the fifteen-year period; Dallas, 10; San Francisco, 26 – including practically all the larger stores in the district. For the most part the samples grew during the fifteen years covered by the index, so that somewhat less than the 190-odd stores included in 1940 were reporting in 1926.[2] We estimate that these stores sold 20 per cent of shoes sold in department stores in the United States.[3]

[1] Submitted by the Federal Reserve Bank of Philadelphia.

[2] This sample was considerably expanded in 1941 as the result of renewed interest in departmental information. Beginning with the May 1941 issue of the *Federal Reserve Bulletin*, the Board has published information on sales and stocks of departments of department stores each month – 250 stores contributed information of this sort in March 1941, the first month for which the data was published (*ibid.*, p. 452); 351 stores reported departmental statistics in March 1944. Information for women's shoe departments was obtained from 241 of these stores (*ibid.*, May 1944, p. 605).

[3] The estimate was made in the following way: We had dollar figures of shoe sales for one year for each district, although the year to which they applied differed for the various districts. We used our constructed index of sales for each district to project the dollar figures for each district to 1939, and these seven figures summed to \$43.6 million in 1939. Total shoe sales of all department stores, excluding estimated shoe sales of mail order houses and including leased departments, was \$229.2 million. This estimate is based on the 1939 census and includes basement shoe departments which are excluded in our sample.

$$\frac{43.6}{229.2} \times 100 = 19.0 \text{ per cent.}$$

Construction of the Index

The figures obtained from the Federal Reserve banks reported men's and boys' shoe departments and women's and children's shoe departments separately.[4] The data were for the most part in the form of percentage change for the aggregate sales of an identical sample from the same month of the previous year. Although for each pair of, say, Januaries, the sample was constant, the number of reporting stores changed from time to time. Data in this form could have been linked to a base year in which each month was 100, and a continuous index formed in this way. But the seasonal and other movements of the base year would have been amputated from the figures. Consequently, we requested and obtained monthly dollar (or percentage) sales for one year in which the sample remained virtually constant. Monthly dollar figures were expressed as relatives of their average value for the year, and the figures for percentage change for the same month of the following year were then linked to the relatives for the base year, to form a continuous index revealing the full seasonal movement.

The indexes for men's shoe departments and for women's shoe departments in each district were combined with a weight of 40 and 60 respectively.[5] These weights represented the relative importance of all sales of men's and women's shoes rather than such sales in department stores only.

Combined men's and women's shoe sales were then adjusted to eliminate seasonal variation. The seasonal adjustment was made on each district series separately, for two reasons: first, it yields a somewhat better seasonal adjustment; second, we needed to examine the sales series for individual districts to determine their worth, and for this the elimination of the strong retail seasonal is essential. The strength of this seasonal and the difference for men's and women's shoe purchases, as well as for earlier and later years, is shown in Table A-1. The method used was that of averaging all Januaries, Februaries, etc., for a period during which seasonals had remained reasonably constant and adjusting for trend.[6] It is interesting to note that for all districts, seasonal patterns differed during earlier and later years; the shift occurred sometime between 1929 and 1933.

The Weighting Problem

In order to combine the individual district indexes into a national total, a weighting scheme had to be found. If, on the one hand, each district index is judged to characterize

[4] All districts reported sales for men's and boys' shoes combined, and 5 of the 7 districts reported sales for women's and children's shoes combined. For the 2 districts reporting women's shoes and children's shoes for separate departments, we used the data for the women's shoe departments only. In the succeeding discussion we shall use the term "men's" and "women's" in referring to men's and boys' shoe departments and women's and children's shoe departments respectively.

[5] In deriving the 40-60 weights, the census categories of "men's," "youths' and boys'," and "athletic" and "sporting" shoes were classed as men's shoes, and "women's," "misses' and children's," "leather and fabric uppers," and "canvas, satin and other fabric uppers" were classed as women's shoes.

The 40-60 weights overstate the relative importance of sales of men's shoe departments of department stores. The *Sixteenth Census of the United States, 1940, Census of Business* (Vol. I, *Retail Trade, 1939*, Part 2) in the section on Commodity Sales indicates a 25-75 relationship between sales of men's and women's main store shoe departments. At the time the decision was made, however, we planned to use the department store materials and the chain store figures as two fallible estimates of total shoe sales in the country rather than as characterizing specifically the shoe sales of department stores and chain shoe stores respectively. Study of the indexes after they were completed and other considerations lead to a change in plans which means that men's shoe sales are slightly overweighted. The possible effects of this error are described below, p. 119.

[6] For a description of the method of seasonal adjustment see Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles* (National Bureau of Economic Research, 1946), pp. 46 ff., method 1.

shoe sales of department stores in the given district, which tend in turn to differ materially from those of the country as a whole, then the relative importance of department store shoe sales in each district should form the basis of the weighting scheme. Failing an affirmative judgment on this question, we should have simply to weight each district sample by the sample size, that is, the relative volume of shoe business done in each district by the reporting stores; this course would be reluctantly followed either if information were lacking about shoe sales by districts or perhaps if significant differences were disclosed among the several samples or among actual shoe sales for each district.

TABLE A-1

SEASONAL INDEXES OF DEPARTMENT STORE SHOE SALES, FIVE FEDERAL RESERVE DISTRICTS COMBINED, SELECTED PERIODS

	1926-1929			1937-1940		
MONTH	*Men's Shoes*	*Women's Shoes*	*Total*	*Men's Shoes*	*Women's Shoes*	*Total*
January	76	79	77.5	70	68	69.0
February	66	64	65.0	62	66	64.0
March	82	100	91.0	87	117	102.0
April	98	110	104.0	91	117	104.0
May	99	110	104.5	99	118	108.5
June	112	120	116.0	123	118	120.5
July	76	82	79.0	67	65	66.0
August	69	79	74.0	58	70	64.0
September	105	105	105.0	118	134	126.0
October	93	107	100.0	90	107	98.5
November	106	109	107.5	101	96	98.5
December	219	135	177.0	232	123	177.5

Actually, we do have a little information that bears on the judgment that must be made – indexes of total department store sales and income payments in each district.[7] Having noted differences among districts in our shoe department indexes, we study these other data to see whether parallel differences appear in them. It is worthwhile to make these comparisons with some care, for they serve a double purpose: in addition to providing the basis of selecting the weighting scheme, they help to evaluate the reliability of our shoe sales statistics.

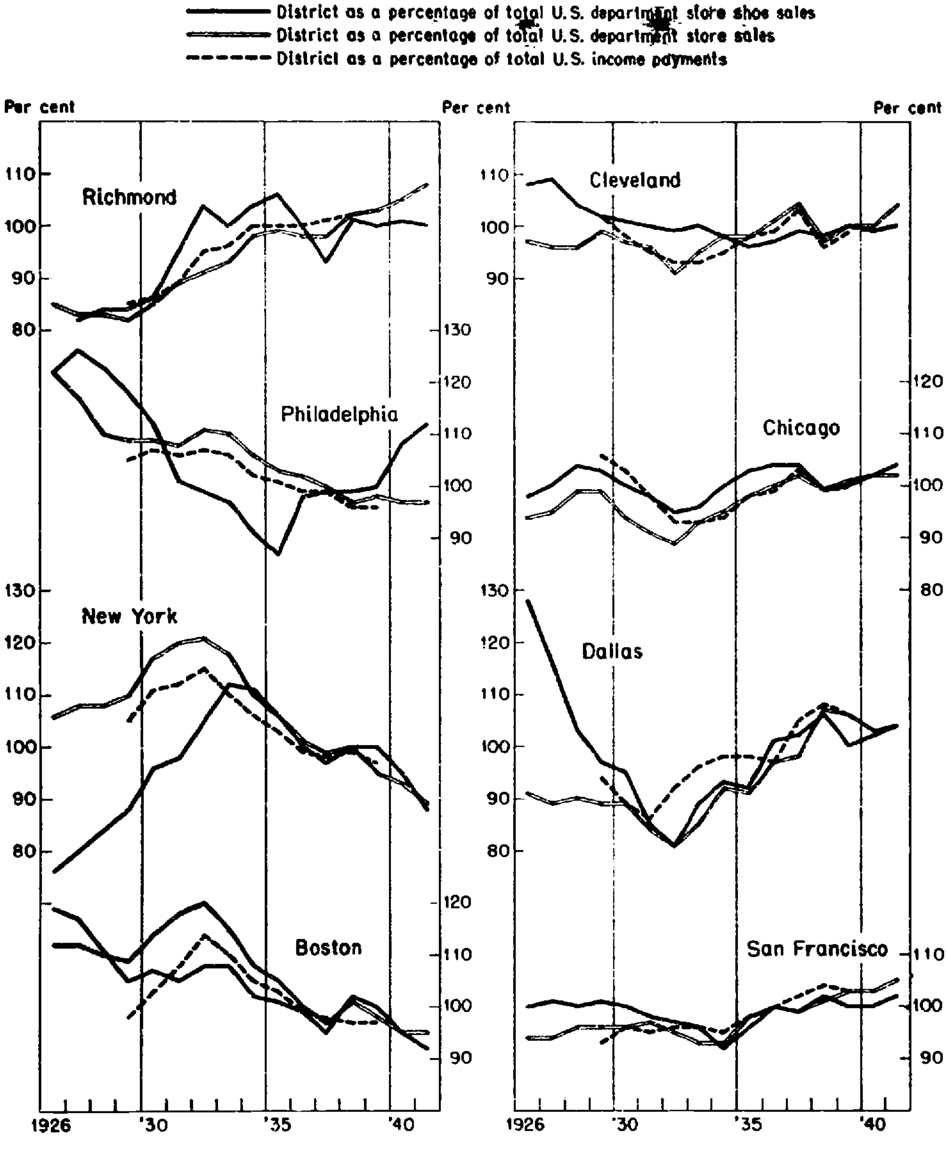
In Chart A-1 three sets of data (department store shoe sales, department store total sales, and income payments) are plotted for each Federal Reserve district; the data have been converted to percentages of the national average. The charts seem to convey the general impression that the three sets of data for any one district deviate from their national averages in a roughly parallel fashion. Several procedures were employed to test this impression. Though the parallelism exhibited by the income payment series is interesting, comparisons were restricted to the department store data more immediately relevant to our problem.

Year-to-Year Variation in Patterns. Similarity in the pattern of change from 1926-1940 between shoe department and total department store sales in a given district would be reflected in similarity in the direction of changes for the two sets of ratios from year to year; accordingly these movements were tallied. In 81 per cent of the district years, for which the direction of change of the ratio of district shoe sales to national shoe sales

[7] Total department store sales are the Federal Reserve Board indexes which, in their revised form, have been adjusted to 1929, 1935, and 1939 census levels. The income data are Department of Commerce figures for state income payments converted to Federal Reserve district by *Business Week*.

CHART A-1

RATIOS OF SHOE DEPARTMENT SALES, TOTAL DEPARTMENT STORE SALES, AND INCOME PAYMENTS IN EIGHT FEDERAL RESERVE DISTRICTS TO NATIONAL TOTALS, 1926-1941



was compared with the direction of change of the ratio of district department store sales to national department store sales, the direction of change was similar.[8]

Timing of Subcyclical Movements. Table A-2 shows the results of two sets of timing comparisons. For all series, specific subcyclical turns were selected in the monthly data

[8] The significance of this figure may be roughly gauged by comparing it with an analogous percentage obtained by a random grouping of the two sets of ratios; for example, shoe departments in Richmond compared with department store sales in Dallas, and similarly for seven remaining districts when the districts to be paired are drawn at random. Two sets of these random groupings were made. The percentage of months when the members of each pair moved in the same direction was 38 in the first drawing and 54 in the second. This suggests – though of course it would have been better to repeat the operation many times – that the figure of 81 per cent might well be meaningful.

TABLE A-2

SUBCYCLICAL TURNS IN DISTRICT SHOE DEPARTMENT AND DISTRICT TOTAL DEPARTMENT STORE SALES COMPARED WITH NATIONAL SHOE DEPARTMENT AND NATIONAL TOTAL DEPARTMENT STORE SALES, 1926-1940

DISTRICT	TOTAL STORE SALES (T) SHOE DEPT. SALES (S)	NUMBER OF TURNS: Leading (—) (1)	NUMBER OF TURNS: Lagging (+) (2)	NUMBER OF TURNS: Synchronous (0) (3)	AVERAGE LEAD (—) OR LAG (+) (Mos.) (4)	AVERAGE DEVIATION (Mos.) (5)	COMPARISON OF TIMING FOR T & S SERIES AT EACH TURN: No More Than 2 Mos. Apart (6)	Turns Unassociated for Both Series (7)	Over 2 Mos. Apart (8)	Turns Unassociated for Only One Series (9)	All Turns (10)
Richmond	T	2	6	8	+.75	1.4	11	1	4	3	19
	S	5	8	4	+.12	1.8					
Philadelphia[a]	T	3	3	8	—.07	1.4	8	2	6	3	19
	S	6	5	6	—.06	1.6					
New York	T	3	3	11	+.18	1.4	8	0	7	4	19
	S	5	4	8	—.18	1.2					
Boston	T	3	3	9	+.13	1.1	6	2	7	4	19
	S	5	5	5	+.20	1.7					
Cleveland	T	1	7	11	+.63	1.1	15	0	4	0	19
	S	3	4	12	+.21	.7					
Chicago	T	3	5	7	—.07	.9	12	2	3	2	19
	S	5	3	9	—.41	1.3					
Dallas	T	5	2	7	—.43	1.2	6	2	2	9	19
	S	4	2	5	—.64	1.5					
San Francisco	T	5	2	7	0	1.0	10	3	2	4	19
	S	5	3	6	—.28	1.2					
							76	12	35	29	152

[a] Sales of shoe specialty stores.

TABLE A-3

COMPARISON OF TREND OF SHOE DEPARTMENT AND TOTAL DEPARTMENT STORE SALES IN EIGHT FEDERAL RESERVE DISTRICTS, 1926-1941

DISTRICT	AVERAGE INDEX NUMBERS, 1937-1941, AS % OF AVERAGE FOR 1926-1930		RANK OF FIGURES IN COLS. 1 AND 2	
	Dept. Store Shoe Sales[b] (1)	*Dept Store Total Sales*[c] (2)	*Col. 1* (3)	*Col. 2* (4)
Richmond[a]	112	125	8	8
Philadelphia	82	85	1½	1½
New York	106	85	7	1½
Boston	82	86	1½	3
Cleveland	89	103	3	4
Chicago	95	104	5½	5
Dallas	90	114	4	7
San Francisco	95	106	5½	6
United States	94	99		

Coefficient of rank correlation	8 districts	.5
	7 districts (excluding New York)	.8

[a] Since shoe sales for the Richmond district only start in 1927, the comparisons were based on averages of 1927 through 1930, and 1938 through 1941.

[b] National Bureau of Economic Research district shoe department indexes.

[c] Federal Reserve Board district indexes of total department store sales, *Federal Reserve Bulletin*, June 1944. Adjusted to census levels 1929, 1935, and 1939.

by studying the contours of each series individually. In the upper rows (T) of the first five columns, specific subcyclic turning points for eight *district* department store *total* sales are compared with specific turning points of *national* department store *total* sales. In the lower rows (S) the turning points of *district* department store *shoe* sales are compared with turning points of *national* department store *shoe* sales.[9] Columns 1-5 indicate similarity of timing behavior of each district T and S series with respect to their reference turns. Average leads or lags in column 4 vary as between total sales and shoe sales at most within a fraction of a month. By and large, timing of turns for the shoe departments and total department stores for each district differs from the country averages in more or less the same direction and degree. If we rank first the T figures in column 4 and then the S figures, the two sets have a coefficient of rank correlation of .8.

Another set of timing comparisons is given in columns 6-10. Here we make turn-by-turn comparisons for each reference turn shared by both national series of the lead or lag of a district shoe S series with respect to the national shoe S series and the district total store T series with respect to the national total store T series. Of the 152 possible comparisons (19 turns for 8 districts) 76, or just one-half, are no more than two months apart. If we include the cases where both the district shoe and the district total department stores series have no specific turn to match their respective national series, 88 in all are similar. In only 35 cases are the timing comparisons definitely over two months different.

Relative Trends of Districts. In Table A-3 we used as a rough measure of trend the average index for 1937 through 1941 expressed as a percentage of the average index for

[9] For both the national series a few specific turns were ignored, for we wished to use only those turns that the shoe departments and total stores had in common. Nineteen turns in both series were shared and consequently included in the two reference schemes.

1926 through 1930. The fact that the general trend of shoe departments is downward relative to the adjusted total department store figure is discussed later. Here we are concerned with whether each district shows the same ranking of trend ratios in its shoe sales as in its total store sales. Consequently, the eight ratios were ranked first for shoe departments and then for total department stores. The two sets of rank numbers (cols. 3 and 4) are similar for all except New York and Dallas. The rank correlation coefficient is .5 when all are included, .8 when only New York is excluded.

Amplitude of Cyclical Movements. The amplitude of cyclical movements in the various districts may also be compared for shoe departments and total department store sales. Table A-4 presents the results of such a calculation. The fall from the specific peak in the neighborhood of the 1929 reference peak to the specific trough in the neighborhood of the 1933 reference trough was calculated and expressed as a percentage of the average standing during the cycle phase. Analogous procedures were followed for the rise from 1933 to 1937 and for the fall from 1937 to 1938. The percentage rise or fall for shoe departments and for total department stores is given, together with the rank standing of these figures for each of the eight districts. The rank standings of the various districts seem relatively similar for each of the three-cycle phases when, first, sales of shoe departments and, second, sales

TABLE A-4

COMPARISON OF CYCLICAL AMPLITUDE OF SHOE DEPARTMENT AND TOTAL DEPARTMENT STORE SALES IN EIGHT FEDERAL RESERVE DISTRICTS, 1928-1938

DISTRICT	TOTAL STORE SALES (T) SHOE DEPT. SALES (S)	DECLINE 1929-1933 % Decline	Rank	RISE 1933-1937 % Rise	Rank	DECLINE 1937-1938 % Decline	Rank
Richmond	T	41	8	49	5	7	7
	S	36	8	38	6	10	6½
Philadelphia	T	53	5	38	6	18	2
	S	79	1	52	3	14	4
New York	T	43	7	27	8	12	4
	S	38	7	31	8	15	3
Boston	T	49	6	32	7	8	6
	S	51	6	32	7	9	8
Cleveland	T	64	2	59	2½	22	1
	S	59	5	49	4	22	1½
Chicago	T	68	1	59	2½	16	3
	S	69	2	55	2	22	1½
Dallas	T	57	3	65	1	5	8
	S	67	3	60	1	13	5
San Francisco	T	56	4	53	4	9	5
	S	65	4	47	5	10	6½
United States	T	55		49		13	
	S	57		42		10	
Coefficient of rank correlation			.7		.8		.7

Note: Change during a cycle phase is expressed as a percentage of average standing during the cycle phases. Standing at peak or trough is calculated as a 3-month (or 2-month) average in accordance with the usual National Bureau of Economic Research procedure for the analysis of business cycles.

of total department stores provide the basis of the districts' rank position. The coefficients of rank correlation are .7 or .8 for each phase.[10]

Combining the District Series into a National Total

The evidence supplied by the preceding analysis requires us to combine the district series in accordance with a weighting system reflecting the relative importance of shoe sales by department stores in the various Federal Reserve districts. In order to arrive at such a set of figures several sources of information were considered. Information about shoe sales of department stores based on commodity data of the 1929 and 1939 census of distribution is insecure and difficult to compile. The results of an attempt to do so are shown in column 1 of Table A-5.

TABLE A-5
WEIGHTS FOR SHOE DEPARTMENT AND TOTAL DEPARTMENT STORE SALES IN EIGHT FEDERAL RESERVE DISTRICTS AS PERCENTAGE OF TOTAL UNITED STATES SALES, 1939

DISTRICT	SHOE DEPT. SALES[a] (1)	TOTAL STORE SALES: *NBER Computation*[b] (2)	*Special Census Tabulation*[c] (3)	*FRB Sample*[d] (4)
Richmond	6.4	6.6	6.6	6
Philadelphia	7.3	7.0	6.8	7
New York	11.2	14.1	15.4	17
Boston	5.7	6.8	6.7	6
Cleveland	8.6	9.3	11.1	12
Chicago	23.6	23.0	20.1	19
Dallas	4.4	3.7	3.8	3
San Francisco	10.3	11.8	12.8	14

[a] The *Census of Business*, Vol. I, *Retail Trade, 1939*, Part 2 gave for each state the ratios of shoe to total sales of department stores reporting commodity information separately for women's and children's, men's and boys', and basement shoe departments. The three percentage figures were summed and applied to sales of all department stores in the state. Estimated sales first for shoes and then for total department store sales were summed for all states included in a given Federal Reserve district. Since the detailed geographic data available in 1929 were not tabulated in 1939, the sales of states falling in two or more districts were apportioned on the basis of the 1929 ratios of included to excluded sales, and thus an estimate of shoe sales of department stores in each Federal Reserve district was obtained. This figure was divided by an estimate of shoe sales of department stores based on data on commodity sales for the country as a whole given in the 1939 census.

[b] Obtained as described in note a, except that data for total sales of department stores were used.

[c] Percentage figures calculated from col. 1 of the table on p. 545 of *Federal Reserve Bulletin*, June 1944. This table gives the result of a special census tabulation of sales by department stores in 1939, including sales taxes and excluding catalogue sales of mail order houses. This tabulation was requested by the FRB in order to calculate the weights for its revised index of sales of department stores.

[d] Percentage of sales by the FRB sample of department stores reported by stores in each Federal Reserve district, 1939-1941. The figures were supplied to us through the courtesy of Woodlief Thomas, Assistant Director, Division of Research and Statistics, Board of Governors of the Federal Reserve System.

[10] Comparisons for 1937-1938 are deteriorated by the fact that for the shoe data the standing at the trough was frequently based on 2 rather than 3 months. April was unduly high because of a late Easter; therefore, since March could not also be included, it seemed best to exclude April when the turn fell in May and base the standing on May and June only. The department store data had been adjusted for the shifting date of Easter and accordingly did not show the same irregularity.

Alternatively, approximations to the desired weighting scheme may be made using total department store sales, and for this we have census data (cols. 2 and 3) and weights from the Federal Reserve Board sample (col. 4). The table suggests that the various data yield roughly similar results, and we select column 4 as the one that combines an acceptable basis of inclusion and exclusion with a ready figure for all twelve districts. Actually, these figures give the proportion that the sales reported by stores in each Federal Reserve district bear to sales reported by all of the fourteen hundred or so stores throughout the country that presented statistics to the Federal Reserve Board or district banks in 1939, 1940, and 1941. But the selection of the sample was predicated on the special census tabulations in column 3. Sales of mail order houses are excluded and sales taxes allowed for.[11]

The four districts for which no shoe data are available – St. Louis, Atlanta, Minneapolis, Kansas City, carried a total weight of 16, which was distributed among the other districts with the exception of the North and Middle Atlantic sections, in approximate proportion to the weight already assigned them. The exception was indicated by an examination of district indexes of income payments and total department store sales, which suggested that the shoe sales of the four unrepresented districts would be unlike those of the central and northerly eastern seaboard states. The final weights for 1927 to date were Richmond, 8; Philadelphia, 7; New York, 17; Boston, 6; Cleveland, 16; Chicago, 24; Dallas, 4; San Francisco, 18.[12]

The index numbers for each district were multiplied by their respective weights and, where necessary, changed to a 1939 base in one operation. The eight index numbers were then combined into a single national index.

Correction for Changing Date of Easter

In each of the district series the seasonal correction failed to adjust for Easter, since its shifting date cannot be allowed for in the average monthly standings used in the seasonal corrections. This fact made necessary an additional correction which, however, could be postponed until the district series had been combined into the national index of sales of shoe departments.

The method used is similar in principle, though somewhat different in detail, to the one used by the Federal Reserve Board in their department store index.[13] It involved determining the characteristic fashion in which seasonally adjusted sales for March and April deviated from the average sales of February through June, correlating these deviations with the changing date of Easter, and adjusting for the typical association.[14]

[11] The size of the shoe sample, except in the case of Chicago and Cleveland, bears some relation to that of department stores as a whole. Equating the sum of their weights for seven districts to that of the department store data in col. 4 – 77 – the figures are Richmond, 6.0; New York, 16.0; Boston, 8.7; Cleveland, 20.0; Chicago, 12.8; Dallas, 2.7; San Francisco, 10.5.

This means that the choice between the two basic weighting schemes outlined above, p. 81, was largely theoretical, since the actual district weights would have been not very different in either case. To learn this, however, we needed to obtain the other weights. Also, had we not wished to examine the district indexes to select a weighting scheme, we would have wished to do so to evaluate the worth of the index, a problem considered more particularly later.

[12] For 1926, when the weights of the Richmond district had to be redistributed, the weights were Richmond, 0; Philadelphia, 7; New York, 19; Boston, 7; Cleveland, 17; Chicago, 26; Dallas, 4; San Francisco, 20. The 1926 and subsequent indexes were linked in a continuous series.

[13] See the April 1928 issue of the *Federal Reserve Bulletin*, pp. 239-241.

[14] More specifically, each year the seasonally corrected data for March and April were expressed as ratios to the 5-month average of February through June. The deviations of the resulting ratios from 1.00 were then plotted against the date of Easter for the year in question. The Easter dates ranged from March 24 to April 21. April deviations were plotted with their signs reversed,

SALES OF SHOE CHAINS

The data are based on the dollar sales of six shoe chains for 1926 through 1931 and five thereafter and were obtained through the courtesy of the Federal Reserve Bank of New York and the cooperation of an additional chain store company. After our index had been completed, the Department of Commerce finished a far more comprehensive set of data on sales of shoe chains, which begins in 1935. This material provided an interesting check on our computations and was, as explained at the outset, used in preparing the final version of our shoes sales index for 1935-1941. It was not, however, joined with our chain store series, which presents a consistent picture for 1926-1940.

The six chains include one family, one women's, and four men's shoe store chain systems. In 1932 the women's shoe chain dropped out. The family shoe store chain, however, is far larger than the other companies except in the last few years of the series, when the phenomenal growth of one of the other chains relegated it to second place. The six chains sold about 15 per cent of the sales of shoe chains recorded by the 1929 census, and the five chains sold about 14 per cent of the sales of shoe chains recorded by the 1939 census. Since for the country as a whole sales of men's shoe chains were considerably smaller than those of women's chains and far smaller than those of family chains, these various sorts of outlets receive weight in our sample very different from that for the country as a whole. The big majority of the sales of men's shoe chains are included in the sample, whereas the proportion of family chains is far smaller and women's chains are not represented at all after 1932.

Construction of the Index

The aggregate dollar sales of the sample for each month were expressed as relatives of the average monthly sales in 1939. For the six years, 1926-1931, for which the sales of an additional chain were included, the 1939 base was raised to include hypothetically the additional chain. These monthly index numbers were then corrected for seasonal variation and for the shifting date of Easter by the same methods that were applied to the department store data (see pp. 81, 88).

INDEX OF SALES OF SHOE DEPARTMENTS AND SHOE CHAINS

In order to consolidate all our direct information concerning sales of shoes to consumers, we combined the indexes for shoe departments and shoe chains.

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so that the observations provided by March and April could be used in combination to determine the correction factors. The graph suggested that the deviations from normal sales, related to a shift in the date of Easter, align themselves in a succession of plateaus, rather than along a slanting line, as Easter shifts from its earliest to latest date; the size of the typical deviations changes systematically, of course, from plateau to plateau. The four groups of Easter dates within which the deviations seemed to remain more or less level were April 1 and earlier, April 4-8, April 9-13, April 16 and after. The average deviation within each period was determined by inspection, and the correction factor was obtained by adding that deviation to 1.00 for March and subtracting it from 1.00 for April. The four correction factors for March were 1.11, 1.01, .97 and .91, and for April, .89, 99, 1.03, and 109. The uncorrected index numbers for March and April for a given year were then divided by the correction factor for March and April respectively that was appropriate to the date of Easter in that year.

Combining the Two Indexes

Here, as in the case of the several district series for department stores, a weighting system is required. Here too, before a choice can be made, it is necessary to decide whether the two series ought to be regarded as samples of a single universe or whether there are significant differences between the behavior of department store and specialty chain store sales of shoes. In the first case the weighting scheme should reflect sample size; in the second, the proportion of total shoe sales in the country made by each of the two sorts of distributors.

Whatever our decision, it happens that the actual weights would be virtually the same, for the two samples are about equal, as is the proportion of total shoe sales made in 1939 by the two groups of stores that the samples represent.

TABLE A-6
SHOE SALES OF SPECIFIED DISTRIBUTORS, 1939

			CENSUS TOTALS[a]			
	REPORTING SAMPLE		*For Type of Distributor Specified in Stub*		*For Related Types of Distributors*	
TYPE OF STORE	*Mill. $*	*% of Total*	*Mill. $*	*% of Total*	*Mill. $*	*% of Total*
Department Stores	43.6	50	234.5	43	423.6[b]	43
Chain Stores	43.9	50	306.8	57	550.5[c]	57

[a] Computations based on commodity sales and other data from *Sixteenth Census of the United States, 1940, Census of Business, 1939.*

[b] Shoe sales of all apparel or general merchandise stores as well as department stores.

[c] Sales of all other shoe stores as well as chain shoe stores.

Table A-6 shows that the sample sizes would indicate 50-50 weights and the "representative" principle would weight department stores by slightly less. But the chain store sample actually includes only five organizations, and since any single organization is always subject to some special and consequently atypical influences, one would be loath to weight these five businesses more heavily than the large number of independent organizations included in the department store sample. We concluded, therefore, that 50-50 weights would roughly satisfy both weighting criteria, and these were used.

I might add that, though the coincidence that I have described obviates the need to study how the chain store data behave at this point, such an investigation is necessary to a final evaluation of our sales figures. As we see in Part II, pp. 117-119, differences between the course of shoe sales in chain and in department stores seem in line with expectations based on what we know of the differences in income receipts and sorts of shoes bought by the predominant type of customer of the two sorts of distributors.

The question whether the two series should be adjusted for trend prior to combining them was decided in the negative. It will be recalled that the department store series was judged to have a slightly downward trend relative to that which would have appeared had all department stores been included. The chain store series, however, seemed to move more or less in accordance with the census bench marks.[12] No trend correction was made for either series, since one would in any event have to be made for the combined total in order to make it representative of total retail sales of shoes. Further, trend correction of

[12] Taking 1929 as 100, the index numbers for all shoe chain stores and leased departments from the *Census of Distribution* and the National Bureau of Economic Research index of shoe chains respectively were: 1929 – 100, 100; 1933 – 61, 63; 1935 – 79, 83; 1939 – 99, 97.

the two indexes — department and chain store shoe sales — would affect primarily the relative weight of each series from year to year, and that not very materially.[16] Census bench marks for 1929 and 1939, the only basis for the correction, are inadequate, and so the enterprise did not seem worth undertaking.

Adjustment for the Number of Saturdays and Sundays in a Month

It will be useful to describe at this point a step which was actually taken after the index had been adjusted to represent total retail shoe sales and expressed in dollar form. The adjustment could quite as well have been made in the combined shoe sales index for department and chain shoe stores, and logically it belongs at that point. Indeed, since store hours for chain and department stores often vary, it would have been preferable to correct the two component series separately.

The dollar sales figures — reported by cooperating stores — on which our index is based are total sales for one month. When the month happens to have five Sundays, it has one less selling day than usual. Then, too, different days of the week typically account for more or less than one-sixth of the week's sales. Saturday especially is noted for carrying far more than its proportionate share. There is reason to believe, therefore, that months with five Saturdays would have higher sales and those with five Sundays lower ones than normal months.

After noting in the charts that month-to-month irregularities in the index seemed to conform to these presuppositions, a test was made in the following way: Each month was expressed as a ratio to a centered five-month moving average. Each of these ratios was put in one of four groups depending on whether the month had five Saturdays and five Sundays, five Saturdays and four Sundays, four Saturdays and five Sundays or four Saturdays and four Sundays. It was found that the average ratios, 1926 through 1940, were, for each of the four groups respectively, 1.015, 1.037, .959, .993.[17] The correction factors were applied by dividing each monthly sales figure by the ratio appropriate to it.

Weather Correction

The following is a description of a method of adjustment for variations in shoe sales due to abnormal weather temperatures. Though the resulting correction was not put to use on the final sales series, the method is deemed to be of sufficient interest to justify this short digression.

The adjustment is based on the hypothesis that an early onset of the year's season stimulates, and a belated one depresses, shoe buying at the turn of the season. Consequently, we expect that in the months February through June (incorporating turns of two seasons — winter to spring and spring to summer) above normal temperatures would be associated with relatively high, and below normal with relatively low, shoe buying,

[16] The 50-50 weights are realized in the base year, 1939, when both index numbers are 100 and maintained until, moving backward, 1936. But since the shoe chain store sales show some upward trend relative to department shoe sales, by 1926 the average annual weights are 56-44. This shift in weights is of course somewhat exaggerated by the failure to correct for that portion of the relative downward trend in the shoe departments index that is spurious.

[17] It is interesting to note that the corresponding ratios computed for our final sales estimates for the years 1935-1941, which were, it will be recalled, based on the department store series and Commerce data for independent and chain shoe stores, were 1.017, 1.041, .952, and .995. Considering that the first set of data are drawn from the period 1926 through 1940 and the second set from 1935 through 1941, and that they are based on data which are partially different in composition, the figures are surprisingly similar.

whereas in the months August and September, abnormal temperatures exert an opposite effect.[18]

The procedure for testing this hypothesis and obtaining the correction factors is analogous to the one used in adjusting monthly data for the changing number of Saturdays and Sundays. First, a five-month moving average (centered at the third month) was taken of dollar shoe sales corrected for seasonals and for Saturdays and Sundays. Next, percentage ratios of the original data to the five-month moving average were computed for each month. Then all the months (Februaries through Junes, Augusts, and Septembers) in which abnormal temperatures were observed were classified into two groups: those with temperatures expected to have a stimulating effect on shoe sales and those with temperatures expected to have a depressing effect, respectively. In each group the sales ratios were added up and averaged, yielding the figures 101.8 for the stimulating and 98.3 for the depressing group. After a statistical test confirmed the signficance of the difference between these two figures, they would have served as correction factors. That is, the shoe sales figure for each month in each of the two groups would have been divided by the respective group average – thus tending to eliminate the average influence of the effect of the weather.

It will be evident from the above that the difficulty which prevented us from actually using the adjustment lies in the concept of a mean national temperature. The virtual 1-1 weights for the selected regions implicit in the national average certainly do not correspond to the relative volumes of shoe sales in these regions. In other words, the proper procedure requires a decomposition of our total series into the respective "weather regions" and separate weather corrections on each component series prior to their combination. Consequently, though the work did seem to confirm the presence of an influence of abnormal weather on shoe buying, the measures described above cannot be taken as properly representing its quantitative impact.

ESTIMATES OF TOTAL SHOE SALES IN THE UNITED STATES

The combined department and chain store monthly indexes were adjusted for trend and converted to dollar figures in the following steps: (1) constructing preliminary *annual* estimates of total shoe sales; (2) converting the index of department and chain shoe sales to dollar figures of shoe sales by these outlets; (3) expressing the total annual dollar sales of shoes as a ratio to the annual sales by department and chain shoe stores, 1926-1940; (4) fitting an exponential trend line to the ratios; (5) adjusting the monthly dollar estimates of shoe sales of department and chain stores by multiplying them by monthly trend values derived from the exponential equation.

This outline indicates that we rejected the notion of basing a trend correction on bench-mark information given by the *Census of Distribution* that provided commodity

[18] "Normal" monthly temperatures were computed in the following manner: we selected 9 cities comparable in geographic coverage with our shoe sales series – Boston, New York, Richmond, Harrisburg, Cincinnati, Chicago, St. Louis, Los Angeles, and San Francisco – and averaged their mean temperatures for each month for the years 1926 through 1942, weighting both of the last two cities by two-thirds. These approximations to national temperatures were then averaged for all the Februaries, Marches, etc., to give us a normal (actually, average) temperature figure for each month of the year.

"Abnormal" temperatures were defined as those exceeding a range of ± 0.8 to ± 1.6 (depending on dispersion of the data) from the normal.

data in 1929 and 1939. We have mentioned these figures before; they are not sufficiently reliable to support this sort of superstructure.[19]

The next problem was to devise dollar estimates of all sales of shoes to final domestic consumers other than the United States government. The two sets of data – those for shoe departments and those for chain shoe stores – are all the monthly information available for the whole period. Study of these figures, undertaken in Part II of this Appendix, suggests that they are not quite adequate to give a respectable idea of cyclical or subcyclical waves in consumer shoe buying. Long-term trends in buying, on the other hand, could hardly be properly portrayed by these figures. For one thing, we have noted that the department store data have a downward trend bias. But even were the trends for both shoe departments and chain stores perfectly represented, there is no reason to suppose that the trend of shoe sales by other sorts of outlets would be similar. Clearly, then, the monthly indexes of shoe sales by department and chain stores must be adjusted to the trend of total shoe sales.

Preliminary Annual Estimates of Shoe Sales

Since we have utilized all the available information on retail shoe sales, independent estimates could be based only on information about production of shoes. Shoe output minus exports plus imports minus an increase (or plus a decrease) in inventories of finished shoes in commercial hands equals the number of shoes moving to the final consumer. The number multiplied by the appropriate price equals the value of consumer buying.

Information on monthly output of shoes has been collected by the Bureau of the Census since 1921. The reports cover between 95 and 99 per cent of the industry's output. One very rough way of adjusting for inventory change is to average output figures for two or more years. But this system is not likely to be good enough, since we know that particularly during the three years 1930-1932 change in stocks was both great and in the same direction; consequently, we must try to make a specific allowance for them. A description of this effort and the other steps in arriving at the preliminary estimates follows.

Adjustment for Net Imports and Undercoverage. The monthly figures for shoe production, compiled by the Bureau of the Census on the basis of reports by the large majority of the country's shoe manufacturers, were raised to the level of production of all shoe manufacturers by dividing each year's figure by a coverage percentage. These percentages

[19] There is considerable dissimilarity in the commodity data as obtained in 1929 and 1939. The sources of noncomparability for census data on commodity sales are:

	1929	*1939*
Basis for selection of stores.	Willingness and ability to submit the required information.	Minimum sales: $60,000, location in city of over 10,000 population.
Proportion of all stores of given type submitting commodity data.	Substantial difference in the two years. For the two years respectively, the percentages were: family clothing stores, 61, 64; men's shoe stores, 30, 83; women's shoe stores, 88, 86; family shoe stores, 42, 67; department stores (total), 84, 70; general merchandise stores (without food), 21, 60.	
Method of summarizing data.	U.S. totals are simple averages of state data for geographic divisions and simple averages of geographic divisions.	U.S. totals are total sales of given commodity and total sales of stores submitting commodity data.

were computed by comparing annual shoe output in pairs reported by the sample of producers included in the monthly reports with the annual output in pairs reported by all manufacturers at biennial censuses for the seven census years 1927-1939.[20] The corrections representing the coverage of the monthly sample were: 1926 – .94; 1927 – .94; 1928 – .95; 1929 – .96; 1930 – .975; 1931-1935 – .99; 1936 – .98; 1937-1941 – .97.[21]

Net imports were then added to domestic production. The import and export data are readily available on a pair basis from the Bureau of Foreign and Domestic Commerce.

Adjustment for Change in Inventories. The estimation of changes in inventories of finished shoes is the least satisfactory part of the entire undertaking. Shoes are held by retailers, dealers, and shoe manufacturers – the largest part by retailers. To estimate retailers' inventories, we developed bench-mark figures for 1929 and 1939 from the *Census of Distribution* and interpolated with an index of shoe stocks of a sample of department stores.[22] We describe first how the bench-mark figures were derived and second how the department store series was developed and adjusted to the census levels.

The retail census of 1929 and 1939 collected information on the stocks carried by the various types of retailers at cost on December 31. This information was also collected in the 1933 and 1935 censuses of business. The 1929 and 1939 enumerations, it will be remembered, also obtained from some stores information as to the sales of specified commodities. We have, then, information on stocks for shoe stores, general merchandise stores, and apparel stores, all of which carry shoes. We have also the ratio of shoe sales to total sales for the smaller sample of these types of stores submitting commodity data in 1929 and 1939.

In order to convert this information into estimates of shoe inventories, it was put through a series of transformations. For shoe stores the stock figures were raised to a retail level by a 32 per cent markup at retail.[23]

But the retail census seems to underestimate shoe sales by about 20 per cent;[24] on the assumption that the undercoverage ratios applied to sales of shoe stores as well as to total sales of shoes[25] and to shoe stocks as well as sales, the inventory estimates were raised to 100 per cent coverage. Next, since shoe stores sell articles other than shoes, some allow-

[20] For the three census years 1929, 1931, and 1933 the data were adjusted to include an estimate of physical output for "other footwear," for which value of production alone had been reported to the census. This was achieved by applying an estimated price of such footwear to the value figures. This price was estimated by applying the relative movement of the Bureau of Labor Statistics wholesale price index for boots and shoes to the 1927 price for "other footwear" computed from census quantity and value data.

[21] The percentages for intercensal years were obtained by straight-line interpolation, and the end years 1926 and 1940 were kept at the same level as their respective adjacent years 1927 and 1939.

[22] For an evaluation of this estimate see Part II of this Appendix, from Table A-10 through Table A-11. The only merit we can claim for the method at this point is that it was the best that could be devised. It should be kept in mind, however, that although the inventory estimates are burdened by a variety of assumptions for which there is too little basis in fact, they are in the end used only to derive the *trend* correction in the retail sales index already described.

[23] The figure is based on a study conducted by Bruce M. Fowler and William H. Shaw of the Department of Commerce and published in the *Survey of Current Business,* July 1942, p. 16, Table 3.

[24] See discussion in first half of section beginning Part II.

[25] In making our final estimate of sales of shoes in 1939 to which the sales indexes were linked, the assumption that all retail outlets underreported shoe sales by the same per cent was changed. It seemed reasonable to suppose that the fault lay more with the ratios of shoe to total sales than with the total sales reported by a given type of outlet. Accordingly, the undercoverage for general merchandise and apparel stores was assumed to be way over 20 per cent and that of shoe chain stores, way under, with only the weighted total approximating the 20 per cent figure. The causes of the undercoverage are discussed below (see note 24 above).

ance had to be made for stocks of bags, stockings, and the like. After studying the turnover ratios of these items in department stores, it was assumed that such stock would turn slightly more than twice as fast as shoes, hence roughly twice as fast as total stocks of shoe stores. On the basis of this assumption and the sales data we calculated that the ratio of other than shoe stocks to total stocks was 3.6 per cent in 1929 and 5.4 per cent in 1939.

In estimating shoe inventories of apparel and general merchandise stores, the census commodity sales data were used after raising for undercoverage. The estimates of shoes sold by these stores were converted to estimates of shoe inventories by applying a turnover ratio based on shoe departments of department stores of 2.3 for 1929 and 2.5 for 1939.[26] The estimates of shoe inventories held by shoe stores were added to those of all other stores selling shoes at retail to obtain an estimate of shoe inventories held by retailers in 1929 and 1939 – the required bench-mark figures.

The next step involved developing year-end data for 1926-1940 on shoe inventories of department stores. Five of the seven Federal Reserve district banks that compile information on sales of shoe departments of department stores also have data on stocks of departments of a good many of the stores reporting sales. These figures were formed into nationwide indexes of department store stocks of men's and boys' shoes and of women's and girls' shoes.[27] The two series were combined in seasonally corrected form with a 1-1 weight[28] and a 1939 base. This work was all done on a monthly rather than merely end-of-year basis, since the indexes would be required in this form in another connection. The December index numbers were then linked to an estimate of shoe stocks of all retailers in 1939. The resulting estimate of retailers' inventories in 1929 could then be compared with estimates obtained directly from the census of distribution for that year.

The figure derived from extrapolation using department store data was considerably lower than that derived from the census. In other words, all shoe stocks fell more between 1929 and 1939 than did the stocks of our sample of department stores. Using as a base December 31, 1939 stocks of $471.3 million in both cases, December 31, 1929 stocks were $718.7 million according to the computation based on the census and $546.7 million according to the department store index. Assuming that this difference is a function of the difference between the trend of all shoe stocks and of those held by the reporting

[26] The sales-stocks ratios used here were based on average turnover ratios reported to the Controllers Congress of the National Retail Dry Goods Association by five size groups of department stores. Since the National Retail Dry Goods Association figures refer to ratios of sales to *average* stocks for the year, we changed them to end-of-year sales-stocks ratios by using our five district department store shoe stocks indexes and information supplied us by another source to find the relationship between average and end-of-year stocks. The *average* turnover ratios for 1929 and 1939 were 2.2 and 2.3 respectively; corrected to *end-of-year* turnover ratios, they became 2.3 and 2.5 respectively.

[27] These same data were to be used for computing monthly sales-stock ratios which would be compared with changes in shoe production. Since we have an index of production of men's and of women's shoes, it was desirable to have also the sales-stock ratios separately for men's and women's shoe departments. The study of the district shoe sales indexes made possible by the seasonal adjustment of each of the sectional series indicated that this step could be omitted for other department store data. Consequently, the seasonal adjustment was made after the district shoe department data for each of the men's and women's shoes had been combined for the country as a whole into two series – stocks of men's and of women's shoe departments.

[28] The district weights developed for the sales figures were used for the stock data. Since Dallas, San Francisco, and Philadelphia did not submit usable information on department store stocks, the weights carried by these districts were distributed among the other five – New York, Boston, Richmond, Chicago, and Cleveland – for 1927-1940. In 1926, Richmond was not included and the weighted data for the four districts were linked to the 1927 figures. Men's and women's stocks were combined with a 1-1 weight, since although fewer men's than women's shoes are sold (the weights for sales were 40-60), men's shoe stocks typically turn somewhat more slowly than women's. The size of stocks therefore would be nearer equal than would sales.

sample of department stores, we apportioned it evenly over the ten-year interval, and the annual correction was also extended backward to 1925. In justification of this sort of trend adjustment one can say little more than that it was the simplest, and there was no basis for preferring an alternative.

Stocks on hand of wholesalers of shoes and other footwear were, according to the *Census of Business*, $69.4 million at the end of 1929 and $30.6 million at the end of 1939 (valued at cost).[59] Adding the average margin between wholesale cost and retail selling price – 40 per cent[60] of retail – the figures for the two years were $115.7 million and $51.1 million respectively. This amounted to an average decline over the ten-year period of $6.46 million a year. But changes in the value of wholesalers stocks could not be approximated by a straight-line interpolation and extrapolation of this annual trend decrement. Between 1929 and 1933, at least, a heavy cyclical factor operating both on prices and on pair inventories must have been superimposed on the trend decline. We estimated the impact of cyclical decrease in stocks during this period from the cyclical component of the fall in shoe department sales – it came to a 32 per cent drop from 1929 for the three years 1929-1932 – and used this figure in conjunction with the annual trend decrement of $6.46 million to allocate the total adjustment to each year.[61]

The estimates of retailers' and wholesalers' inventories are expressed in current dollars. This means that a decrease in inventories might represent in part a decline in the physical stock actually removed from the shelves and in part a decline in the average price of stock due to lower purchase price or markdown. In order to calculate retail sales by adding a decrease in inventories to current production, it is necessary to eliminate the price element in changes in stocks. This was done for wholesale and retail stocks combined, by dividing the dollar estimates by a price of year-end inventories obtained by averaging August through December prices, November and December given double weights. The weighted five-month average represents an effort roughly to approximate price tags actually carried by goods in stock on December 31. The price index used for this and other aspects of the trend adjustment is the average factory price of shoes raised by a fixed distributors' margin.[62]

The only data available on changes in manufacturers' inventories of shoes are the year-end statistics on the value of finished inventories held by shoe manufacturers for

[59] The figures combine the classifications of limited function wholesalers, manufacturers' sales branches, and agents and brokers. *Fifteenth Census of the United States, 1930, Census of Distribution*, Vol. II, *Wholesale Distribution, 1929*, p. 75; *Sixteenth Census of the United States, 1940, Census of Business*, Vol. II, *Wholesale Trade, 1939*, pp. 49, 52, 56.

[60] This figure was obtained by converting the wholesale and retail gross margins, given in the *Survey of Current Business*, July 1942, Table 3, to a percentage of retail price. The average figure for 1929 and 1939 was 40.5. But this estimate assumes that the average gross margin of all retailers is applicable to retailers who buy their merchandise from wholesalers. It seems likely that the proper figure would be slightly lower. As a token acknowledgment of this fact, 40.0 rather than 40.5 was used.

[61] The details of the computation were: we assumed that wholesale stocks dropped, between 1929 and 1932, by 32 per cent of the 1929 value, or $37.0 million, because of cyclical factors and added to this set of factors the annual trend drop of $6.46 for three years, or $19.4 million. This gave December 31, 1932, inventories of $59.3 million (115.7 – [37.0 + 19.4]), and the difference between this figure and the 1929 bench-mark figure was interpolated in equal annual increments for 1929-1932; the difference between the 1932 figure and 1939 was similarly interpolated evenly between 1932 and 1939 and projected for 1940. The basic trend increments of $6.46 million were used to extrapolate the 1929 figure back to 1926.

[62] Wholesale prices were those calculated by the Tanners' Council of America; they linked the index of wholesale price of shoes compiled by the Bureau of Labor Statistics to the average price of shoes at the factory obtained every two years by dividing the value by the number of pairs of shoes produced as reported by the biennial *Census of Manufactures*. We raised these figures each month by 41 per cent of the retail value (that is, divided them by the complement of .41 or .59).

the years 1936-1949, published in the biennial *Census of Manufactures*. Indexes relating to other stages of the production and distribution process cannot be used as substitutes, since the factors determining inventory change differ at each stage and consequently the pattern of change may be quite different.

The alternative we selected was to apply a typical turnover ratio to production figures.[30] It indicates how one of many influences that bear on stocks – physical requirements of changing production schedules – might have operated could it have been segregated. Actually, my later work in this industry and that by Abramovitz for manufacturing industries as a whole suggested that shoe inventories of manufacturers would be more likely to have an inverse association with output rather than the positive association implied by assumed constant turnover rate. The impact of the possible error from the mistaken judgment underlying these calculations on the estimates of shoe sales is fortunately not large, as will be seen from discussion on pages 107-110, 121.

The estimates of the number of pairs of finished shoes carried by producers were added to those carried by wholesalers and retailers. The change in inventories in all hands from one year-end to the next was then computed. An increase in inventories was subtracted and a decrease added to the number of pairs of shoes produced for domestic consumption during the year to obtain the estimate of retail sales of shoes during the year. These figures were then converted to dollar form by multiplying by the Tanners' Council factory price of shoes raised to a retail level by a 41 per cent markup at retail. These, then, are the preliminary annual estimates of shoe sales.

Monthly Dollar Shoe Sales of Department and Chain Stores. At the second step[31] 1939 census materials were used for the construction of an estimate of shoe sales (in dollars) by department stores and shoe chains. The estimate served as a basis for conversion of the annual index numbers of the combined department and chain store series into a series of dollar volume. The derivation of the base year figure involved the use of 1939 census data by types of outlets and by commodities for chain stores, leased departments, and department stores. It also involved uneasy guesses concerning probable undercoverage of the census data. For both chain stores and department stores it was assumed that the percentage undercoverage was very considerably less than for all sales of shoes.

Trend Correction. In order to see how the trend of the sample of department and chain store sales differs from that of all shoe sales, first, department and chain store shoe sales were subtracted from total shoe sales, and, second, total shoe sales were divided by the department-chain shoe sales. The two sets of figures – absolute differences and ratios – were plotted against a time scale and compared visually. The ratios were selected as the better mode of expression since they considerably lessened the deep cyclical movement present in the original series and in their differences. The trend of the ratios could therefore be more adequately determined than that of the differences.

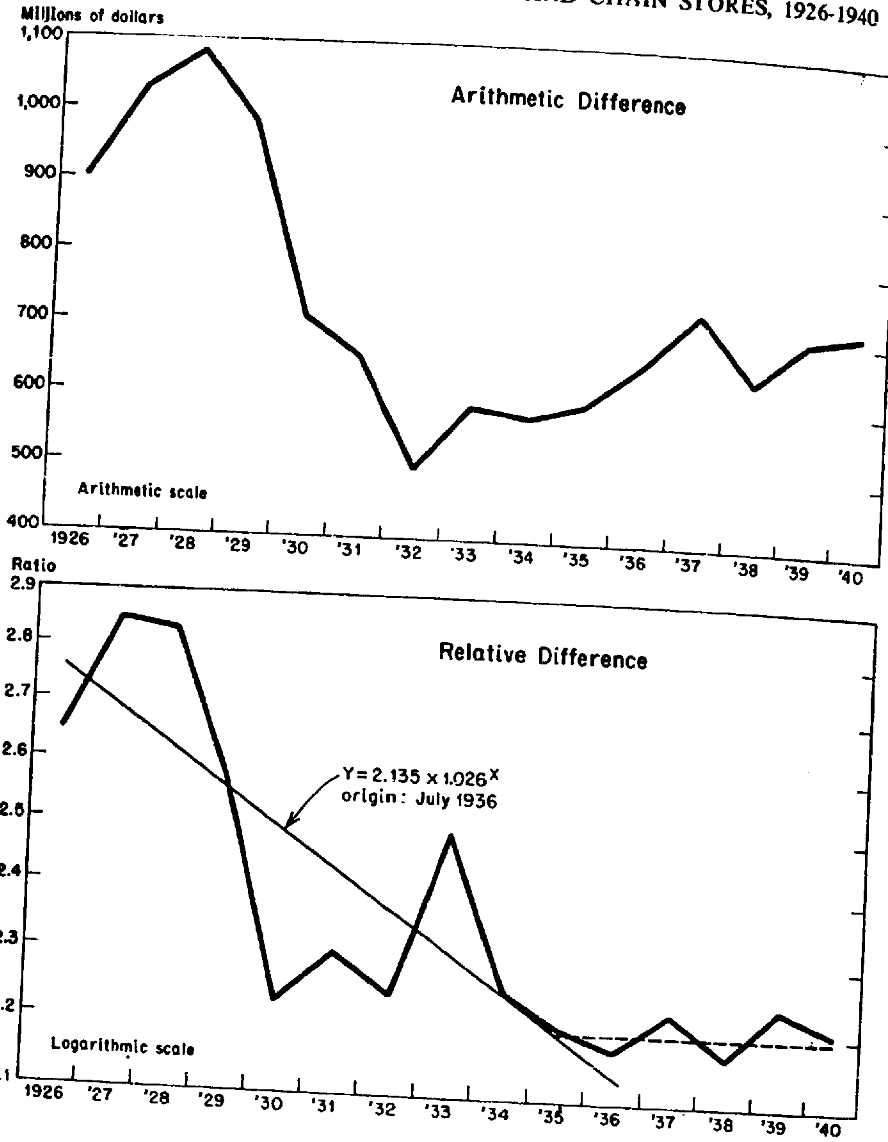
[30] The ratio was based on the biennial *Census of Manufactures* for 1936-1939. However, several adjustments had to be made on the data before they could be used to compute the typical turnover ratio: (1) Adjustment for undercoverage using a ratio which the value of products for the firms reporting inventories bore to the value of products of all leather footwear establishments reporting to the census; (2) raising the basis of inventory valuation from cost to selling price using a markup of 13 per cent, a figure obtained by consolidating information from a number of sources; (3) transforming value into pair data by means of a price deflation that endeavored to reproduce a cost or market, whichever is lower, principle of cost accounting.

The pair inventory figures were then compared with the pair production data. For each of the four years 1936-1939 the ratio of production to year-end inventories was computed. The figures were 14.0, 12.3, 20.7, 21.4; they averaged 17.1. These turnover ratios are both too high and too variable for comfort. Nevertheless, there seemed nothing to do but to proceed with the plan of applying the average ratio to annual production, 1925-1940, including for the sake of consistency the four years when actual year-end inventory data were available.

[31] See pp. 92-93 above.

CHART A-2

RELATIONSHIP BETWEEN PRELIMINARY ESTIMATE OF TOTAL SHOE SALES AND SHOE SALES OF DEPARTMENT AND CHAIN STORES, 1926-1940



As Chart A-2 indicates, the trend was downward until about 1936 and then evaporated. After experimenting with freehand curves, straight lines, and exponential curves, the latter method was adopted. The equation $y = ab^x$, which may be actually applied as a straight-line fit to the logarithms of the ratio, seemed to suit the material slightly better than the other forms. In addition, it was faintly preferable on logical grounds.*

The equation was fitted to the annual ratios for 1926-1935, since the trend disappeared

* The trend in the ratio of total shoe sales to department-chain shoe sales would presumably result from some sort of differential growth in the two series. Although the growth of the two sales aggregates would not need to conform to some simple mathematical principle, long-term growth frequently does. An arithmetic straight-line fit to the ratios of the two sets of figures would not be consistent with any simple growth principle such as uniform absolute or percentage increments for both series. An exponential curve fit to the ratios would be consistent with uniform percentage growth for both of the series, although it would also of course be consistent with other growth principles.

thereafter. A smooth transition was effected between the two periods by moderating the rate of decline of the first period from the ninth month prior to the month of intersection of the two trend lines – July 1935 – to the ninth month after the month of intersection, so that from September 1934 the trend values had gradually diminishing rates of decline until April 1936, after which they were zero.

The estimates of shoe sales by department and chain stores were then multiplied by the trend ratios to obtain monthly estimates of total shoe sales.

THE SECOND SERIES FOR 1935-1941

In 1943 new statistics became available. They had been prepared by the Current Business Analysis Unit of the Department of Commerce from monthly information starting in 1935, concerning sales of a goodly number of retail stores.[*]

The New Data

The independent store sample was obtained from between 60 and 70 stores in 1935 and increased to between 400 and 500 in 1939. About 25 shoe chain organizations supplied information during the first few years, whereas between 40 and 50 are included in the 1941 and 1942 sample. An index of sales of each of the two types of shoe outlets, obtained by averaging the change of an identical sample from the previous month and from the same month of the previous year, is put on a dollar basis and adjusted for trend by using the 1935 and 1939 *Censuses of Distribution* in conjunction with sales tax data from a number of states.

These series have the advantage, in the first place, of giving direct representation to sales of independent shoe stores. In the second place, the sample of chain stores is far larger than ours. In the third place, our series for chain stores cannot be continued after 1940. In view of these significant contributions it seemed desirable to utilize this new material for the latter part of our series.

The Construction of the Estimates

The plan of procedure was simple enough. The Commerce data was put on a base representing sales of independent and chain shoe stores and leased departments. Our shoe department index was put on a base representing sales of department, general, and apparel stores, etc. The sum of these two series produce monthly estimates of total sales of shoes.

The Department of Commerce data included independent and chain shoe stores and leased departments. Sales of such outlets totaled $617 million in 1939. This figure needed to be reduced by sales other than shoes by this type of outlet and increased to allow for census undercoverage. These operations performed on the 1939 census data produced a figure of $645.3 million. Accordingly, the Department of Commerce data, after having been adjusted for seasonal variation, were multiplied by the ratio of 645.3/617.0. They were then corrected for the changing date of Easter in the manner previously described.

Since we estimated that all sales of shoes to final consumers totaled $1,263.1 million in 1939, sales of outlets other than shoe stores were $1,263.1 minus 645.3, or $617.8. This figure was used as the base of the department store index in 1939.

The two sets of data for each month were then added to obtain the new estimates of sales of shoes for 1935-1941. A correction for the varying number of Saturdays and

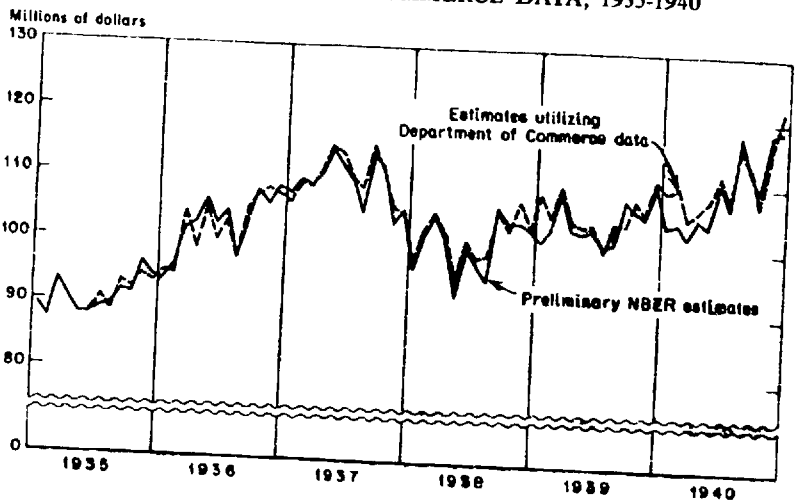
[*] Some of the data were published in the November 1943 *Survey of Current Business*, p. 12. We also obtained some directly from the Department.

Sundays in a month was calculated and applied in a manner similar to that described above, p. 91.

Splicing the New and Old Series

The new and old series were spliced together in 1935. Since the June 1935 figures happened to be identical, a simple average of the two sets of estimates was struck for June through December 1935. This splicing provided a smooth transition to the new data, which were used alone from 1936 on; it also served to reinforce the Department of Commerce series during the last half of 1935 when the sample on which it was based was relatively small.

CHART A-3
ESTIMATES OF SHOE SALES BASED ON DEPARTMENT AND CHAIN STORE DATA WITH TREND CORRECTION, COMPARED TO ESTIMATES UTILIZING DEPARTMENT OF COMMERCE DATA, 1935-1940



The first and second sets of estimates for 1935-1940 are plotted in Chart A-3. Although the two series have about one-half of their total represented by the same set of data – shoe departments of department stores – the similarity is striking. This impression survives a comparison of the two series with the common element dropped out, as shown by the two sets of chain store indexes of shoe sales, 1935-1940, in Chart A-6, below.

PART II
EVALUATION OF THE FINAL ESTIMATES

In the first part of the Appendix we have described the mechanics of the construction of estimates of total shoe sales in the United States. At each point, attention was centered on decisions that had to be made with respect to the choices of data and methodological steps in the estimating procedure.

In Part II an attempt is made to evaluate the reliability of the final results. Needless to say, we cannot aim at exact measurement of margins of error. At best, we hope to arrive at some notion of how good our estimates are for the main purposes they are intended to serve, such as recording the general level, the trend movement, the timing and amplitude of cyclical and subcyclical fluctuations in shoe sales.

THE BASE-YEAR FIGURE

The general level of the estimates is determined by the base-year figure in 1939. This figure for total sales of shoes, it will be recalled, is primarily predicated on shoe production adjusted for exports, imports, and inventory change during the year and converted to a dollar figure – $1,263.1 million.

Estimates Based on Sales of Retail Stores

The first step in appraising this figure was to square it with an independent, however rough, estimate based on the census of retail trade. By using the census data on shoe sales as a percentage of sales of stores reporting commodity breakdowns and applying these percentages to sales of all stores of each type, we arrived at an estimate of shoe sales which totals $974.1 million. Table A-7 outlines the computation. This figure is $289 million less than the estimate based on the *Census of Manufactures*. How can this discrepancy be explained?

Four sorts of factors might be expected to contribute to inadequacy of the figure based on retail data: (1) Shoes may be sold by stores not reporting commodity breakdowns that include the category "footwear"; (2) shoes may move to the consumer without passing through retail stores; (3) total sales of various sorts of stores as reported to the retail census may be too low; (4) the ratio for various types of stores of shoe sales to total sales yielded by the commodity data may be too small.

1. In Table A-8 certain supplementary calculations take account of the first point – stores not reporting shoe sales which nevertheless do sell them. The largest item in the total is an estimate of shoe sales by general stores selling food, for which sales of shoes are not separately listed in the commodity tabulations. Moreover, it is necessary to include shoe sales by stores classified in this census as grocery and food stores of various sorts. Also, the sale of rubber footwear needs to be estimated and subtracted from the total. Table A-8 provides the details. This calculation reduces the discrepancy between shoe sales as calculated from manufacturing and retail sales data to $171.7 million. Needless to say, the supplementary estimates are very wobbly indeed.

2. As to shoes that do not pass through retail stores, they would, in the first place, include shoes imported directly by tourists for their own use. It is difficult to think of any

TABLE A-7

CALCULATION OF SHOE SALES OF RETAIL STORES, 1939 CENSUS

(dollar figures in thousands)

TYPE OF STORE	% OF SHOE SALES TO TOTAL SALES	TOTAL SALES	SHOE SALES (*cols. 1* × *2*)
Department stores	5.9	$3,974,998	$234,525
Dry goods stores	4.0	229,286	9,171
General merchandise stores:			
With food	8.2	112,108	9,193
Without food	15.8	371,814	58,747
Variety stores	1.1	902,833	9,931
Men's and boys' clothing	4.9	664,511	32,561
Family clothing	10.1	429,454	43,375
Women's ready-to-wear	2.4	1,009,494	24,228
Men's-boys' furnishings	1.7	108,801	1,850
Men's shoe stores	92.4	78,770	72,783
Women's shoe stores	84.9	154,138	130,863
Family shoe stores	90.3	384,156	346,893
Total			$974,120

way in which the size of this item may be determined, but it seems most unlikely that it was at all substantial in 1939. In the second place, shoes sold directly by wholesalers and manufacturers to industrial users or household consumers seem to have totaled $17.5 million in 1939.[illegible] These shoes, though purchased by their final users, would not have passed through retail stores.

3. Underreporting of total retail sales is occasioned by the fact that enumerators who call after the close of the year cannot obtain information concerning the sales of stores that have closed within the year. On the basis of a tabulation in the 1933 *Census of American Business,* George Stigler estimated, on what he believed to be a conservative basis, the extent to which the demise of stores caused the 1933 census tabulation to understate total retail sales.[illegible] Applying the ratio of underestimation of total sales as calculated by Stigler for various sorts of stores to the shoes sales of those stores, we obtain a figure for 1939 of $34.5 million shoe sales that were presumably not included in the estimate based on the census because the stores closed before enumerators called. This figure is little more than a careful guess, since it takes for granted the various assumptions upon which Stigler's figures are based as well as certain additional ones: that the 1933 ratios are applicable to 1939 and that total store ratios are applicable to shoe sales.

These two factors, sales by manufacturers and wholesalers to final users and absence of statistics on sales of stores closing during the census year, may, then, account for perhaps $52.0 million of the remaining discrepancy of $171.7 million between sales as computed from manufacturing and sales data, leaving a residual discrepancy of $119.7.

4. This difference may be explained in part or wholly by the fact that the ratio of shoe sales to total sales for several types of stores may be systematically too low. W. C. Truppner, Chief, Business Division, Bureau of the Census writes: "The care with which the breakdown of commodity sales is made by the respondent varies, of course, from store to store, but there seems to be a tendency to understate secondary lines and to overstate

[illegible] *Census of Business,* Vol. V, *Distribution of Manufacturers' Sales, 1939,* p. 119.

[illegible] Unpublished study on retail trade.

TABLE A-8
SUPPLEMENTARY ESTIMATES OF SHOE SALES OF RETAIL STORES, 1939
(dollar figures in thousands)

TYPE OF STORE	ESTIMATED % OF SHOE SALES TO TOTAL SALES	TOTAL SALES	ESTIMATED SHOE SALES (cols. 1 × 2)	
Infants wear stores	.8[a]	$ 13,436	$ 108	
Variety stores with less than 20,000 sales	1.1[b]	73,968	814	
Sporting goods stores	5.4[c]	56,914	3,073	
Other apparel stores	5.4[c]	36,448	1,968	
General stores with food and grocery stores probably carrying shoes	4.5[d]	2,052,714[e]	92,372	
Total			$ 98,335	
add total from Table A-7			974,120	$1,072,455
subtract estimated sales of rubber footwear by other than shoe stores			29,019[f]	
Total sales of leather footwear				1,043,436
add estimates of other sales of shoes:				
¼ value of infants footwear and moccasins and slippers			21,907[g]	
⅔ value of beach sandals			26,090[h]	1,091,433

[a] Ratio from commodity sales tabulation, *Sixteenth Census of the United States, 1940, Census of Business,* Vol. I, *Retail Trade, 1939,* Table 18.

[b] The shoe ratio for variety stores with sales of over $20,000 was applied to those with sales of less than $20,000.

[c] Shoe sales as percentage of total sales of other than shoe stores.

[d] Shoe sales as percentage of total sales of general stores in 1929. From special report, *Apparel Retailing* (*Fifteenth Census of the United States, 1930, Census of Distribution, 1930. Retail Distribution* [Trade Series]), p. 29; p. 74, Table 7C.

[e] Sales of general stores in 1929, $2,570,744, reduced by .81855, the ratio that sales of food plus general stores in 1939, $10,975,309,000, bore to sales of food plus general stores in 1929, $13,408,165,000. This procedure was followed because of the statement contained in a letter from W. C. Truppner, Chief, Business Division, Bureau of the Census, that many stores classified as general stores in 1929 were classified as food stores in 1939.

[f] Value of product of rubber footwear expressed as a percentage of value of product of rubber and leather footwear is 5.56. Since rubber footwear is explicitly excluded in shoe sales of shoe stores but not in shoe sales of all other stores, this percentage figure was multiplied by shoe sales of other than shoe stores ($1,072,455,000, above, minus sales of shoe stores per Table A-7, $550,539,000 equals $521,916,000 times 5.56 equals $29,019).

[g] Value of product of infants footwear, $17,600,000, plus value of product of slippers and moccasins, $34,100,000 equals $51,700,000. One-quarter of the total was judged to have been sold in parts of stores where they would not be included in shoe sales. This amount of $12,925 was raised by 41 per cent at retail (or divided by 59) to convert value at factory to retail value.

[h] Value of beach sandals was $3,700,000 according to the census of manufactures in 1939. It was assumed that two-thirds of this total would not be included in the shoe sales estimated above. The figure was raised to a retail price in the same manner as described in note g.

the primary lines as well as 'other sales'."[m] Many stores which gave commodity breakdowns but did not report any sales of shoes and rubber footwear might nevertheless have sold footwear and reported such sales under the head of "women's apparel," "accessories,"

[m] Letter of February 13, 1945. In connection with this letter and several others, from which many of the ideas expressed in this section were obtained, I am deeply indebted to Mr. Truppner for highly effective and very gracious assistance.

or "other sales." When, therefore, the dollar sales of shoes and other footwear by stores reporting commodity breakdowns is expressed as a percentage of total sales of these stores, the resulting figure may be too low. This tendency would probably not be present in the case of shoe sales in specialty shoe stores and department stores, but it could nevertheless account for a substantial amount of understatement. The sales of stores other than shoe and department stores for which commodity ratios were available totaled $3,828.3 million; shoe sales averaged 4.9 per cent of the total. If the proper ratio had been one percentage point higher, the estimate of shoe sales would have been raised by about $38 million. Actually, there is no way of telling what the proper correction would be.

The meager conclusion to be drawn from the confrontation of our estimate based on production data with the one based on census retail data is that no inconsistency is evident. The outstanding characteristic of the supplementary estimates is their high degree of inaccuracy. These computations would be more reliable for commodities that represent a larger proportion of the sales of a more limited variety of stores, particularly when these stores tended to be large or located in central shopping areas.

In the case of shoes the margins of error that accompany the commodity data are probably wider than those associated with sales of manufacturing establishments and the adjustment for net imports, inventory change, and average price. We proceed, then, to a direct appraisal of the estimate based on production figures.

Estimates Based on Production

The base-year figure $1,263.1 million was obtained in the following way: production in 1939 adjusted for undercoverage was 437.4 million pairs. This plus net imports of 2.0 million pairs minus a decrease in inventories of 3.8 million pairs – as suggested by our preliminary estimates – equals 443.2 million pairs, which when multiplied by the average retail price of $2.85 is $1,263.1 million.

The record of production and net imports ought to be reasonably reliable. The figure for inventory change, however, is altogether untrustworthy. One way – a poor one but the best at our disposal – of estimating the probable limits within which the true figure for inventory change during 1939 would lie is to inspect the estimates of change that resulted from some experimentation with various methods of estimating retail sales of shoes. The range of the estimates of inventory change lies between –4.2 million pairs and +11.0 million pairs.[40] These estimates yield sales values of $1,264.3 million and $1,221.0 million respectively.

A second point at which the base figure is highly vulnerable is the estimate of average price – $2.85. The figure is the Tanners' Council's average factory price of shoes raised by a 41 per cent markup at retail. The factory price is based primarily on the average

[40] The inventory change figures given in the following table are in all cases estimated retail sales minus production of shoes as reported in the census. These "secondary" estimates of retail sales are in all cases obtained by adjusting the trend of the department-chain shoe sales index to that of preliminary estimates based on production statistics. The methods of arriving at the "preliminary" estimates and of making the trend adjustments differ, as indicated in the stub:

	PRELIMINARY	SECONDARY
T.C.–NBER price data		
Exponential trend fit	–3.8	+2.5
Exponential trend fit through 1935 and Commerce data thereafter		–4.2
Freehand trend fit		+4.2
NICB–NBER price data		
Exponential trend fit	+8.0	+11.0

TABLE A-9

COMPUTATION OF SPREAD BETWEEN FACTORY AND RETAIL PRICE, 1939

(dollar figures in thousands)

CHANNEL OF DISTRIBUTION	VALUE AT FACTORY	VALUE AFTER TRANSPORTATION TO 1ST DESTINATION, 3.5% OF VALUE AT DESTINATION[d]	VALUE AFTER ADDING WHOLESALER'S GROSS MARGIN: *Margin as % of Sales*	VALUE AFTER ADDING WHOLESALER'S GROSS MARGIN: *Total Value*	COST TO FINAL CONSUMER: *Retail Margin as % of Sales*	COST TO FINAL CONSUMER: *Total Value*
To manufacturer's owned and operated outlets:						
Wholesale branch for distribution to retailers	$153,638[a]	$159,210	14.0[e]	$185,128	33[h]	$ 276,310
Wholesale branch for sale to industrial user and final consumer	1,685[a]	1,746	14.0[e]	2,030	0	2,030
Retail store	30,656[b]	31,768	0	31,768	33[h]	47,415
To other business concerns in U.S. for resale:						
Wholesalers and jobbers for resale to retailers	135,336[c]	140,245	15.8[f]	166,562	33	248,600
Wholesalers and jobbers for resale to industrial users and final consumers	989[c]	1,025	15.8[f]	1,217	0	1,217
Retailers including chains	383,174[b]	397,072	0	397,072	35[i]	610,880
To users and consumers:						
Industrial users	6,811[b]	7,058	8.2[g]	7,688	0	7,688
Consumers at retail	1,210[b]	1,254	17.0	1,511	0	1.511
Total	$713,499	$739,378		$792,976		$1,195,651
Weighted average gross margin at each stage		3.5%	6.8		33.7	
Weighted gross margin between value at factory and price to consumer						40.3%

See page 106 for notes.

NOTES TO TABLE A-9

[a] Total sales of manufacturers to wholesale branches were $155,323,000 (*Sixteenth Census of the United States, 1940, Census of Business*, Vol. V, *Distribution of Manufacturers' Sales, 1939*, p. 119). Sales of manufacturers to wholesale branches for sale to industrial user and final consumer were $1,685,000 (*ibid.*, Vol. II, *Wholesale Trade, 1939*, pp. 122 ff.).

[b] *Ibid.*, Vol. V, p. 119.

[c] Total sales of manufacturers to wholesalers and jobbers were $136,325,000 (*ibid.*, p. 119). Sales of manufacturers to wholesalers and jobbers for resale to industrial users and final consumers were $989,000 (*ibid.*, Vol II, pp. 122 ff.).

[d] Bruce M. Fowler and William H. Shaw, "Distributive Costs of Consumption Commodities," *Survey of Current Business*, July 1942, p. 16, Table 3.

[e] Average expense of shoe manufacturers' sales branches as percentage of sales is 12.2 (*Census of Business, 1939*, Vol. II, p. 49) plus profits of 1.8 equals 14.0 per cent of sales.

[f] Average expense of service and limited function shoe wholesalers is 12.8 (*ibid.*) plus salaries of 349 proprietors at $3,500 per year equals 13.8 per cent of sales, plus 2 per cent profits.

[g] Expense of chain store warehouses as reported in the *Fifteenth Census of the United States, 1930*: 6.7 per cent of sales plus 1.5 per cent profit.

[h] The ratio of salary expense to sales was about the same in the 1935 and 1939 retail census tabulations. We therefore used the 1935 total expense ratio for shoe retailers of 27.9. In 1929, salaries of proprietors, calculated at average full-time employee rate, were 3.5 per cent of sales. But this is a very low rate, and the percentage figure was accordingly raised to 5.0 per cent (salaries of owners and officers for 300 small shoe stores surveyed by Dun and Bradstreet in 1939 ranged from 16.1 for smallest store group in the smallest cities to 6.8 for the largest stores in the largest city size group [*Standard Ratios for Retailing*, Dun & Bradstreet, p. 71]). Profits of 2 per cent were added to bring the gross margin percentage to slightly under 35.0 per cent of sales. To allow for possible overstatement of expenses and profits the figure was cut to 33 per cent. (Dun and Bradstreet reported an average gross margin of 32.9 for the 300 small stores surveyed.)

[i] In the case of retailers dealing directly with manufacturers, total costs are probably somewhat higher than for smaller stores. Typical gross margins for shoe departments of department stores were 37.7 as calculated by the Controllers Congress of the National Retail Dry Goods Association. Accordingly the figure of 35.0 was used.

price of shoes produced in 1939 as revealed by the biennial census data on quantities produced and value of output. It changes slightly depending on just how the volume and value data detailed in the census are matched, but reasonable variations are very small indeed – a cent or two. Another source of error results from using output prices to describe retail prices *for the same period;* presumably shoes are sold at retail quite a few months after they are produced, on the average, and this lag ought to be incorporated in the calculation. But though when prices were changing rapidly, considerable error could perhaps result from failure to make this allowance, this was not the case in 1939.[41]

A third possible source of error lies in the figure of 41 per cent – the spread between price reported by the manufacturer and price paid by the consumer, expressed as a percentage of the latter. This figure seems to be generally used in the trade. We have endeavored to check it independently as well as to arrive at a judgment as to the probable limits within which the true figure for 1939 might lie. The procedure consisted of estimating transportation costs, wholesalers', or retailers' margins and applying them to the proportion of total production passing through the various channels of trade. The gross margin percentages were arrived at after examining a great many sources of information. One set of computations is reproduced in Table A-9.

[41] The quantitative importance of this error can be appraised by making alternative assumptions that ought to bound the area of reality. Let us assume that the shoes sold in January 1939 were purchased during September, October, November, and December 1938 and January 1939, twice as much in December and January as during the other three months. A 41 per cent markup at retail added to factory prices, averaged and weighted in this way for each month of 1939, would produce an average price of $2.82 for the year instead of the $2.85 that represents current prices only.

The table yields a spread between factory and retail price of 40.3 per cent of retail price. To obtain the maximum and minimum reasonable range, the gross margin percentages for the various operations were varied in accordance first with liberal, then with niggardly assumptions, and the process of computation exhibited in the table repeated. This procedure suggested that the total spread in 1939 was probably not over 42 nor under 39 per cent of retail price. Combining this range with the one resulting from the use of current or lagged wholesale prices, we get a maximum average price of \$2.90 and a minimum of \$2.72. Since the calculation of inventory change will not – except by chance – be affected by the absolute level of prices in 1939, it would be possible for differences due to inventory and price to act in a cumulative manner. In Table A-10, therefore, the maximum divergences are combined to produce a cumulative result reflecting a range of error due to imperfections in the calculation of inventory change and average price. Averaging the maximum plus and minus errors, the calculations suggest that our base figure might err by ±5 per cent, or about ±\$60 million.

TABLE A-10
RANGE OF ESTIMATES FOR 1939 REFLECTING FALLIBILITY OF INVENTORY AND PRICE DATA

ESTIMATE	PRODUCTION ADJUSTED FOR UNDERCOVERAGE AND NET IMPORTS (millions of pairs)	INVENTORY CHANGE (millions of pairs)	ESTIMATED PAIR SALES (cols. 1–2) (millions of pairs)	AVERAGE PRICE (\$)	ESTIMATED DOLLAR SALES (mill. \$)	PRELIMINARY MINUS EXTREME ESTIMATE (mill. \$)	PRELIMINARY MINUS EXTREME ESTIMATE % of Preliminary Estimate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Preliminary estimate	439.4	—3.8	443.2	\$2.85	\$1,263.1		
Estimate of inventory or price yielding highest retail sales figure	439.4	—4.2	443.6	2.90	1,286.4	—\$23.3	—1.8
Estimate of inventory or price yielding lowest retail sales figure	439.4	+11.0	428.4	2.72	1,165.2	+97.9	+7.8

TREND

The trend correction in effect uses a statistical technique to raise the level of the department-chain index to that of a preliminary estimate of total retail sales. The value of the procedure therefore lies in the accuracy with which change in total sales is depicted and the adequacy of the trend correction.

First, as to the preliminary estimates, we assume that the data on exports and imports and the biennial census figures are substantially correct and that, therefore, the monthly shoe production census, raised to the biennial census level, also gives a substantially accurate picture of change in shoes produced or imported for domestic consumption. The adequacy of the preliminary sales figures rests, therefore, on the calculation of inventory change and average price.

The estimates of change in inventories of finished shoes in all commercial hands are

Table A-11

ESTIMATES OF CHANGE IN SHOE INVENTORIES, 1926-1940

YEAR	USED IN DERIVING PRELIMINARY ESTIMATES OF SALES FROM PRODUCTION DATA (1)	OBTAINED BY WEIGHTING SAMPLE DATA ON INVENTORIES OF RETAILERS AND WHOLESALERS (2)	OBTAINED BY SUBTRACTING FINAL ESTIMATES OF SHOE SALES FROM SHOE PRODUCTION (3)	COL. 1 AS % OF SALES ESTIMATES (4)	COL. 2 AS % OF SALES ESTIMATES (5)	COL. 3 AS % OF SALES ESTIMATES (6)
	(millions of pairs)					
1926	+5.6		−8.6	1.67		2.45
1927	−5.1	+6.4	+16.9	1.38	1.85	4.88
1928	−3.0	+11.8	+22.9	0.82	3.48	6.75
1929	+10.2	+7.8	+11.1	2.76	2.12	3.01
1930	−3.5	−5.4	−40.9	1.10	1.52	11.53
1931	−11.3	−25.3	−29.9	3.39	7.20	8.51
1932	+7.3	−12.2	−9.0	2.32	3.68	2.72
1933	−12.2	−1.3	+14.7	3.31	0.38	4.29
1934	+7.8	+4.9	+7.9	2.19	1.37	2.21
1935	+4.4	+19.0	+4.1	1.14	4.91	1.06
1936	+10.7	+12.6	+7.2	2.56	2.98	1.70
1937	−7.4	−6.1	−5.3	1.70	1.41	1.23
1938	−4.9	−7.7	−15.6	1.19	1.82	3.69
1939	−3.8	+6.7	−4.2	0.86	1.50	0.94
1940	−10.2	+0.9	−17.7	2.38	0.20	4.06
Average annual change, ignoring signs	7.2	9.1	14.4	1.92	2.46	3.93

very poor indeed, since they rely on inadequate information. For manufacturers the estimates are in all probability quite wrong even as to direction of change.[45] Hindsight also informs us that it was a mistake to interpolate changes in wholesalers' inventories between bench-mark years by an index of retailers' stocks. Information on stock from a small sample of shoe wholesalers, which we obtained later, indicated that changes in wholesalers' stocks typically do not parallel those of retailers. It is the stocks of retailers that dominate our preliminary estimates. Their year-to-year changes, ignoring signs, average 6.5 million pairs for the period 1926-1940. The comparable figure for changes in stocks of wholesalers and manufacturers combined average 1.4 million pairs. Unfortunately, even retailers' stocks, based as they are on shoe stocks of a sample of department stores which may not be typical of total shoe stocks of all retailers, are far from adequate.

Another source of error in the inventory estimates derives from the need to convert dollar to pair figures. This operation suffers not only from inadequacy of the price figures but, in addition, from their application to inventories, in view of the vagaries of cost or market accounting.

Some notion of the possible magnitude of error can be obtained by comparing the estimates of change in stocks that we used in the adjustment of the production figures with those obtained by a later independent estimate (col. 2 of Table A-11) as well as with those obtained by subtracting our final estimates of retail sales from production destined for domestic consumption. Especially in the first half of the period, figures vary widely. The only consolation is that they represent a small proportion of the total preliminary sales figures, so that their inadequacy is not fatal to the basic calculation.

Preliminary sales estimates based on shoe production originally reported in pairs must be converted to dollars before their trend relation to the shoe sales index can be studied. Consequently, the price statistics afford another source of error. Table A-12 certainly does not show the boundaries of the error, but it does at least show its size under two alternative procedures — first, the one we used in which the price reflator was wholesale prices of shoes raised to a retail level and, second, the one in which it was based on retailers' reports of shoe prices. In both cases the bench-mark figures presuppose an unchanging margin over factory price of 41 per cent, and this is not likely to be the case. Realized margins probably fell during the severe depression of the thirties. They undoubtedly rose in 1933 under the National Industrial Recovery Act. Furthermore, and probably most important of all, they may well have had a slightly upward trend for the whole period.[46]

[45] See p. 97, *supra*.

[46] A comparison of the Bureau of Labor Statistics wholesale price index for shoes with the National Industrial Conference Board retail shoe price index shows a tendency for retail prices to edge downward relative to wholesale prices, but little reliance can be placed on differential trend growth of data of this sort. The Retail Census and the Controllers Congress of the National Retail Dry Goods Association provide testimony on the opposite side, suggesting that retailers' gross margins may have widened during the thirties. The census shows total expenses per $100 of sales, excluding the services of proprietors, $1 or $2 higher in 1935 than in 1929 for department stores, family clothing stores, and shoe stores. Since payrolls per $100 of sales continued to gain very slightly between 1935 and 1939, there is no reason to assume a reversal of the 1929-1935 change in total expense. Information concerning profits as well as total expense is provided in the statistics on operating results of department and specialty stores submitted to the Graduate School of Business Administration at Harvard University. It suggests that gross margins of department stores likewise increased somewhat between 1929 and 1939, whereas the departmental breakdowns obtained by the Controllers Congress suggest that the gross margins for shoe departments of department stores shared in the general trend. According to computations by the Department of Commerce, the spread between factory and retail prices for all semidurable commodities was 37.3 in 1929 and 40.6 in 1939. (Bruce M. Fowler and William H. Shaw, "Distributive Costs of Consumption Commodities," *Survey of Current Business*, July 1942, pp. 12 ff.)

But, of course, gross margins of each distributor could rise and still the spread between manu-

(Continued on page 110)

TABLE A-12
COMPARISON OF TWO ESTIMATES OF AVERAGE RETAIL PRICE OF SHOES, 1926-1940

YEAR	T.C.-NBER RETAIL PRICE OF SHOES (1)	NICB-NBER RETAIL PRICE OF SHOES (2)	DIFFERENCE (COLS. 1 — 2) $ (3)	% of Col. 1 (4)
1926	$4.32	$4.43	—$.11	—2.55
1927	4.31	4.30	+.01	+.23
1928	4.59	4.34	+.25	+5.45
1929	4.37	4.32	+.05	+1.14
1930	4.05	3.99	+.06	+1.48
1931	3.47	3.45	+.02	+.58
1932	2.86	2.84	+.02	+.70
1933	2.66	2.64	+.02	+.75
1934	2.90	2.88	+.02	+.69
1935	2.81	2.80	+.01	+.36
1936	2.90	2.85	+.05	+1.72
1937	3.05	3.04	+.01	+.33
1938	2.88	2.97	—.09	—3.13
1939	2.85	2.86	—.01	—.35
1940	3.05	2.91	+.14	—4.59
Average % difference, ignoring signs:				
Census (odd) years				.53
Intercensal years				2.54

To the sources that might distort the preliminary estimates of shoe sales we must add the difficulties of trend fitting itself. Chart A-4 shows the ratios of the preliminary estimates of shoe sales (adjusted shoe production) to the annual sums of monthly estimates of shoe sales by department and shoe chain stores. In the top half of the chart the figures are plotted on a logarithmic vertical scale and the two exponential straight lines are shown – the downward sloping one to 1935 while chains were growing rapidly, and the horizontal one thereafter. In the lower half of the chart the same figures are plotted on arithmetic scales with one freehand curve fitted to the whole span of years. We used the first of the two schemes, yet obviously it involves a large, irreducible component of personal judgment.

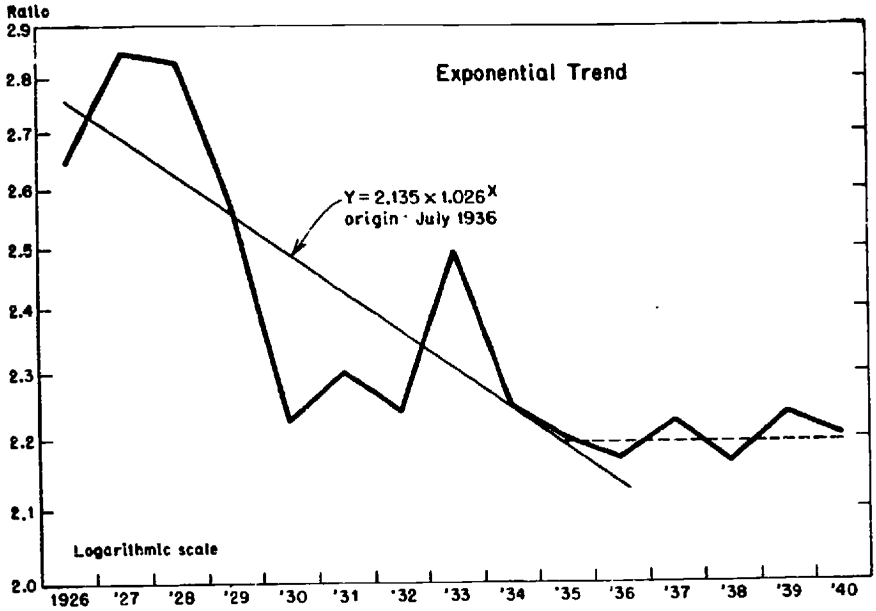
Fortunately, the figures are not at all susceptible to the abuse which the foregoing examination indicates they have inevitably suffered. Chart A-5 shows four annual estimates of shoe sales based on various methods of trend fitting and price reflation. They certainly appear to follow roughly parallel courses. Table A-13 provides specific comparisons. Other things the same, the choice of freehand rather than exponential trend (cols. 1 and 2) increases the downward trend from 1926 to 1940 by about $20 million –

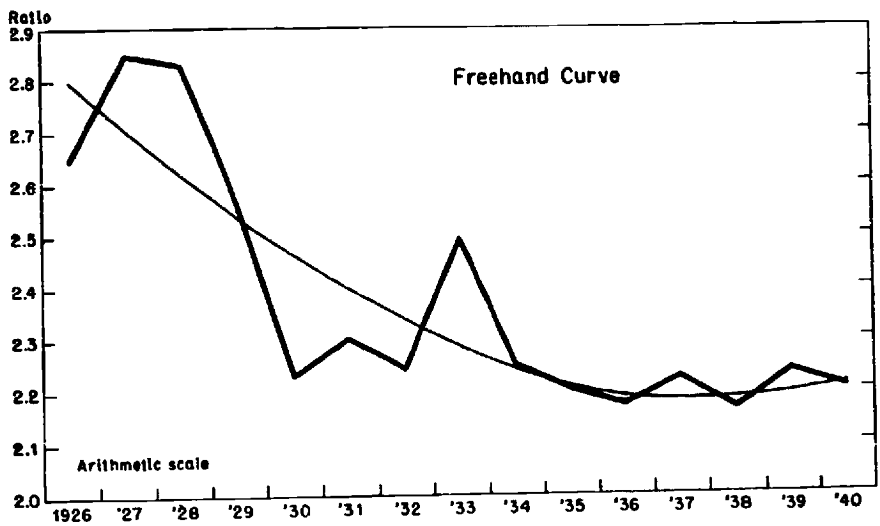
---

facturer and consumer might remain the same or even fall if the channels of distribution were sufficiently simplified. The census publications on the distribution of manufacturers' sales suggest that a smaller proportion of total shoes passed through wholesalers' hands in 1939 than in 1929. But the effect that these changes would have would not be quantitatively significant enough to counteract more than about a one-half to one percentage point decrease (1939 to 1929) in gross margin of retailers. (This judgment is arrived at by substituting the channels of distribution pertaining in 1929 for those of 1939 in Table A-6.) We conclude that it is likely that the spread between factory and retail price may have risen somewhat between 1929 and 1941 and before, but the inadequacy of information on profits makes the conclusion highly tentative.

CHART A-4

RATIOS OF PRELIMINARY ESTIMATE OF TOTAL SHOE SALES TO SHOE SALES OF DEPARTMENT AND CHAIN STORES, 1926-1940



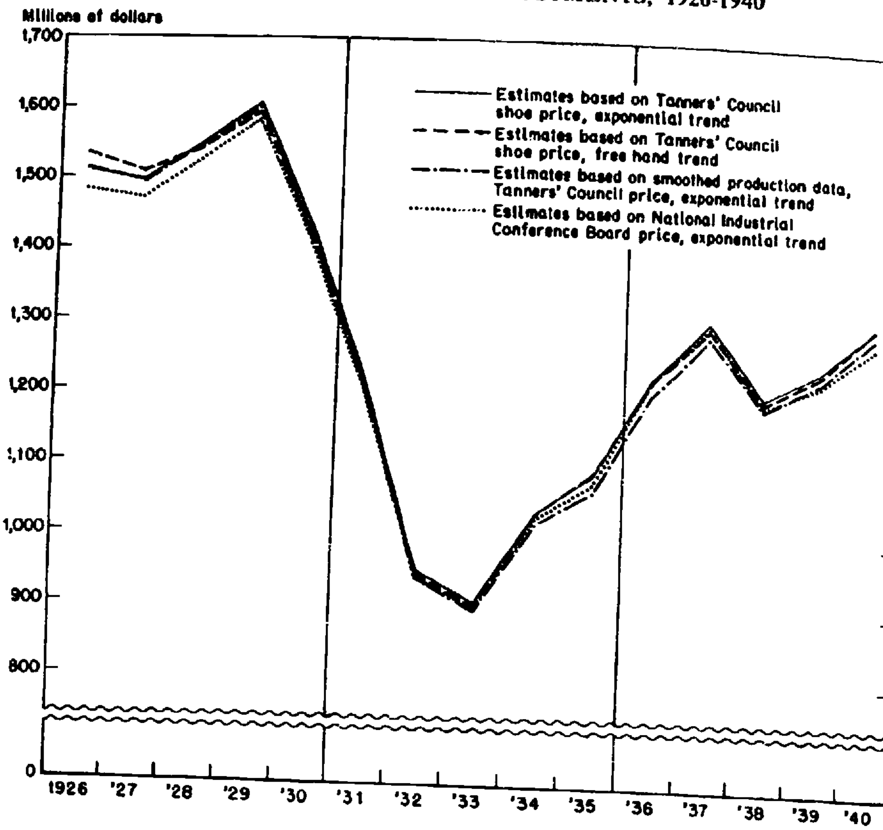


or from $199.8 to $222.3 million. It decreases the downward trend between the two peak years 1929 and 1937 very slightly and decreases the cyclical amplitude from an average drop or fall of $281.6 to $272.6 million. Even the theoretically unjustifiable procedure of basing the preliminary figures simply on a two-year average of output for domestic consumption, other things the same (compare cols. 1 and 3), increases the downward trend only by a bit more than 1 per cent of the average standing of the series and affects the average cyclical amplitude hardly at all. Substitution of reflation by using a retail rather than a wholesale price index to interpolate the census average price figures (raised by 41 per cent; cols. 1 and 4) causes still less alteration in the figures.

We concluded that the trend correction is not bad because it is hard to make it bad,

CHART A-5

FOUR ESTIMATES OF TOTAL RETAIL SHOE SALES BASED ON DIFFERENT TREND AND PRICE ADJUSTMENTS, 1926-1940



and much of the labor spent on trying to make it good was labor lost.[44] The chief deficiency lies in the failure to take into account a probable trend increase of a point or so in margins of retail over factory price. If the margin had increased, say, from 40 to 41 or 41.5 per cent over the period, a not improbable amount, the index of shoe sales might be about 2.5 per cent too low in the final years relative to the early ones.[45]

The suspicion focuses on the transition from dollar to pair figures which would affect the estimates insofar as the cycle or trend characteristics of the data were altered in the course of the trend adjustment in which price estimates played an important part. The heavy drop in stock during the long depression suggests that sales might be too high, and consequently the downward trend in the ratio (which was reversed in the adjustment) was overstated during the period. Since the trend was broken in 1935, this might mean that a bit of the proper major cycle amplitude was removed from the dollar estimates. But it seems likely that the difficulty will be concentrated in the accuracy of the pair rather than dollar series. For the inadequacies of the average price computation hit full force when shoe sales must be converted to pair figures for comparison with output data.

[44] We have persistently asserted that shoe sales could not be accurately estimated on the basis of *Census of Distribution* data on commodity sales. It is hard to say, therefore, whether it is an argument for or against our series to say that on the basis of the census materials shoe sales in 1939 were 79.0 per cent of 1929 and the final estimates show a corresponding figure of 78.5.

[45] The total rise in margins to 41.5 from 40, or 1.5 points would have been associated with a rise in estimated shoe sales of about 3.7 points between 1926 and 1940. This is .25 per year or about 2.5 for the ten years 1926-1935. After that, of course, no trend correction was made that involved reflation of pair figures.

TABLE A-13
VARIOUS ESTIMATES OF TREND AND CYCLE IN SHOE SALES, 1926-1940
(dollar figures in millions)

PEAK AND TROUGH YEARS	SALES ESTIMATES BASED ON T.C. PRICE *Exponential Trend*[b] (1)	*Freehand Trend* (2)	SMOOTHED PRODUCTION DATA;[c] T.C. PRICE, EXPONENTIAL TREND (3)	SALES ESTIMATES BASED ON NICB PRICE, EXPONENTIAL TREND[d] (4)
	DOLLAR SALES			
1926	$1,511.7	$1,533.1	$1,512.2	$1,483.1
1929 (P)	1,607.9	1,593.4	1,599.1	1,583.3
1933 (T)	906.6	900.7	894.8	897.5
1937 (P)	1,308.5	1,297.8	1,287.6	1,300.1
1938 (T)	1,205.9	1,197.7	1,189.0	1,191.7
1940	1,311.9	1,310.8	1,298.3	1,283.5
Av. sales for all 15 years	1,273.0	1,269.5	1,260.9	1,256.4
	CYCLICAL CHANGES IN SALES			
1926-1929	+$ 96.2	+$ 60.3	+$ 86.9	+$100.2
1929-1933	—701.3	—692.7	—704.3	—685.8
1933-1937	+401.9	+397.1	+392.8	+402.6
1937-1938	—102.6	—100.1	—98.6	—108.4
1938-1940	+106.0	+113.1	+109.3	+91.8
Av. change per phase:				
Dollars	$281.6	$272.6	$278.4	$277.8
Per cent[a]	22.1	21.5	22.1	22.1
	TREND			
1926-1940:				
Dollars	—$199.8	—$222.3	—$213.9	—$199.6
Per cent[a]	15.7	17.5	17.0	15.9
1929-1937:				
Dollars	—$299.4	—$295.6	—$311.5	—$283.2
Per cent[a]	23.5	23.3	24.7	22.5

[a] Percentage of average sales for 15 years.

[b] Pair figures were converted to dollar figures using the Tanners' Council of America average factory price of shoes raised to retail levels by a 41 per cent margin. The exponential trend was fitted to the ratios of preliminary total retail shoe sales to the combined department-chain store shoe sales index.

[c] Smoothed production figures were used as preliminary estimates of total retail shoe sales.

[d] The price figures used for converting pairs to dollars were based on census data for wholesale prices raised to retail levels by a 41 per cent margin interpolated in the reports on retail shoe prices obtained by the National Industrial Conference Board.

PATTERN OF FLUCTUATION

In order to arrive at a judgment concerning the accuracy of cyclical or subcyclical fluctuation in shoe buying, several sorts of evidence may be examined.

First, the behavior of the several subindexes may be studied both for evidence of similarity in behavior and for the reasonableness of differences. Table A-14 compares the subcyclical fluctuations reflected in eight Federal Reserve district indexes with those of the national index of department store shoe sales. It also compares the latter index and the chain store index. In the stub of the first section of the table are the dates of specific

TABLE A-14

SUBCYCLE TURNS IN TEN COMPONENT SERIES COMPARED TO TURNS IN TOTAL NATIONAL SHOE SALES, 1926-1940

NUMBER OF MONTHS THAT TURNS IN COMPONENT SERIES LEAD (—) OR LAG (+) TURNS IN TOTAL SALES

		P Dec. 1926	T May 1927	P Feb. 1928	T Mar. 1928		P Aug. 1929		T Dec. 1930	P Apr. 1931		T Mar. 1933	P Aug. 1933	T Dec. 1933
Districts:														
Richmond[a]			0	—1	+3	oo	+1		—3	+2	oo	0	+1	0
Philadelphia	o	—2	0	—1	+8		—2					0	+1	—2
New York		0	—4			ooo		ox	+2	+3	oo	—2	0	—1
Boston	oo	0	0	—2	+2		—4	oo	+1	—1		—2	+1	+2
Cleveland	o	0	0	—2	+1		—4		+3	+3		0	0	0
Chicago	o	—1	0	—2	+1	oo	—1	oo	—1	—2	oo	0	0	—2
Dallas		—4	0	—2	+5	oo	—1					0		
San Francisco		0	+2	—3	+5		—2		0	+1	oo	0	0	—1
Total dept.	o	0	0	—2	+2		0		0	+2		0	0	—2
Chain stores		+3	0	—2	+1		0		+3	+1		0	0	0
Number matched		9	10	9	9		9		8	8		10	9	9
Average time		—.4	—.2	—1.9	+3.1		—1.4		+.6	+1.1		—.4	+.3	—.7
Average deviation		1.0	.6	.4	1.5		1.4		1.5	1.4		.3	.2	1.0

[a] The Richmond series starts in 1927.

Note: P and T indicate peak and trough respectively in total national shoe sales. Unmatched specific turns are shown by x for major turns and o for minor turns. Unmatched reference turns are shown by a blank.

TABLE A-14 (*Continued*)

SUBCYCLE TURNS IN TEN COMPONENT SERIES COMPARED TO TURNS IN TOTAL NATIONAL SHOE SALES, 1926-1940

NUMBER OF MONTHS THAT TURNS IN COMPONENT SERIES LEAD (—) OR LAG (+) TURNS IN TOTAL SALES

	P *May 1934*	T *Sept. 1934*	P *Mar. 1936*	T *Aug. 1936*	P *Sept. 1937*	T *May 1938*	P *Mar. 1939*	T *July 1939*	P *Dec. 1939*	T *Mar. 1940*
Districts:										
Richmond[a]	–2	0 oo	+2	0	–4	0	–4	+3		o o
Philadelphia	0	–1 oo			–4	0	–3	–2	0	+1
New York	0	+2 oo	–4	0	–2	0	0	0	0	+1 o
Boston		oo			–3	0 oo	o			+1 o
Cleveland	0	0	+2	0	0	0	0	0	0	+2
Chicago	0	+2			+1	0	–6	0		
Dallas	–2	–2 oo		o +3	0			–1		
San Francisco	–2	–2	+3	+5	–3	–3 oo				
Total dept.	0	–2	+2	0	0	0	0	0	0	+2
Chain stores	0	–2 oo	+2	+1	–4	0	–5			+2
Number matched	9	9	6	7	10	9	7	7	4	6
Average time	–.7	–.6	+1.2	+1.3	–1.9	–.3	–2.6	0	0	+1.5
Average deviation	.4	1.3	1.3	.8	1.7	.3	1.5	.8	0	.5

Grand average deviation .9

[a] The Richmond series starts in 1927.

Note: P and T indicate peak and trough respectively in total national shoe sales. Unmatched specific turns are shown by x for major turns and o for minor turns. Unmatched reference turns are shown by a blank.

(*Continued on page 116*)

TABLE A-14 (*Continued*)

SUBCYCLE TURNS IN TEN COMPONENT SERIES COMPARED TO TURNS IN TOTAL NATIONAL SHOE SALES, 1926-1940

SUMMARY FOR MATCHED TURNS

	Number of Turns						
	Matched	*Leading* (−)	*Lagging* (+)	*Synchronous* (0)	*Average Timing (Mos.)*	*Average Deviation (Mos.)*	% OF ALL MONTHS COVERED IN UNLIKE PHASE[b]
Districts:							
Richmond[a]	17	5	6	6	−.1	1.5	28.9
Philadelphia	16	8	3	5	−.4	1.7	24.4
New York	17	5	4	8	−.3	1.4	27.8
Boston	13	5	5	3	−.4	1.5	32.2
Cleveland	20	2	5	13	+.3	1.0	10.6
Chicago	16	7	3	6	−.7	1.3	20.0
Dallas	11	6	2	3	−.4	1.9	29.4
San Francisco	16	7	5	4	0	2.0	25.5
Total dept.	20	3	4	13	+.1	.8	9.4
Chain stores	18	4	7	7	0	1.4	22.2
Number matched	164	52	44	68			
					Grand average deviation	1.5	

[a] The Richmond series starts in 1927.

[b] Comparisons cover January 1926 through December 1940 – 180 months – except in the case of Richmond (see note a).

peaks and troughs selected in our final estimates of all shoe sales in the country; these constitute the "reference series" for the table. Whenever one of the ten series had a specific subcycle turn which could, in consonance with National Bureau of Economic Research timing rules,[a] be matched with one in the reference series, the number of months by which it leads or lags (zero if it synchronizes) is given in the appropriate column. If no specific turn was marked, the column is left blank. Turns that are not matched are shown by small o's (minor turns) or x's (major turns) between columns. There are 200 opportunities for matching turns and 164, or 82 per cent, are actually matched. Of these, 41 per cent occurred in just the same month, and the average deviation for all turns for the ten series was ±1.5 months. The last column in the table suggests that some of even this small average deviation was due in considerable part to small shifts in the turns in the final series relative to those of its components when the changing date of Easter and the number of Saturdays and Sundays were taken into account. For we see that for some dates turns in the components fairly consistently lead or lag those in the aggregate, and this would have to be due largely to these extra adjustments performed on the final series. Turn-by-turn average deviations for the 20 turns gives a figure of ±.9 months.

But in spite of the real similarities among the subsections of the table, there are important differences too. We discussed the difference among the district series of department store shoe sales in connection with the problem of combining them into a single national index. We concluded that a characteristic divergence in shoe sales for a given district from the country totals tended to be paralleled by divergence in total department store sales in the district. This was true with respect to timing of turns and the amplitude of cyclical and subcyclical fluctuations.

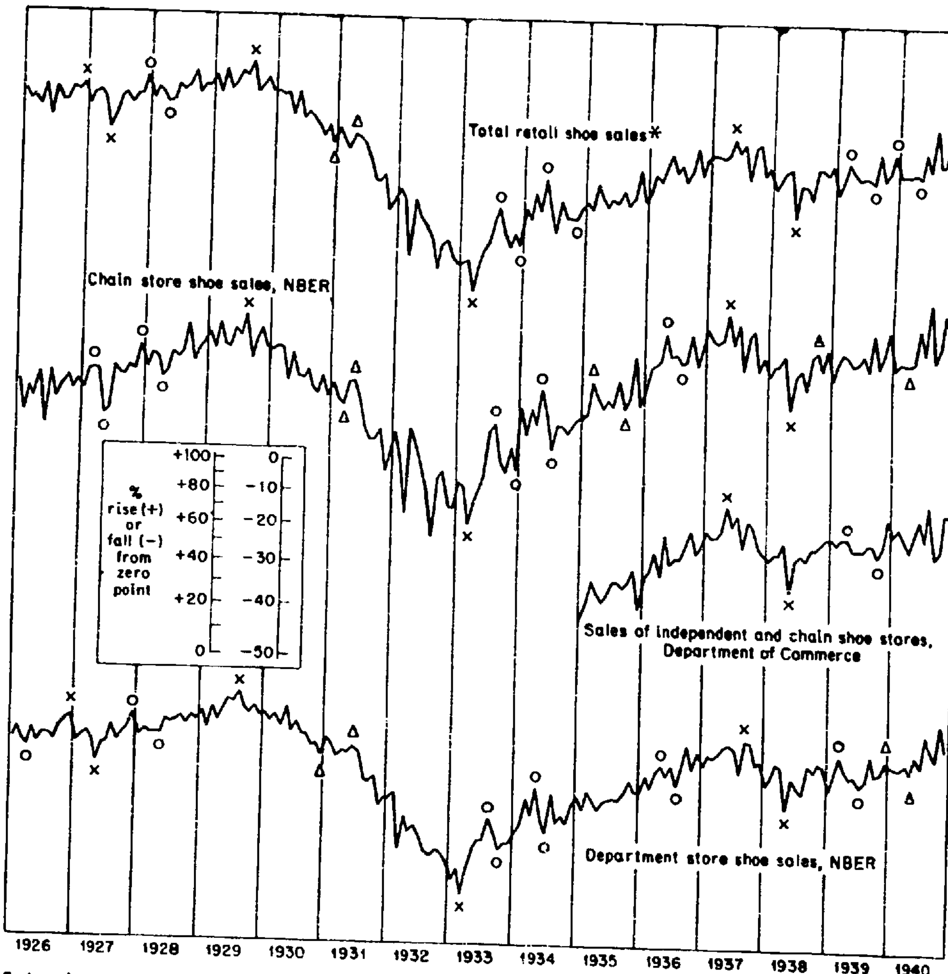
As between the sales of shoe chain stores and shoe departments, differences also are apparent. There was no need to examine these in connection with the weighting problem for the two indexes, since the actual weights that we would have selected would have been about the same regardless of our conclusions as to the representativeness or random character of the differences. However, at this point it is important to judge how sensibly the combined index behaves. Chart A-6 exhibits final estimates of shoe sales and their two major components.

The amplitude of the major cyclical movements of shoe chain stores may be compared with those of the shoe departments of department stores: expressed as a percentage of the average standing for the phase, the fall from the peak in 1929 to the trough in 1933 was 59 and 57 per cent respectively, the rise from 1933 to 1937 was 62 and 42 per cent, the fall from 1937 to 1938 was 16 and 10 per cent. These figures suggest that chain store shoe sales fluctuated more severely than those of department stores except that during the depression of the thirties the difference was slight. But shoe chain stores were experiencing a considerable secular increase during the twenties, and presumably this trend persisted through at least the first half of the thirties. It seems reasonable to assume that were it not for the trend factor, the decline of shoe sales of chains would have been more pronounced relative to that of department stores in the depression of the thirties and thus have been characterized by broader cyclical amplitude throughout. This explanation receives support from a comparison of the average subcyclical amplitude of the two sets of data. Expressed as relatives of the mean of the series, the average rise or the average

[a] The rules, with very minor modifications, are those described in Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles* (NBER, 1946), p. 118. For several of the series, notably Boston and Richmond, the selection of minor movements was most unsatisfactory, since the erratic aspects of the data were so considerable. This is likely to be the case with indifferent retail shoe statistics for which seasonal movements are extremely large relative to cyclical ones.

CHART A-6

ESTIMATES OF TOTAL SHOE SALES AND THEIR COMPONENTS, 1926-1940



Each series seasonally adjusted and corrected for Easter. Specific subcycle turns are marked by X for major turns, O for minor turns, and Δ for retardations.

* Not corrected for number of Saturdays and Sundays as are the final estimates. Department of Commerce data used after 1935.

fall during the subcycle phases occurring between 1926 and 1938 (15 for both series) was 17.0 per phase, or 1.90 per month for shoe chains, and 12.8 per phase, or 1.41 per month for shoe departments of department stores.

The fact that business fluctuations are more heavily imprinted on shoe chains than on shoe departments might be explained in several ways. For one thing, a goodly portion of the income spent in these chain stores is derived from wages or lower salaries. Conversely, it seems probable that the customers of department stores come in larger proportion from the white collar and entrepreneur group, whose incomes are steadier or higher, and spending patterns on commodities like shoes are likely to be steadier. That even the delicate patterns of spending are intimately associated with those of income was demonstrated in the body of this monograph. It carries the corollary that if the income stream of customers of one type of store follows a characteristically different course from that of another type, sales patterns of these stores will differ in a fashion parallel to the income patterns. An interesting demonstration of this parallelism appears when monthly statistics on farm income, on the one hand, and entrepreneurial income and payrolls, on the other, are compared respectively with rural sales of general merchandise stores and sales of department stores. The preponderance of men's shoe chains in the reporting sample might also add somewhat to the slightly stronger fluctuation in the chain store data. Sales of men's shoes may have a heavier subcyclical fluctuation than those of the more perishable women's shoes. For whatever it is worth, our measures of cycle-subcycle amplitude for men's and boys' shoe departments of department stores show an average amplitude of 13.9 per phase and 1.75 per month; women's and girls' shoe departments have a per phase amplitude of 10.5 and 1.48 per month. The three major cycle phases occurring between 1929 and 1938 have average amplitudes of 41.3 per phase for men's and 34.6 per phase for women's shoe departments. Finally, the chain store figures reflect both the cyclical impact of changing sales in a given store, which the department store data also reflect, and at least part of the impact which must have a reinforcing cyclical pattern of opening and closing stores on the sales aggregate. The department store index certainly undersamples stores likely to go out of business and misses almost entirely the new stores which of course have a high percentage rate of growth.

The conclusion of reasonable representativeness of the shoe chain index is supported by comparing it with the overlapping, broadly based Commerce data for 1935-1940, that is, with the 1935-1940 segment of the total shoe sales series as shown on Chart A-6.

In general, then, we conclude that the pieces out of which our index is composed seem individually to portray the characteristics of the subuniverses to which they apply. Consequently, if the weighting scheme is adequate, their combined force ought to give a fairly solid representation of the sum of the universes covered, and this seemed to apply to the minor as well as major fluctuations. This in turn should be a good picture of total sales in the country, providing no important universes are left out.

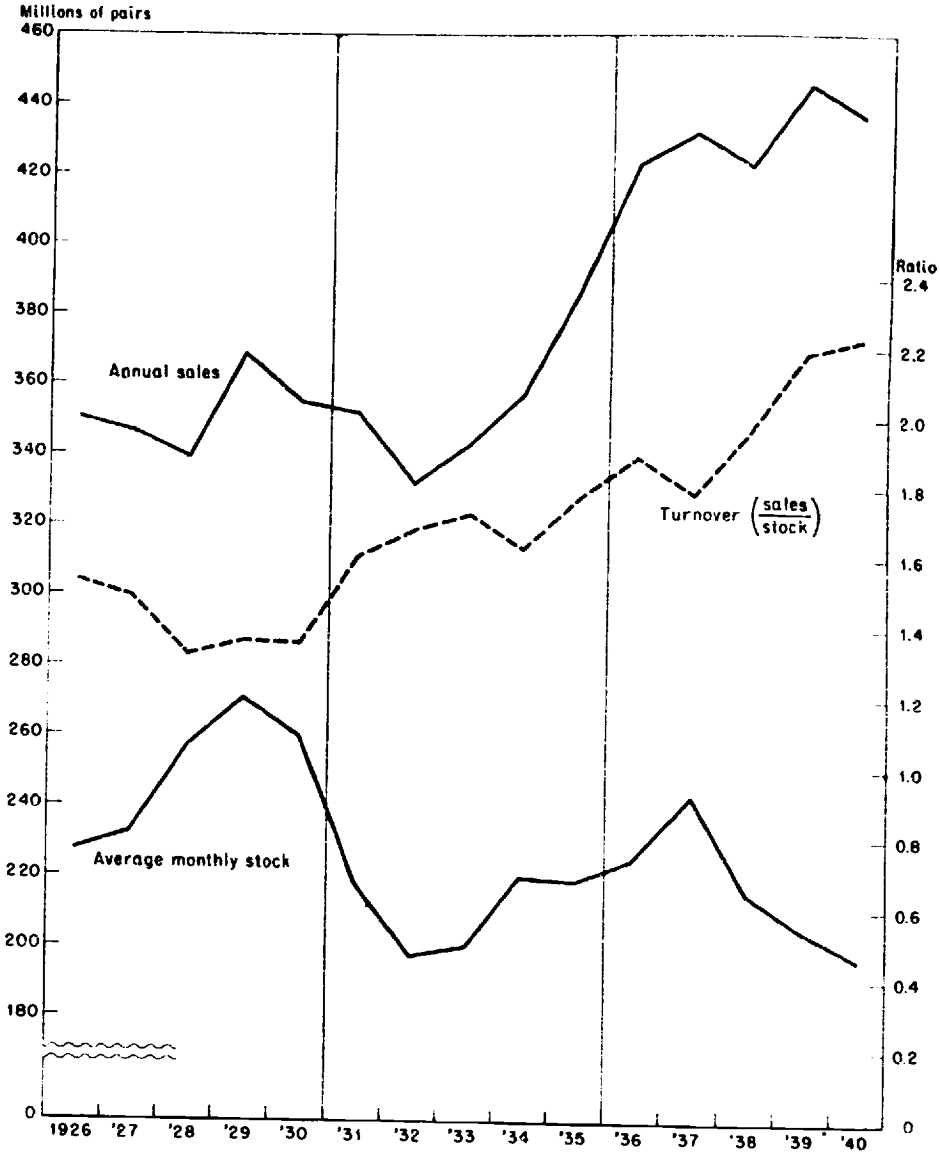
This last point raises the question whether the major income streams are adequately represented, and it seems clear that agricultural income is not. Neither the department nor chain store indexes cover rural sales of shoes at all adequately. Consequently, we would expect our estimates to misrepresent total shoe buying slightly when agricultural income has a pattern which is distinctly different from the rest of the income stream. But the extent of the distortion is not likely to be large, partly because agricultural income constitutes only, on the average, around 15 per cent of total income payments and partly because farmers are probably a group who tend to tie their buying less firmly to short-term fluctuations in income than do city dwellers.

A second source on which judgments can be based is what we know of the bias in the samples of reporting stores. A well recognized villainy of reporting samples is their conservative bias: they are subject to a downward trend through their failure to include promising new stores whose rate of increase of sales exceeds that of total sales, a bias which is only partly compensated for by the failure to sample the less successful store as adequately as the more successful one. But since we have presumably adjusted for trend on the basis of data not subject to this bias – the census data on production – this problem need not concern us. The remaining question, then, is whether the composition of the sample implies a bias that would affect cyclical patterns.

There is some evidence and certainly a reasonable presumption that the founding of new stores is relatively more important in prosperity than depression. Business failures, on the other hand, have an inverse correlation with business cycles and even some subcycles. Since, on the whole, the downward bias of the failure to include new firms is stronger than the upward bias of underrepresentation of weak firms, the net resultant might be that in depression the less than usual downward bias and greater than usual upward bias would tend to cancel one another, whereas in recovery the greater downward bias and smaller upward one would leave a net downward tendency. Were this to be the

Chart A-7

SHOE SALES, STOCKS, AND TURNOVER RATIOS, 1926-1940



case, we might have a slight damping of major cycle fluctuation in our estimates resulting from the characteristics of the stable sample.

On the whole, however, our sales figures suffer less from this difficulty than most. For one thing, department stores enter and leave business much less frequently than most stores.[47] But what is more important, the chain store figures catch the entrance and exit of individual stores, though of course they miss that of chain store organizations.

[47] The percentage of stores in business in 1939 that had been established in 1939 or 1938, between 1939 and 1930, and before 1930 respectively were as follows: for department stores, 2.3, 18.2, 79.5; for family clothing stores, 11.7, 42.9, 45.4; for shoe stores, 12.9, 46.8, 40.3. (From *Sixteenth Census of the United States, 1940, Census of Business*, Vol. I, *Retail Trade, 1939*, Part 1, Table 19A, pp. 170 ff.)

A third basis of judgment is how sensibly the final sales estimates behave. Change in stock of finished shoes in commercial hands represents the difference between output destined for domestic consumption and current sales. Stock-change is small compared with the two flow series. We have considerable confidence in one of the two series – shoe output. If changes in stock have a reasonable cyclical pattern, it bolsters confidence in the other flow series – sales. Chart A-7 shows this imputed stock-change series; linked cumulatively to a base figure, we compute estimates of stocks, shoe sales, and the sales-stock ratio, all in pairs. Stocks show a positive cyclical pattern which is reasonable, though the extent of the change seems extreme. The turnover ratio has a positive cyclical pattern and this, too, is routine, since the great bulk of stocks are those of retailers. The upward trend in the ratio accords with information from many other sources. But in the light of subsequent study the failure of stocks to turn over more rapidly when sales are rising and less rapidly when they are falling arouses suspicion

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