Volume Title: Real Wages in Manufacturing, 1890-1914

Volume Author/Editor: Albert Rees, Donald P. Jacobs

Volume Publisher: Princeton University Press

Volume ISBN: 0-87014-069-8

Volume URL: http://www.nber.org/books/rees61-1

Publication Date: 1961

Chapter Title: The Cost-of-Living Index

Chapter Author: Albert Rees, Donald P. Jacobs

Chapter URL: http://www.nber.org/chapters/c2286

Chapter pages in book: (p. 74 - 119)

CHAPTER 4

The Cost-of-Living Index

THE new cost-of-living index for the period 1890–1914 and its component indexes are presented in Table 22. The more important components are also plotted in Chart 6. The index is designed to measure

TABLE 22

The NBER Cost-of-Living Index and Its Components, 1890–1914
(1914=100)

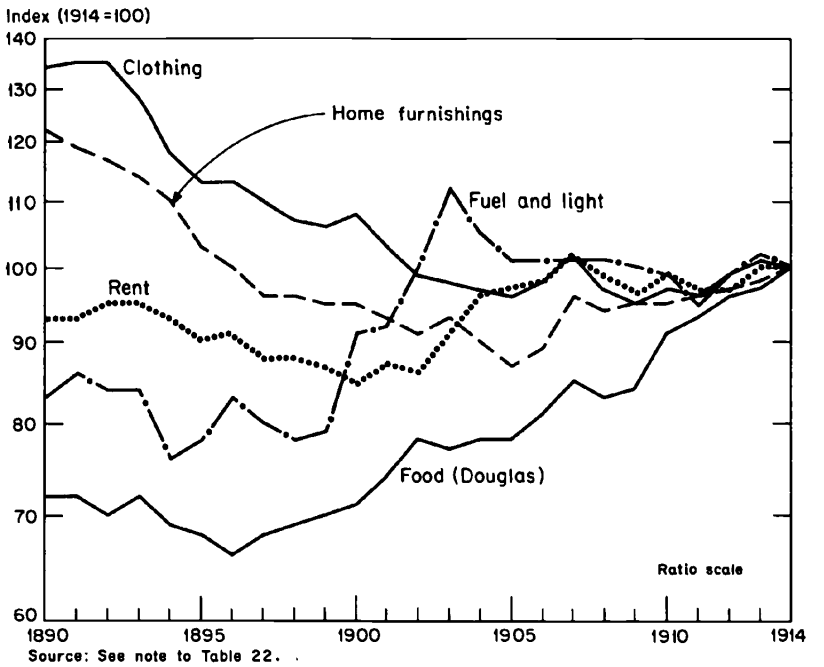
	All Items	Food (Douglas)	Clothing	Home Furnishings	Rent	Fuel and Light	Liquor and Tobacco (Douglas)	All Other Items
1890	91	72	134	122	93	83	81	106
1891	91	72	135	119	93	86	83	107
1892	91	70	135	117	95	84	80	107
1893	90	72	128	114	95	84	81	105
1894	86	69	118	110	93	76	84	100
1895	84	68	113	103	90	78	87	97
1896	84	66	113	100	91	83	86	98
1897	83	68	110	96	88	80	85	95
1898	83	69	107	96	88	78	89	93
1899	83	70	106	95	87	79	92	93
1900	84	71	108	95	85	91	93	95
1901	85	74	103	93	87	92	96	94
1902	86	78	99	91	86	100	96	93
1903	88	77	98	93	91	112	95	96
1904	89	78	97	90	96	105	96	97
1905	88	78	96	87	97	101	98	97
1906	90	81	98	89	98	101	98	98
1907	94	85	102	96	102	101	98	101
1908	92	83	97	94	99	101	100	98
1909	91	84	95	95	97	100	100	97
1910	95	91	97	95	99	99	98	98
1911	95	93	96	96	97	95	99	97
1912	97	96	99	97	97	99	100	98
1913	99	97	101	98	100	102	98	100
1914	100	100	100	100	100	100	100	100

SOURCE: See text except for Douglas's indexes, which are from his *Real Wages in the United States, 1890–1926*, Boston, 1930, pp. 36 (food) and 609 (liquor and tobacco).

changes in the prices paid by manufacturing wage earners for consumer goods, though it may also prove useful for some broader purposes. We begin the discussion with Douglas's food index and our unsuccessful attempts to improve on it. We then discuss in some detail our new indexes of the retail prices of clothing and home furnishings based on mail-order catalogues. These indexes fall

CHART 6

Principal Components of the NBER Cost-of-Living Index, 1890–1914



Source: See note to Table 22.

between 1890 and 1914, although the wholesale prices of clothing and home furnishings rise—a pattern we do not entirely understand. Next we deal with our new index of rents based on newspaper advertisements, and our index of the prices of fuel and lighting, a composite of old and new data. We return to Douglas to pick up his index of prices of liquor and tobacco and then discuss the weighting of the components.

Our cost-of-living index rises considerably less than Douglas's, and

this is the main source of the rise in real wages found in this study. At the close of the chapter, we consider whether the index is biased in one direction or the other and cannot find a basis for thinking that either bias is more probable.

Food

Douglas's "most probable index of the relative cost of food to working-men" is based on the retail prices of twenty-nine foods from 1890 to 1907[1] and of fifteen of these foods from 1907 to 1914. The fourteen omitted items are continued by wholesale prices from 1907 to 1914, and wholesale prices are used for seventeen additional items whose retail prices were not collected by BLS at any time during the period. All thirty-one of the wholesale series are adjusted to a presumed retail basis according to the differences between indexes of wholesale and retail prices for the items whose prices were collected at both levels (twenty-seven until 1907 and thirteen thereafter).

In seeking to improve on the Douglas food index, we looked first for sources of additional retail price series, especially for the period after 1907. Two such sources were found. For June of each year, starting in 1898, the New Jersey Bureau of Industrial Statistics collected the prices of a large number of food items in seventy-four cities or towns in the state.[2] In 1920, the Massachusetts Commission on the Necessaries of Life published the retail prices of thirty-seven food items for each month beginning in 1900.[3] The quotations were apparently taken from records of retailers; no information is given on the locations within the state to which they apply.

To determine whether to substitute New Jersey and Massachusetts retail prices for wholesale prices wherever possible, we made the following test. For each item whose national retail prices were available after 1907 we plotted annually, beginning in 1898, the retail series for the two states, the national retail series, and the wholesale series. We then judged from the charts whether the state retail data or the BLS wholesale data more closely approximated the national

[1] The retail prices of thirty items were collected by the Bureau of Labor during this period. However, Douglas did not use the series for veal, apparently because his budget weights did not permit him to separate expenditures on veal from expenditures on mutton and lamb. Elsewhere he deals with problems arising from the absence of weights by using simple averages of all the available series.

[2] The prices of forty-two items were collected throughout 1898–1914 if different grades of the same commodities are counted separately. Seven items had been added by 1914.

[3] *Report*, 1920, pp. 123–141 and 154–172.

retail series. Somewhat surprisingly, the state retail data for both states were, on the whole, not better approximations of the national retail data than were the wholesale data. Although the state retail data were markedly better approximations for a few items, they were markedly worse for an equal number. All of the other series tended to fluctuate more than the national retail and, in some cases, the state retail fluctuated more than the wholesale series. This tendency in the New Jersey retail series probably arises because they are for a single month in each year, whereas the wholesale are averages of monthly data. The erratic movement of some Massachusetts series may be due to the use of quotations from a very small number of stores. Other Massachusetts series, however, are suspiciously stable.

Our final decision was not to use any state data on food prices. We turned next to the weighting of the food index. Douglas's weighting pattern for food expenditures is taken from the *Eighteenth Annual Report of the Commissioner of Labor* (*Cost of Living and Retail Prices of Food, 1903*) and is summarized in the second column of Table 23. It seemed unusual because of the very small proportion of the food budget spent on starchy foods. One explanation for this is the relatively high income of the families whose budgets were studied. The average annual income of the 2,567 families that reported food expenditures in detail was $827, while that of all 25,440 families covered in the study was $750. For the larger group the average income from the earnings of the husband alone was $621. In contrast, our estimate of average annual earnings in manufacturing in 1901 (the year covered by this budget study) is $446.[4]

The *Sixth* and *Seventh Annual Reports of the Commissioner of Labor*[5] provide a source of data on food expenditures in which family income can be roughly controlled by selecting sets of data, since the data are given separately by the industry in which the

[4] The rough standard that the income from the earnings of the husband should be about equal to the average annual earnings in manufacturing involves two opposite sources of error: (1) Our annual earnings estimates are "full-time equivalent" earnings based on the average number of workers employed for the whole year, and not on the total number of individuals employed at any time during the year. However, some husbands in budget-study families must have been ill or unemployed during part of the year, and their earnings would, therefore, be lower than full-time equivalent earnings; (2) The average earnings of all manufacturing workers include the earnings of women, children, and single men, which tend to be lower than those of husbands. Because the second of these errors probably predominates, we prefer to select a set of families from the budget study such that the income of husbands is slightly above the manufacturing average.

[5] *Cost of Production: Iron, Steel, Coal, Etc.*, 1891, and *Cost of Production: The Textiles and Glass*, 1892.

principal breadwinner worked. If we exclude the data for two high-wage industries, we are left with a sample in which the average income from the earnings of husbands is close to that of all manufacturing workers. The seven industries included are cotton, woolens, pig iron, steel, iron ore, bituminous coal, and coke; the excluded high-wage industries are glass and bar iron. The average earnings of

TABLE 23

Summary of Food Expenditure Patterns from Budget Studies, 1890–91 and 1901
(per cent)

	Per Cent of Total Food Expenditure	
	1890–91[a]	1901[b]
Meat	27.8	28.4
Poultry and fish	1.4	5.4
Eggs	3.3	5.1
Dairy products	14.6	16.1
Lard	2.7	2.9
Coffee and tea	5.9	4.9
Sugar and molasses	8.1	5.3
Flour and meal	13.5	5.1
Bread	2.1	3.8
Rice and potatoes	3.8	4.6
Vegetables	3.7	5.8
Fruit	1.8	5.0
Vinegar, pickles, and condiments	0.3	1.3
All other	10.9	6.2
Total	99.9	99.9

[a] Computed from *Cost of Production: Iron, Steel, Coal, Etc., Sixth Annual Report of the Commissioner of Labor* (1891), and *Cost of Production: The Textiles and Glass, Seventh Annual Report of the Commissioner of Labor* (1892). Data apply to families with heads-of-household working in the seven industries listed in the text.

[b] Computed from *Cost of Living and Retail Prices of Food, 1903, Eighteenth Annual Report of the Commissioner of Labor* (1904).

husbands in the seven industries (weighted by the number of families in the sample) was $450. Our estimate of the average annual earnings in all manufacturing industries in the years apparently covered by these budget studies is $430 for 1890 and $434 for 1891.

The first column of Table 23 summarizes the food expenditures pattern for 1890–91 of families in these seven industries. This pattern gives a substantially heavier weight to starches and sugar than the pattern for 1901. From 1898 to 1914 there were divergent movements

in the prices of various foods. The prices of meat, poultry, and eggs and dairy products rose sharply, while the prices of flour and bread rose much less, and the price of sugar fell. It seemed possible, therefore, that a change in weighting patterns would materially alter the movement of the index. This, however, did not prove to be true. When we measured price changes over the whole period of rising prices from 1898 to 1914 using the two sets of weights summarized in Table 23 we got almost identical results. This happened because the 1890–91 pattern gives lower weight than the 1901 pattern to rice, vegetables, fruits, vinegar, and fish, all of which had smaller than average price rises. The lower weights of these items offset the effect of the heavier weights for starches and sugar.

The 1890–91 weighting pattern thus seems better in principle than the 1901 pattern because it applies to families whose income is more like that of all manufacturing workers. In practice, however, the choice of weights makes so little difference that we did not bother to recompute the entire index. In the end we accepted the Douglas food index without change. It is shown, converted to the base 1914 = 100, as the second column of Table 22.

Clothing and Home Furnishings

The methods used in constructing the clothing and home furnishings components of our cost-of-living index are very similar, and they will, therefore, be discussed together.

For both clothing and furniture Douglas used BLS wholesale group indexes as his basic indexes. To dampen their fluctuations, these were adjusted by the differences between wholesale and retail price indexes for identical food items. The use of the wholesale group index "cloths and clothing" to represent retail clothing prices involves some special difficulties.[6] First, this group index includes some items (carpets, sheetings, and blankets) that would not be classified as clothing in the consumer budget studies. This leads to the underweighting of the true clothing items and the overweighting of home furnishings. More important, "cloths and clothing" includes several items or groups of items that would almost never be bought by consumers without further processing (leather, four series; linen

[6] The wholesale group indexes for 1890–1914 were revised by BLS from time to time. The versions used by Douglas in *Real Wages*, Appendix B, can be reproduced by converting the indexes given in *Wholesale Prices, 1890–1919*, BLS Bulletin 269, July 1920, to the base 1890–99 = 100.

shoe thread; raw silk, two series; scoured wool, two series; worsted yarn, two series; and cotton yarn, two series). The price behavior of these raw materials and semifinished goods may be quite different from that of finished clothing or of yard goods.

Our indexes of the retail prices of clothing and home furnishings are constructed from data from the catalogues of Sears, Roebuck and Company and Montgomery Ward & Company. The use of mail-order data for retail price indexes is, of course, not new. W. I. King used Sears data in constructing a cost-of-living index for 1909–28 which was published in the bulletins of the National Bureau of Economic Research. More recently, mail-order data were used in the Meany-Thomas report during World War II in an attempt to show that the BLS cost-of-living index was biased.[7] The adverse appraisals of the Meany-Thomas report have tended to cast doubt on the use of mail-order data. However, the defect in the Meany-Thomas mail-order indexes was not the source of data, but the way in which items were selected. These were, on the whole, much lower priced than those typically bought by moderate-income urban families and quality was often not held constant. When the BLS selected items at prices deemed representative of those paid by the urban families covered in its budget studies of 1935–36, it obtained indexes of mail-order prices very similar to the corresponding components of the cost-of-living index.[8] We have attempted to profit from this experience by selecting items priced at levels shown by the 1918 budget study[9] to be typical for urban families in a relevant income range.

Apart from the question of price levels, it may be asked whether any other bias arises from the use of mail-order prices, since mail-order buying was more typical of rural than of urban areas during our period. We cannot detect any such bias. The catalogue prices are f.o.b. Chicago and do not include freight to rural areas. The catalogues cover a full range of items suitable for urban working- or middle-class families. The names or descriptions of many items are designed to appeal to such nonfarm workers as engineers, carpenters, plumbers,

[7] George Meany and R. J. Thomas, *Cost of Living*, Washington, January 1944. Meany and Thomas were the labor members of the President's Committee on the Cost of Living.

[8] See President's Committee on the Cost of Living, *Report*, 1945, pp. 51–54, 325–327, and 356–357. The conclusion that the mail-order prices selected by the BLS verified the general BLS indexes was that of a technical committee whose members were Wesley C. Mitchell, chairman, Simon Kuznets, and Margaret G. Reid.

[9] *Cost of Living in the United States*, BLS Bulletin 357. None of the budget studies before 1918 give itemized data on purchases of clothing or home furnishings.

miners, and teamsters. The available evidence suggests that the gross margins of mail-order houses were similar to those of urban department stores.[10] Moreover, catalogue prices are prices at which transactions actually take place—they are not lowered by discounts or bargaining.

In selecting the items for our indexes we began with the general list of items used by the BLS in its cost-of-living index after 1914. These items were selected by BLS from the 1918 budget study. The list contained seventy-one clothing items and twenty-two home furnishings items.[11] We followed the BLS in pricing clothing for a family of four: husband, wife, a twelve-year old boy, and a girl of six. Eventually, we reduced these lists to thirty-six clothing items and nineteen furniture items by dropping items whose prices we could not follow, whose weights proved to be very low, or which could be well represented by a closely similar item. The list used is given in Appendix D.

We have two price series for fourteen of our nineteen furniture items and for about half of the clothing items. The purpose of trying to get two price series for each item was to allow for attrition in following prices back through the catalogues and to provide a wider range of styles and qualities. Only one series was attempted, however, if the item had little weight in the index and if the 1918 budget study showed little variation in the average expenditure per article at different income levels.

In constructing each price series we first selected from the 1918 Sears catalogue the specific variety of the item to be priced.[12] Where possible, the specific varieties were chosen so that the price of one was about equal to the average expenditure per article for all families covered in the 1918 budget study and the price of the other, to the average expenditure per item for families in the income class whose average expenditure was lowest.[13]

[10] See Table 30.

[11] The full list is given in National Industrial Conference Board, *The Cost of Living*, New York, 1925, pp. 75–77.

[12] For example, for men's cotton union suits, basic item 1 under clothing, there were more than forty styles or qualities in the catalogue, ranging in price from 54 cents to $1.98. We chose a long-sleeved combed cotton union suit at $1.48 (specific item 1a) and a long-sleeved Swiss-ribbed lisle at $1.42 (specific item 1b).

[13] This is usually, but not always, the lowest income class. The asymmetrical choice of income classes was made because of the high level of average incomes of the families covered by the 1918 budget study. The average income from earnings of the husband of all families in the study was $1,349. One of us has estimated elsewhere that the average annual earnings per full-time equivalent worker in manufacturing in 1918 were $1,077

It is a serious disadvantage of our procedure that we select items on the basis of a budget study that not only lies outside the period we cover, but is separated from it by the violent price rises caused by World War I. The average expenditure per article for many items was undoubtedly affected by wartime changes in relative prices. However, we had no alternative to the 1918 study.

We attempted to select specific items that were durable and serviceable rather than fashionable. Thus, we usually selected warm, heavy clothing and simple furniture. This, incidentally, made it easier to follow prices, since such items were less affected than others by changes in style.

Once our specific items had been selected for 1918, we followed them back through the catalogues from year to year. We used only one each year for a given item, usually the fall general catalogue. For a few items that seemed likely to be bought in the spring, such as refrigerators or summer underwear, we used the spring general catalogue. Since the great majority of our items were priced in the fall catalogue, which is released during the summer, the indexes can be said to represent prices at about the middle of each year.

In general, it was possible, from the combination of descriptions, pictures, and catalogue numbers, to follow items of given quality with reasonable certainty. As we got into the earlier part of the period, the descriptions became less adequate and our task more difficult. Several items had to be dropped because they could no longer be followed.

Whenever the specific variety of an item disappeared from the catalogue, we substituted a similar one, at as nearly the same price as possible, using an overlap of one year. When the price series was computed, we linked the two segments to remove the change, if any, in price level. Only two of our series have no such links; the largest number for any is eight. The number for each series is shown in

(A. Rees, *New Measures of Wage-Earner Compensation in Manufacturing, 1914–57*, New York, 1960, NBER, Table 9). The income bias appears to be built into the selection of families. Agents were instructed to exclude, among others, families with boarders and "slum or charity families or non-English speaking families who have been less than five years in the United States" (Bulletin 357, p. 2). We are indebted to Margaret G. Reid for calling this point to our attention. See also note 4.

For men's cotton underwear, which can again serve as an example, the average expenditure per article by husbands was $1.58 for all income classes and $1.41 for the income class "under $900." The range of expenditures by income class is, of course, much narrower than the range by families. It can, nevertheless, be wide for some items. For chairs and stools the average expenditure per item in all families was $3.90; for families in the income class "under $900" it was $1.92.

Appendix D. Occasionally, these links involved a major change in the character of the item. For example, no gas stoves appear in Sears catalogues before 1902, and we used a coal cooking stove before that time. Appendix D notes all such major changes.

In all cases we began following items in 1918 in the Sears catalogues only.[14] When we could no longer follow any appropriate style or quality of the item, we switched to Ward catalogues and tried to follow the item there. Items that first appeared in Sears catalogues after 1900 could usually not be found in Ward catalogues any earlier. Before 1900, however, the Ward catalogues were much more complete. The 1890's was a period of rapid growth and change for Sears;[15] Ward, in contrast, was a well-established and stable firm. The Ward catalogue contained a full range of clothing and home furnishings throughout the 1890's. Sears carried only watches and jewelry before 1894. Thus, for 1890–93 our indexes use Ward data only, for 1894–1900 they are mixed, with the proportion of Sears data increasing; after 1900 they are based predominantly on Sears data.

When we had two or three specific series for a basic item, we computed simple averages of these series before weighting them. (In Appendix D these are designated by letters such as 1a and 1b; the number refers to the basic item.) If one specific series ended before the other, the remaining one was linked to the average.

For many of the clothing items in the BLS list we were unable to use our usual procedure because frequent shifts in fabric and style prevented following any one style for more than a year or two. For the five most important of these items we used an alternative chain-index procedure.[16] These items were men's wool suits, women's wool suits, women's wool coats, women's housedresses or wrappers, and women's cotton waists.[17] For these items we selected five specific styles in 1918 that could be followed back to 1917, and computed the simple average of the percentage changes. For 1917 and 1916 we repeated the procedure using, for the most part, different specific

[14] We began with Sears catalogues because they were available in the University of Chicago Library and the New York Public Library and because by the end of our period, Sears was much the larger of the two houses.

[15] See Boris Emmet and John E. Jeuck, *Catalogues and Counters*, 1950.

[16] We are indebted to Mrs. Ethel D. Hoover of the Price Division of the Bureau of Labor Statistics for suggesting this procedure to us.

[17] We substituted cotton waists for the silk waists in the BLS list because Bulletin No. 357 shows that silk waists were more important than cotton only for families with incomes above $1,200 a year.

items, and so back for each pair of years.[18] The percentage changes were then linked, forming a chain index. In a few cases the number of items included in a link was fewer than five if five could not be followed. It was not possible in the chain indexes to relate price levels to the average expenditures in 1918. For men's suits, women's cotton waists, and women's housedresses, the items in the chain indexes remain fairly stable throughout the period. For women's wool coats, the styles changed rather rapidly. Before 1904, capes and jackets were more common than full-length coats.

Before 1906 ready-to-wear women's suits did not appear consistently in the catalogues of either house. We therefore used a composite index of wool serge yard goods and trimmings (buttons, braid, and satin lining). These components were followed by our usual method rather than the chain-index method. The yard goods were given a weight of 8, the lining, 2, and braid and buttons, 1 each.[19]

Because chain indexes are sometimes subject to cumulative error or "drift" we have computed an alternative clothing index in which the chain items are omitted. In this version the composite index for women's suits described in the preceding paragraph is used throughout 1890–1918. The weights of the other chain items are reassigned to other series, in large part to yard goods. The two versions of the index are compared in Table 24. The index excluding chain items lies below the other before 1913 and above it in 1917–18. The largest difference (9 points) occurs in 1891–92. The basic trends of the two versions are quite similar. We decided to use the version including the chain items, since it incorporates additional information that seems to have some value.

For both the clothing and home furnishings indexes we used weights based on the expenditures of families with incomes under $1,500 in 1918, as reported in the 1918 budget study. The average expenditures per family for the three income classes "under $900," "$900 and under $1,200," and "$1,200 and under $1,500" were combined in a

[18] As an example of the procedure, we may describe the series for housedresses for 1916–18. For the link from 1918 to 1917, the five items were a standard percale, a checked flannelette, a cotton serge stout, a striped gingham, and a checked gingham. The first, third, and fifth could also be followed from 1917 to 1916. The other two were replaced by a figured flannelette and a chambray stout.

[19] These weights are based on the relative share of cloth and trimmings, respectively, in the total cost of a ready-to-wear woman's suit whose wholesale price was below $20. The costs were reported to the Tariff Board by seventeen large New York City manufacturers. See *Wool and Manufactures of Wool*, Report of the Tariff Board on Schedule K of the Tariff Law, House Document 342, 62nd Congress, 2nd Session, 1912, pp. 892–898.

TABLE 24

Alternative Versions of the Clothing Price Index, 1890–1918
(1914=100)

	Including Chain Items	Excluding Chain Items
1890	134	126
1891	135	126
1892	135	126
1893	128	120
1894	118	112
1895	113	108
1896	113	108
1897	110	104
1898	107	102
1899	106	101
1900	108	104
1901	103	100
1902	99	95
1903	98	94
1904	97	94
1905	96	93
1906	98	95
1907	102	99
1908	97	94
1909	95	94
1910	97	95
1911	96	95
1912	99	98
1913	101	101
1914	100	100
1915	101	100
1916	111	111
1917	146	148
1918	186	191

SOURCE: See text and Appendix D.

simple average.[20] For home furnishings, the items included in our index account for about 58 per cent of all expenditures on home furnishings for these income groups. The remaining expenditures are largely on items very unlike the included items. The most important

[20] An average weighted by the number of families in each class would have overweighted the highest class. For general discussion of the income bias in this budget study, see note 13.

excluded groups are dishes and glassware, kitchen utensils, brooms and brushes, lamps, pianos, "talking machines," and toys.[21] We did not attempt to assign the weights of omitted articles to specific included articles; thus, the included items carry the weights of omitted items in proportion to their own importance. The weights for the home furnishings index are shown in Table 25.

TABLE 25

Weights for the Home Furnishings Price Index

	Average Expenditure per Family, 1918	Per Cent of Total Weight
Carpets	$3.07	11.3
Linoleum	1.22	4.5
Chairs	1.94	7.1
Tables	1.34	4.9
Couches	1.36	5.0
Dressers and chiffoniers	1.03	3.8
Buffets and china closets	0.84	3.1
Bedsteads	1.70	6.3
Bed springs	0.74	2.7
Mattresses	1.45	5.3
Blankets	1.29	4.7
Sheets	1.11	4.1
Pillowcases	0.54	2.0
Stoves	4.54	16.7
Refrigerators	0.67	2.5
Tablecloths	0.27	1.0
Towels	0.48	1.8
Baby carriages	2.13	7.8
Sewing machines	1.47	5.4
Total	$27.19	100.0

SOURCE: *Cost of Living in the United States*, BLS Bulletin 357, pp. 392–401. The dollar amounts are simple averages of expenditures per family for the three lowest income classes.

For the clothing index it seemed desirable to account explicitly for omitted items, since the included items represented a much smaller part of total expenditures. We therefore divided all clothing items into the twelve categories which define the rows of Table 26, and each of these was further divided into men's, women's, and children's items. In each of the resulting thirty-six cells we entered the expenditure on

[21] These items are also omitted from the BLS index after 1914. Except for pianos and talking machines, Bulletin 357 does not give average expenditure per article, which may explain their omission by BLS.

TABLE 26

Distribution of Basic Clothing Items and Expenditures by Categories

Category	*Men's* Expenditures[a]	*Men's* No. of Items[b]	*Women's* Expenditures[c]	*Women's* No. of Items[b]	*Children's* Expenditures[d]	*Children's* No. of Items[b]
Hats and caps	$2.61	2	$3.42	0	$2.80	0
Woven wool outerwear	14.83	2	9.18	2	11.91	4
Woven cotton and silk outerwear	9.71	3	11.47	3	13.44	2
Knit cotton clothing, except hosiery	3.03	1	2.64	2	4.57	2
Knit wool clothing, except hosiery	1.92	1	0.50	0	2.34	1
Hosiery	3.00	1	2.25	1	5.65	1
Corsets, garters, and suspenders	0.60	0	1.57	1	0.56	0
Nightwear, handkerchiefs, and woven underwear	0.92	1	2.55	0	2.27	0
Shoes and other leather products	12.66	1	8.66	1	20.52	2
Rubbers and other rubber goods	1.17	1	0.29	0	1.35	0
Celluloid collars and cuffs	0.55	1	none	0	0.12	0
All other items	1.85	0	1.73	0	1.03	0
Total	$52.85	14	$44.26	10	$66.56	12

[a] From *Cost of Living in the United States*, BLS Bulletin 357. Average expenditures of husbands per family, simple average of averages for the three lowest income classes.

[b] Number of basic items in our price index in 1918. Some items are represented by two price series.

[c] Average expenditures of wives per family, computed as for husbands.

[d] Sum of average expenditures per family for male children, 12 years and under 15 years, and female children, 4 years and under 8 years, computed as for husbands.

such items by our hypothetical family of four (husband, wife, boy of twelve, and girl of six). These were the simple averages of average expenditure per family for the three lowest income classes of the 1918 budget study. Table 26 shows for each cell, first, these average expenditures and, second, the number of basic items priced that fall in the cell (not the number of separate price series or specific items, which is larger).

We assigned weights to items in three steps. First, the expenditure

in the empty cells (those in which we priced no items) were assigned to the full cells on the same row.[22] If there was one empty cell and two full cells in a row, the expenditures in the empty cell were divided equally among the full cells. Second, the average expenditures in each cell, including those added in the first step, were assigned to the items in the cell in proportion to expenditures on them. Third, we totaled the expenditures in each column after step two. Because the first column (men's) had the fewest empty cells, it was relatively overweighted. It has been found in more recent price studies that the prices of children's clothing sometimes move differently from those of other clothing. We therefore adjusted all the weights in each column to restore the column totals. The weights in the first column were multiplied by approximately 0.81, those in the second column by approximately 1.15, and those in the third column by approximately 1.12.[23] The weights for each item resulting from this procedure are shown in Table 27. When, in moving back through time from 1918,

TABLE 27

Weights for the Clothing Price Index
(per cent)

	Per Cent of Total Weight
Man's	
Union suit, cotton	1.54
Cap, winter	0.97
Hat, felt	3.51
Coat	1.51
Suit, wool[a]	6.03
Overalls or work pants	1.46
Shirt, cotton	2.80
Union suit, part wool	1.11
Nightshirt	2.92
Socks, cotton	1.53
Shoes	6.44
Rubbers	1.43
Collar, celluloid	0.34
Necktie	0.68
Total	32.27

(continued)

[22] For example, we did not price women's hats or children's hats and caps. In step one, the expenditures on these items are assigned to men's hats and caps.

[23] We are indebted to Dorothy S. Brady for suggesting this three-step weighting procedure.

TABLE 27 (concluded)

	Per Cent of Total Weight
Woman's	
Coat, wool[a]	3.68
Suit, wool[a]	2.93
Housedress or wrapper	4.49
Waist, cotton[a]	1.46
Corset	1.96
Corset cover	0.62
Union suit, cotton	1.28
Stockings, cotton	1.62
Shoes, high	6.24
Total	24.28
Child's	
Boy's mackinaw or reefer	1.77
Boy's pants, cotton	1.91
Boy's pants, wool	1.75
Union suit, cotton, 12-year	2.64
Union suit, wool, 12-year	1.82
Stockings, cotton, 12-year	3.96
Boy's shoes, high	12.92
Girl's coat, winter	3.45
Girl's shoes, low	1.47
Underwaist, 6-year	0.57
Total	32.26
Yard Goods	
Wool serge[b]	1.21
Gingham[c]	8.51
Voile[d]	1.46
Total	11.18
Total, all groups	99.99

SOURCE: Computed from Table 26.
[a] Item priced by chain-link method.
[b] Given weight of girl's wool dress.
[c] Given weight of girl's cotton dress, woman's apron, and girl's apron.
[d] Given half of weight of woman's cotton waist.

an item disappeared from the index we reassigned its weight to a similar item and eliminated the change in level by linking.

The years 1915–18, although they lie outside the period of this study, had to be included in the clothing and home furnishings

indexes to enable us to use the 1918 budget study in selecting our items. This also permits comparison of our indexes for 1914–18 with those of the BLS and the NICB. The comparisons are shown in Table 28; they indicate generally close agreement on the size and timing of price rises during World War I.[24]

TABLE 28

Comparisons of Retail Price Indexes for Clothing and Home Furnishings, 1914–1918
(1914=100)

	Clothing			*Home Furnishings*	
	NBER	BLS[a]	NICB[b]	NBER	BLS[a]
1914	100	100	100	100	100
1915	101	102	103	100	105
1916	111	112	120	113	117
1917	146	134	143	132	136
1918	186	176	177	176	179

SOURCE: National Industrial Conference Board, *The Cost of Living*, New York, 1925, pp. 34 and 111; NBER indexes, see text and Appendix D; BLS indexes, see text note 24.

[a] Adjusted to midyear; see text note 24.

[b] July of each year except 1918; 1918 figures are for June.

Before 1914 we can compare our indexes only with components of the wholesale price index. These comparisons are shown in Table 29 in the columns headed "all items." Our indexes are surprisingly different from the wholesale indexes. While both wholesale indexes are lower in 1890 than in 1914, both of ours are substantially higher. All fall from 1890 to 1897, and all rise from 1905 to 1914. However, in the intervening years, 1897–1905, the trends diverge: the retail indexes continue to fall, while the wholesale rise.

[24] The BLS indexes for 1914–17 were based on price data for eighteen shipbuilding centers and for Washington, D.C. for December of each year. For December 1917–December 1918, data were collected for thirteen additional cities. The change from the average prices of 1913 to those of December 1914 was estimated from wholesale price movements and the indexes for December of each year were published on the base 1913 average=100. The estimated change from the 1913 average to December 1914 was only 1 per cent for clothing and 4 per cent for home furnishings. To get the figures shown in Table 28 we have averaged the BLS data for Decembers of adjacent years, obtaining series that refer roughly to the middle of each year, as ours do. The 1914 base figures for these series were obtained by averaging the December 1914 figures and the estimated 1913 figures.

The NICB (*The Cost of Living*), did not publish a separate index for home furnishings, which it included in sundries. It first collected clothing prices in 1918; the prices for earlier years were apparently collected in 1918 from retailers' records.

TABLE 29

Comparison of Retail and Wholesale Price Indexes for Home Furnishings and Clothing, 1890–1914
(1913=100)

	HOME FURNISHINGS				CLOTHING			
	All Items		*Common Items*		*All Items*		*Common Items*	
	NBER Retail	BLS Wholesale	NBER Retail	BLS Wholesale	NBER Retail	BLS Wholesale	NBER Retail	BLS Wholesale
1890	124	72	92	72	133	94	123	93
1891	122	72	90	73	134	91	129	94
1892	120	71	90	70	133	91	128	92
1893	116	68	87	70	126	88	124	90
1894	112	67	79	64	117	78	107	78
1895	105	62	74	60	112	78	107	76
1896	102	58	75	58	112	75	104	76
1897	98	56	78	58	109	75	104	73
1898	97	61	78	61	106	79	99	72
1899	97	62	80	63	105	82	98	76
1900	97	69	86	72	107	88	97	82
1901	95	69	85	69	102	82	96	78
1902	92	73	86	70	98	84	90	80
1903	95	74	86	73	97	88	89	84
1904	92	73	88	75	96	89	92	84
1905	89	71	86	77	96	91	88	85
1906	91	74	92	80	98	97	96	92
1907	98	80	100	86	101	104	102	97
1908	96	78	96	83	96	94	92	89
1909	97	77	97	81	94	98	90	94
1910	97	80	98	85	96	99	93	100
1911	98	85	100	87	96	96	93	98
1912	99	91	98	93	98	98	96	97
1913	100	100	100	100	100	100	100	100
1914	102	99	99	98	99	98	100	99

SOURCE: For the list of items common to the full wholesale and retail indexes, and for the sources of the retail all-items index, see text and Appendix E; wholesale all-items indexes for house furnishing goods and for cloths and clothing from *Wholesale Prices, 1890–1919*, BLS Bulletin 269.

Some of the difference between the movement of the two clothing indexes, and much of that for the two furniture indexes, can be explained by the differences in the selection of items. The wholesale home furnishings index consists of thirteen items, of which only three (chairs, tables, and bedroom sets) have counterparts in our index. The remaining nine consist of glassware, earthenware, table cutlery,

and woodenware (pails and tubs). On the other hand, our index includes many items that do not appear in the wholesale index. Some, such as sewing machines, refrigerators, stoves, bedsprings, mattresses, and linoleum, are wholly unlike any items in the wholesale index.

Table 29 includes indexes of the prices of items common to the wholesale and retail price indexes. The two indexes of common items for home furnishings consist of six items each; both are weighted by the weights of our retail index. The items are carpets, wooden chairs, tables, bedroom sets,[25] blankets, and sheets.[26] The wholesale series for carpets, blankets, and sheets are part of the wholesale group cloths and clothing.

The wholesale index for these six items common to the two main indexes is very similar to the wholesale group index for house furnishing goods. However, the retail index for common items is unlike the full retail index and much more like the wholesale index. Like the wholesale index it is higher in 1914 than in 1890, and it begins to rise in the mid-1890's.

The difference between the two retail indexes seems reasonable. The full index, which includes more highly fabricated articles, reflects more of the growth of productivity in manufacturing and less of the rise in price of such materials as lumber and wool. Three of the four metal items in the full retail index (stoves, sewing machines, and metal bedsteads) continued to fall in price from 1897 to 1905 and contributed substantially to the continued fall of the index in these years, whereas the wholesale index and the indexes of common items contained no metal items before 1907. On the other hand, when the wholesale prices of hardwood lumber rose sharply from 1897 to 1905 so did the prices of all wooden items in the wholesale home furnishings index and in the retail index of common items and of most of the wooden items in the retail index for all items.

The wholesale index for cloths and clothing contains several series for raw materials and semifinished goods and some series that we classify as home furnishings. It gives much more weight to yard goods than our index does, and includes no children's clothing. The finished clothing included is limited to underwear, hosiery, and shoes. Thus,

[25] The wholesale series for bedroom sets includes a bedstead, dresser, and washstand. The bedstead is wood until 1907 and iron thereafter. Our series is an index of the sum of the retail prices of a dresser and a bedstead; we did not price washstands. We switch from a wood to a metal bedstead in 1907 to maintain comparability.

[26] For a more complete description of the items common to the full wholesale and retail indexes, see Appendix E.

our retail series for such items as suits, dresses, coats, shirts, overalls, collars, and hats have no counterpart in the wholesale index.

The two indexes of common items for clothing shown in Table 29 consist of seven items each, weighted as in our retail index. The items are all-wool dress goods, gingham yard goods, men's shoes, women's shoes, men's cotton hose, women's cotton hose, and men's wool union suits.[27] Again there is very little difference between the wholesale index of common items and the full wholesale index. The retail index of common items lies somewhat closer to the wholesale index than does the full retail index, but the general pattern continues to resemble the latter and the lowest point is, again, not reached until 1905. The retail index of common items for clothing includes none of the items for which we used the chain-index method, and this may explain much of its divergence from the all-items index (compare Tables 24 and 29).

For both clothing and furniture, the differences in the selection of items do not explain the full divergence between the retail and wholesale indexes. In clothing, the difference between the two indexes of common items remains large.[28] It should be mentioned, however, that the correspondence of items in these comparisons is very rough, and the wholesale index covers a much wider range of qualities. Thus, in men's shoes for 1918 the two retail prices per pair were $4.45 and $4.95, while the three wholesale prices were $1.51, $5.44 and $5.63. There may also be more changes in quality in the wholesale series. Thus, in the comparison for all-wool dress goods our series is wool serge throughout; the wholesale series is Franklin sackings for 1890–1907, Panama cloth for 1907–13, and storm serge for 1913–18 (for other items, see Appendix E).

In seeking to explain the divergent movements of wholesale and retail prices of similar items, we first considered the possibility that retail gross margins of mail-order houses fell during the period. However, the available direct evidence suggests that just the opposite was true. We can get data on margins for a mail-order house only for 1902–5. These are compared in Table 30 with the margins of two large department stores for the same years. The Sears margins are quite similar to Macy's and slightly below those of Marshall Field and Company. If the Sears margins fell substantially relative to those of

[27] For a full description, see Appendix E.

[28] There are, also, large differences between the wholesale and retail price series for most of the items in these indexes considered individually.

TABLE 30

Gross Margins of Three Large Retailers, 1902–1905
(per cent)

	Sears, Roebuck and Company[a]	R. H. Macy and Company[b]	Marshall Field and Company[c]
1902	25.7	23.2	26.6
1903	23.9	24.6	28.0
1904	25.0	25.2	28.9
1905	24.0	26.1	28.1

[a] Boris Emmet and John E. Jeuck, *Catalogues and Counters*, Chicago, 1950, p. 175.
[b] R. M. Hower, *History of Macy's of New York*, Cambridge, Mass., 1943, p. 390.
[c] Computed from R. W. Twyman, *History of Marshall Field and Company*, Philadelphia, 1954, pp. 161, 175–176.

department stores before 1902, they must have been higher to begin with, and this does not seem likely.

The available evidence on the trend of gross margins in other relevant branches of retail distribution is summarized in Table 31. All of it points to rising gross margins during our period. Annual data on Macy's margins for 1890–1914 and Field's for 1890–1906

TABLE 31

Gross Margins of Retailers of Clothing and Home Furnishings, 1889–1919
(per cent)

	1889	1899	1906	1909	1919
Department stores	22.2	25.6	n.a.	29.3	32.8
Furniture stores, independent	30.6	31.2	n.a.	31.2	39.0
Dry goods stores	19.2	21.4	n.a.	27.0	29.0
Apparel stores	25.4	27.5	n.a.	29.6	31.8
R. H. Macy and Co.	19.5	22.4	26.9	28.4	32.7
Marshall Field and Co.	26.5[a]	27.7	28.7	n.a.	n.a.

SOURCE: Lines 1–4 from Harold Barger, *Distribution's Place in the American Economy*, Princeton University Press for NBER, 1955, pp. 160 ff.; line 5 from Hower, *History of Macy's*, pp. 256, 390; line 6 computed from Twyman, *History of Marshall Field and Company*, pp. 161, 175–176. The Macy data are included in Barger's series for department stores, but the Field data are not.

n.a. = not available.

[a] 1890.

show the same trend.[29] Thus, the movement of gross margins not merely fails to explain the difference between the wholesale and retail price indexes; it widens the difference to be explained.

A second explanation of the differences between the movement of the wholesale and retail indexes relates to the way in which they were constructed. The specific items in the wholesale index were selected at the beginning of the period and followed forward in time until they were no longer important in the market. The items for the retail index were selected at the end of the period and followed backward in time until they disappeared from the market. The retail index will thus tend to include new items sooner after their introduction, at a time when their price may be falling relative to the prices of all items because of the improvement in production processes or economies of scale. The wholesale index will tend to retain for a longer time items that are disappearing from use and whose prices may be rising relative to the prices of all items as the scale of production contracts.[30] We could have tested the effect of this difference by constructing a second retail index on the opposite principle, but this would have involved the collection of much additional price data.

Finally, we must consider the extent to which the divergence between the wholesale and retail indexes results from error in the indexes. In the wholesale indexes, the commodities are specified more precisely than in the retail index and, therefore, may be more comparable through time. Failure to recognize changes in quality in constructing the retail index leads to a price constancy bias—the tendency is to follow a similar commodity at the same price when the price of the identical commodity may have changed. Since the index is constructed backward through time, this may lead us to understate price rises by an upgrading of quality as we move backward during that part of our period in which prices were rising.

Both the retail and wholesale indexes have frequent links in the individual price series made on the basis of a one-year overlap. These also introduce possibilities of error if a link is made in a year when

[29] See the sources cited in the notes to Table 31.

[30] An example of this difference in timing can be given from among our "common items." During the period covered by our indexes, union suits gradually replaced shirts and drawers for men and boys, as judged by their share in the number of underwear items listed in the mail-order catalogues. Our index includes men's wool union suits beginning in 1898; the wholesale index does not introduce them until 1912. In 1903, the retail price of union suits dropped substantially, while the wholesale price of shirts and drawers was unchanged. Since the items involved are very similar, we cannot be too confident that the general explanation given in the text applies to this case.

one of the segments linked has a rise or fall that might have been recognized from continuous data as part of a temporary peak or trough not present in the other segment. Since such errors tend to be random, the larger the number of series in the index, the greater the likelihood that they will be offsetting. On this ground, our home furnishings index may be somewhat more reliable than the wholesale index. The retail home furnishings index is based on thirty-three series, of which twenty cover the entire period. The wholesale index is based on only thirteen series. For the clothing series, such a comparison is difficult. The total number of series is somewhat larger in the wholesale index, but relatively few are for finished clothing.

Rent

The Douglas cost-of-living index does not include a rent component. We know of two previous rent indexes covering the period, one of which we discovered before we constructed our own, and the other only afterward. The first is given in Carl Snyder, *Business Cycles and Business Measurements*,[31] and covers 1875–1913. It is described as a "special study on rents by the Russell Sage Foundation, unpublished" but nothing whatever is said about the nature of the underlying data or the methods of construction. We were unable to learn more about it by direct inquiries to the Russell Sage Foundation, though we got the impression that the Foundation's statisticians now regard it as unreliable. The index often does not change for many years; for example, it remains at 84 (1913 = 100) from 1880 to 1894. It rises 7.5 per cent between 1879 and 1895, a period of falling prices.[32]

The second rent index for this period is that of *The Real Estate Analyst*.[33] This index is based on advertised rents for single-family dwellings in several cities. No information is given on the number of cities or the number of dwellings covered, or on the methods of constructing the index. The index is charted but not given in numbers.

[31] 1927, pp. 137, 291.

[32] Despite the peculiar movement of this index and the absence of any information about its sources, it has been used in at least two recent studies—Leo Grebler, D. M. Blank, and Louis Winnick, *Capital Formation in Residential Real Estate*, Princeton University Press for NBER, 1956, p. 407 and E. H. Phelps Brown and S. V. Hopkins, "The Course of Wage-Rates in Five Countries, 1860–1939," *Oxford Economic Papers*, n.s. II, 1950, pp. 270–271.

[33] A monthly magazine published in St. Louis by Real Estate Analysts, Inc. The rent index for 1890–1914 is shown in the issue of January 1938, pp. 850–851. It is used in Robert F. Martin, *National Income in the United States, 1799–1938*, New York, NICB, 1939, pp. 99 and 131.

Our own index, which is also based on advertised rents, was already completed when we discovered this one, and we were struck by the strong similarity in movement. Our index rises from 1890 to 1893, and then falls sharply until 1900. *The Real Estate Analyst* index moves similarly, with a one-year lead at both turns. Both indexes rise sharply after 1900, regaining their 1891 levels by 1904, and both continue to rise gradually until 1907. From 1907 to 1914 the movements are irregular, but both indexes are lower in 1914 than in 1907.

Our rent index is a simple average of indexes for six large cities, 1895–1914, and for five cities for 1890–95. The combined index is shown in Table 22 and the separate city indexes are shown in Table 32.

The city indexes were computed from the rents asked in newspaper

TABLE 32
Rent Indexes for Six Cities, 1890–1914
(1914=100)

	New York	Chicago	Philadelphia	Boston	Cincinnati	St. Louis
1890	95	86	105	91	[a]	98
1891	94	88	100	86	[a]	104
1892	94	88	102	93	[a]	108
1893	94	91	102	92	[a]	106
1894	94	84	99	87	[a]	108
1895	95	80	98	91	82	97
1896	92	77	102	92	85	100
1897	93	72	98	88	82	97
1898	89	75	98	86	77	100
1899	90	74	96	87	83	91
1900	88	76	95	82	77	90
1901	86	74	96	88	83	93
1902	86	81	96	88	76	91
1903	92	79	96	84	86	108
1904	104	82	100	83	93	116
1905	106	81	102	88	91	116
1906	109	80	102	90	97	110
1907	106	84	107	92	105	116
1908	100	87	99	95	102	109
1909	98	87	100	96	97	103
1910	98	88	100	93	100	112
1911	98	88	101	100	101	95
1912	98	89	99	98	100	99
1913	98	95	96	103	103	105
1914	100	100	100	100	100	100

SOURCE: See text.
[a] The Cincinnati sample is too small to be used before 1895.

advertisements in one paper in each city in April and September of each year.[34] The papers used were the *New York World*, the *Chicago Tribune*, the *Philadelphia Press*,[35] the *Boston Globe*, the *Cincinnati Enquirer*, and the *St. Louis Post-Dispatch*. We used data for the last Sunday in April and September because these precede traditional moving days in many cities. When not enough observations were available on the last Sunday of the month, issues of preceding Sundays were also used.

The selection of cities was dictated by the availability of files or microfilms of newspapers and our cities are obviously not in any sense a representative sample of all cities.[36] We needed to find newspapers that advertised dwelling units at about the rent level paid by working-class families as shown in the various budget studies; several papers examined, including the *New York Times* and the *Boston Transcript*, advertised only, or primarily, dwelling units at much higher rent levels. We attempted to construct an index for Cleveland from advertisements in the *Cleveland Plain Dealer*, but discarded it because there were too few observations before 1905.

Within each city, we collected rent data for the sizes and kinds of dwelling units in which workers typically lived as shown by the 1918 budget-study data for families with incomes below $1,500. The rents for the various sizes and kinds of units were combined using the fixed 1918 weights shown in Table 33. These are derived from the number of budget-study families living in each size and type of unit. Classes whose weight was very small were omitted. Thus, we collected data only for houses in Philadelphia, and only for apartments in New York, Boston, and Chicago, but for both houses and apartments in Cincinnati[37] and St. Louis.

[34] For a previous use of data from classified advertising in newspapers to construct a price index, see Gregory C. Chow, *Demand for Automobiles in the United States*, Amsterdam, 1957.

[35] The Philadelphia data for September 1914 are from the *Ledger* rather than the *Press*; holdings of the *Press* at New York Public Library end in mid-1914. The level of the September index is 5 per cent above April. This is a slightly smaller rise than the rise from April to September in our index for New York, using data from the *World* in both months. We therefore conclude that the Philadelphia rise results from the outbreak of war in Europe rather than from the change in sources. In other cities we did not record the April and September observations separately.

[36] If we assume that the selection of cities by *The Real Estate Analyst* was not identical with ours, the similarity of our index with theirs can be taken as some evidence that our selection of cities does not strongly affect the behavior of our index. The dispersion among our city indexes offers some evidence to the contrary.

[37] For Cincinnati after 1900 we collected data on both apartments and unfurnished rooms in three- and four-room units. The average rents on the unfurnished rooms were

Apart from size, we had little control over the quality of housing. It was seldom possible to tell from the advertisements whether or not a unit had a bathroom, an inside toilet, or steam heat. Units advertised as having garages or stables or as being in buildings with elevators were excluded as being upper- or middle-class housing.

TABLE 33

Weights for City Rent Indexes, by Size and Type of Dwelling Unit

	New York	Chicago	Philadelphia	Boston	Cincinnati	St. Louis
Houses						
3-room[a]	—	—	—	—	8.9	11.8
4-room	—	—	17.1	—	9.5	23.5
5-room	—	—	29.7	—	6.1	6.7
6-room	—	—	45.1	—	—	—
7-room[b]	—	—	8.1	—	—	—
Apartments						
3-room[a]	24.9	—	—	9.5	61.2[c]	49.6
4-room	43.4	43.0	—	43.0	14.3[c]	8.4
5-room	27.6	31.6	—	37.5	—	—
6-room	4.1	25.4	—	10.0	—	—

SOURCE: *Cost of Living in the United States*, BLS Bulletin 357, pp. 276–333; housing data for families with income below $1,500.

[a] Includes all the weight of the budget-study class "less than 4 rooms."

[b] Includes all the weight of the budget-study class "more than 6 rooms."

[c] After 1900, series for these units include both "apartments for rent" and "unfurnished rooms for rent." See note 37.

However, units were never excluded solely because of high rent. In Chicago, many steam-heated units could be identified and these were excluded. When they are included, the average level of rents is far higher than that shown in budget studies for working-class families.[38]

Table 34 shows for selected years the number of observations on which the city rent indexes are based. With the exceptions mentioned

consistently lower for each size. We believe, therefore, that these were units lacking some facilities such as bathrooms or inside toilets (the 1918 budget study shows only 61 of 134 Cincinnati flats and apartments surveyed as having bathrooms and only 80 as having inside toilets). We combined apartments and unfurnished rooms for each size, giving apartments a constant weight of 29.4 per cent for the three-room units and 52.4 per cent for the four-room units. These weights for each size were obtained by dividing the total number of observations for apartments for 1900–1918 by the total number of observations for both types of units. The series for apartments only for 1895–1900 was linked to the combined series by a one-year overlap at 1900.

[38] A study of Chicago housing in 1909 states "modern steam-heated flats . . . are not as a rule occupied by working class families." Great Britain, Board of Trade, *Cost of Living in American Towns*, 1911, p. 144.

in the notes to this table, the samples are of generally satisfactory size. The weakest is Cincinnati before 1908; the small size of this sample probably explains the somewhat erratic movement of the Cincinnati index for 1895–1905.

Five of our city indexes were continued to 1918 to permit comparison of rent levels with the 1918 budget study. The Philadelphia index could not be continued to 1918 because the sample became too small. For 1914–18 we can compare our series with BLS rent indexes in

TABLE 34

Number of Observations Used in Constructing City Rent Indexes, Selected Years, 1890–1914

	New York	Chicago	Philadelphia	Boston	Cincinnati	St. Louis
1890	620	217	179	142	[a]	199
1895	644	269	319	386	74	352
1900	748	271	273	460	129	233
1905	544	228	267[b]	466	91[b]	225[b]
1910	494	230	267	499	418	193
1914	967	217	303[c]	494	555	264

SOURCE: See text.

[a] The Cincinnati sample is too small to be used before 1895.

[b] Three of the city indexes are based on small numbers of observations during the rapid rise in rents of 1902–4. The lowest figures for each city are: Philadelphia, 71 observations for 1902; Cincinnati, 41 observations for 1902; and St. Louis, 37 observations in 1904. That little housing was for rent in St. Louis in 1904 was undoubtedly an effect of the Louisiana Purchase Exposition.

[c] The Philadelphia index for 1912 is based on only 56 observations for January and March. Holdings of the *Philadelphia Press* at the New York Public Library are incomplete for this year.

three cities (there were no BLS rent indexes for Cincinnati or for St. Louis before December 1917). These comparisons are shown in Table 35. In Boston and New York there is close agreement on the size of the rent rise from 1914 to 1918; the Chicago indexes diverge. Some of the differences in year-to-year movement may arise from the differences in timing between the two sets of indexes.

In general, our indexes are less stable than those of the BLS. This is because we measure rents asked for vacant units, while the BLS measures rents paid for occupied units under the terms of existing leases or arrangements. Clearly, the former is a more volatile measure, but there is little reason to expect the long-run trends of the two measures to diverge. Unless landlords overestimate what they can

get for vacant units by more at some times than at others, each point on an index of rents paid should correspond to a weighted average of rents asked at previous times, where the weights are the percentages of all existing agreements entered into at each past time. Any constant percentage difference between rents asked at each date and those actually received under new agreements made at the same date would presumably disappear when the measures are converted to index numbers.

Both our indexes and the BLS indexes show little rise in rents during World War I, perhaps because the effects of rising incomes and costs were offset by the cutting off of immigration.

TABLE 35
Comparison of Rent Indexes, Three Cities, 1914–1918
(1914=100)

	NBER Indexes (April and September)			*BLS Indexes (December)*		
	New York	Chicago	Boston	New York	Chicago	Boston
1914	100.0	100.0	100.0	100.0	100.0	100.0
1915	99.9	92.5	102.7	99.9	99.9	99.9
1916	98.2	91.8	98.2	99.9	100.7	100.1
1917	93.1	92.8	102.0	102.6	101.4	99.9
1918	105.3	96.9	102.2	106.5	102.6	102.8

SOURCE: NBER indexes: see text; BLS indexes: *Cost of Living in the United States*, BLS Bulletin 357, pp. 276–333.

In Table 36 the average levels of rents indicated by our newspaper data are compared with those shown by a number of budget studies and housing surveys. For the newspaper data, the average monthly rent for each size and type of unit is expressed in dollars per room, and these rents per room are weighted by the weights shown in Table 33. Where the survey data are given by room size, the same weights are used. Where they are given by income class, the weights are the number of persons in each class as shown by the survey itself. Descriptions of these surveys and our methods of using data from them are given in Appendix F. Table 37 expresses the comparisons of Table 36 in percentage terms.

On the whole, Tables 36 and 37 suggest that we have succeeded in collecting data representative of the rents paid by working-class families. The surveys for 1918, 1909, and 1907 were confined to such

TABLE 36

Comparison of Rent Levels by Cities, Selected Years, 1891–1918[a]
(average monthly rent per room)

Year and Sources	New York	Chicago	Philadelphia	Boston	Cincinnati	St. Louis
1891						
Boston Globe	[b]	[b]	[b]	$3.16	[b]	[b]
Massachusetts BLS	[b]	[b]	[b]	3.32	[b]	[b]
1893						
Newspaper data	$3.71	$3.41	$2.52	[b]	[b]	[b]
7th Special Report	4.09[c]	3.27	3.07	[b]	[b]	[b]
1900						
Chicago Tribune	[b]	2.89	[b]	[b]	[b]	[b]
City Homes Assn.	[b]	1.80	[b]	[b]	[b]	[b]
1902						
New York World	3.35	[b]	[b]	[b]	[b]	[b]
N.Y. Tenement Dept.	3.45	[b]	[b]	[b]	[b]	[b]
1907						
New York World	4.17	[b]	[b]	[b]	[b]	[b]
Chapin	3.86	[b]	[b]	[b]	[b]	[b]
1909						
Newspaper data	3.84[d]	3.27	2.48	3.49	$3.43[d]	$3.50[d]
British Board of Trade	3.83	2.71	2.81	3.08	3.63	3.82
1918						
Newspaper data	4.07	3.68	[b]	3.74	3.86	3.14
BLS Bulletin 357	3.79	3.21	[b]	3.15	3.46	3.83

[a] See Appendix F for discussion of sources and methods.

[b] Philadelphia newspaper data for 1918 were not usable. All other gaps in the table are due to lack of survey data for comparison.

[c] Manhattan only.

[d] To make size of units comparable with Board of Trade data, six-room units are omitted in New York and five-room houses are omitted in Cincinnati and St. Louis.

families; those of 1900 and 1895 were confined to slum areas. In only two cases does the newspaper rent level differ from the comparison level by more than 20 per cent. The largest difference appears in the Chicago comparison for 1900. The Chicago survey of 1900, however, was taken in three small districts with very bad housing conditions, the total area of which was only 221 acres.[39]

[39] City Homes Association, *Tenement Conditions in Chicago*, 1901, pp. 11–14 and 54.

The differences for 1918, a year of rising rents, are of the sort to be expected between rents paid under old arrangements and rents asked for vacant units. The difference in St. Louis is in the opposite direction from the others, which is consistent with the fact that our St. Louis rent index, unlike those for the other cities, falls from 1917 to 1918.

Since a constant percentage error in average rents would not affect the movement of our indexes, our chief interest in Tables 36 and 37 is in the trend of the percentage differences in the same cities.

Suppose we accept the premise that the surveys of actual rents paid are more comparable over time than, and therefore superior to, the

TABLE 37

Rent Levels from Newspaper Advertising as Percentages of Rent Levels from Survey Data, 1891–1918
(per cent)

	New York	Chicago	Philadelphia	Boston	Cincinnati	St. Louis
1891				95		
1893	91	104	82			
1900		161				
1902	97					
1907	108					
1909	100	121	88	113	94	92
1918	107	115		119	112	82

SOURCE: Computed from data in Table 36, *q.v.*

series based on advertised rents asked. What kind of bias in our indexes would this suggest? In five of the six cities it would suggest that we overstate the rise in rents—either the survey rents rise less or fall more than advertised rents. This conclusion does not seem to depend on changes in the quality or nature of the survey data. The surveys of 1902, 1893, and 1891 are based on a larger number of dwelling units than later surveys. The 1902 and 1891 data are from complete censuses of rented units. They apply to families who, on the average, were probably higher in the income distribution than those surveyed in 1907 or 1909 or than those for which we have used the 1918 data. The 1893 survey, on the other hand, was of selected slum areas, and undoubtedly covered families who, on the average, were lower in the income distribution than the families surveyed from 1907 on.

Because our newspaper data are probably more nearly comparable over time than the surveys, the upward bias in our data suggested in the preceding paragraph may not really exist. There is, however, a different reason for believing that our rent index is biased upward: our failure to control for improvement in housing quality. Both our data and the survey data just discussed undoubtedly refer to better housing at the end of the period than at the beginning. The percentage of all units with bathrooms and inside toilets increased over the period, and the percentage in brick or stone buildings also may have increased. Except in Chicago, where we exclude steam-heated units, the percentage of all units with central heating also must have been rising. An index of rents for units of constant quality would, therefore, rise less than our index.

We have very little data on changes in housing quality during the period. For New York, we can compare data for 1907 and 1918. In 1907, Chapin found that 17 per cent of 318 working-class families with incomes between $600 and $1,099 had bathrooms.[40] The BLS data of 1918 covered 224 families with annual incomes below $1,500 living in flats and apartments, of which 40 per cent had bathrooms. The data on toilets do not appear to be comparable. Chapin gives data on private toilets, BLS on inside toilets, which may often have been shared. The difference in the proportion of families with bathrooms may, of course, represent one in coverage between the two samples rather than an improvement in sanitary facilities between 1907 and 1918. However, when we compare the average rents per room from these two studies, using the same income limits as those for the comparison of the percentage with bathrooms, we find a slightly higher average rent per room in the Chapin study (see Table 36).

For Boston, we can make comparisons of quality over a longer period. The complete census of rented dwelling units for 1891 shows 92 per cent of the families having toilets and 26 per cent having bathrooms.[41] In 1918, the BLS budget study found that 372 of 373 families surveyed lived in houses or apartments having toilets, and 206 (55 per cent) in houses or apartments having bathrooms. The average rent for Boston in 1918 from Bulletin 357, as shown in Table 36,

[40] Robert Coit Chapin, *The Standard of Living Among Working Men's Families in New York City*, 1907, p. 102.

[41] Massachusetts Bureau of Labor Statistics, *Twenty-third Annual Report*, 1893, pp. 116–125. Only 47 per cent of all families had private toilets.

applies to families living in apartments and having incomes below $1,500. Of the 224 families in this group, 223 lived in apartments having toilets (not necessarily private) and 114 (51 per cent) lived in apartments having bathrooms. Thus, the percentage of working-class families surveyed having bathrooms and toilets in 1918 was higher than the percentage of all tenants having such facilities in 1891.

It seems possible to explain the major movements of our rent index for all cities combined in terms of business conditions, immigration, and new construction. The fall from 1893 to 1900 is associated with the depression of the mid-1890's, during which there was a marked fall in the level of immigration. The slowness of rents to recover is characteristic of sticky prices. The rapid rise in rents from 1900 to 1907 coincides with the great increase in immigration during these years. Net arrivals of aliens (arrivals minus departures) were 385,000 in 1900, by far the highest figure since 1893.[42] From 1903 through 1907 they exceeded 500,000 each year and reached 767,000 in 1907. There was a lull in immigration during 1908, but by 1910 net arrivals exceeded the 1907 level. Why, then, does the rent index stop rising after 1907? The explanation seems to be that the number of new nonfarm dwelling units started rose sharply in 1905 and stayed high for the next decade, even during the recession of 1908.[43] In short, from 1900 to 1907 construction lagged behind immigration and rents rose; from 1908 to 1914 immigration remained high but construction caught up and rents stabilized. This pattern of rents is unlike that of commodity prices, which continued to rise from 1907 to 1914.

Fuel and Light

Before 1907, Douglas uses the wholesale group index "fuel and lighting" as the basis for his retail index. After 1907, he uses the BLS indexes of the retail prices of coal and manufactured gas. The resulting index is unsatisfactory in several respects. It omits gas before 1907 and kerosene after 1907. Before 1907 it includes crude petroleum.

[42] See Simon Kuznets and Ernest Rubin, *Immigration and the Foreign Born*, Occasional Paper 46, New York, NBER, 1954.

[43] See David M. Blank, *The Volume of Residential Construction, 1889–1950*, Technical Paper 9, New York, NBER, 1954, p. 67. By citing the increase in the construction of nonfarm dwelling units, we do not mean to imply that many of the new units must have been occupied by immigrants or workers. As middle-class families move into new dwellings, working-class families may move into the units they vacate, and this process can relieve the pressure on rental levels for old units.

Moreover, the BLS retail index for gas after 1907 contains an error, which will be discussed below.

Our fuel and lighting index includes four fuels throughout: manufactured gas, bituminous coal, anthracite coal, and kerosene. To construct an index of the prices of manufactured gas we first corrected the BLS index for 1907–14. The original BLS index is based on data for a varying number of cities, decreasing from 37 in 1907 to 35 in 1912 and then increasing to 44 in 1913 and 1914. The gas prices for all cities were averaged in each year and index numbers were computed from these averages. However, all of the cities that were added in 1913 had rates higher than the average of the original group, so that this procedure makes the index understate the decline in prices. In correcting the index, we also used the BLS data for all cities. We computed the simple average of the percentage change in rates for illuminating gas in identical cities from April 15 to April 15 for each pair of years, and linked these averages.

The uncorrected BLS index is shown in the first column of Table 38; it has been computed from the average prices of gas shown in *Retail Prices*, 1890–1924, BLS Bulletin 396, October 1925, p. 222. (The BLS computed its index from these same average prices, but on the base 1913 = 100.) Our corrected index from the BLS data is given in the second column. Both indexes refer to the price of the first 1,000 cubic feet of gas per month. Where there was more than one gas company serving a city, the simple averages of rates by companies are used in both indexes.

To obtain data for the period before 1907, we wrote to a number of gas companies in large cities, asking for the domestic rates charged by them or their predecessors during 1890–1907. Usable replies were received from eight companies covering the following periods and cities: 1890–1907, New York, Chicago, Philadelphia, Cleveland, Baltimore, and Cincinnati; 1898–1907, Milwaukee and St. Louis.[44] The index shown in the third column of Table 38 is the simple average of the relatives for these cities, linked when the number of cities changes. For years containing a price change, the relatives are based on an average for the year, in which each rate is weighted by the

[44] The companies furnishing rate information were the Consolidated Edison Company of New York, the Peoples Gas, Light, and Coke Company (Chicago), the Philadelphia Gas Works (a division of the United Gas Improvement Company), the East Ohio Gas Company (Cleveland), the Baltimore Gas and Electric Company, the Cincinnati Gas and Electric Company, the Milwaukee Gas Light Company, and the Laclede Gas Company (St. Louis).

TABLE 38

Price Indexes of Manufactured Gas,[a] 1890–1914
(1914=100)

	BLS		*Eight*	*Final*
	Uncorrected	Corrected	*Cities*[b]	(*NBER*)
1890			149.1	147.0
1891			147.4	145.3
1892			143.8	141.7
1893			145.8	143.7
1894			133.7	131.8
1895			132.7	130.8
1896			131.6	129.7
1897			130.6	128.7
1898			130.6	128.7
1899			125.3	123.5
1900			122.0	120.3
1901			119.4	117.7
1902			119.4	117.7
1903			119.4	117.7
1904			119.0	117.3
1905			118.2	116.5
1906			114.9	113.3
1907	105.3	109.8	111.4	109.8
1908	105.3	109.2	111.4	109.2
1909	104.3	108.3	108.0	108.3
1910	103.2	106.1	108.0	106.1
1911	101.1	103.8	102.8	103.8
1912	98.9	103.0	101.8	103.0
1913	101.1	102.1	101.8	102.1
1914	100.0	100.0	100.0	100.0

SOURCE: Uncorrected BLS index: *Retail Prices, 1890–1924*, BLS Bulletin 396, October 1925, p. 222; all other indexes: see text and note 43, below.

[a] Prices for first 1,000 cubic feet per month for illumination.

[b] Seven cities after 1909; six cities before 1898.

length of time it was in effect. For the two cities that had different rates for gas for illumination and for "general use" we have used the rate for illumination.

To permit a comparison of our index from company data with the BLS index, we have continued our index to 1914. Data for the companies included in the earlier segment were taken from the BLS bulletins. Cincinnati is dropped after 1908, since only natural gas was supplied beginning July 1909. Because our index is based on a much

smaller number of observations, it is not as smooth as the corrected BLS index. However, there is a close correspondence in the trends. Our final index for gas is formed by linking the index for eight cities to the corrected BLS index at 1907.

For two reasons, our index understates the fall in gas prices paid by working-class families. First, we have not included natural gas, for lack of proper weights and sufficient information on the dates at which it was introduced. By 1914, natural gas was used in nine of the forty-nine cities covered by BLS reports, but in four of these some manufactured gas was also used. The rates per cubic foot for natural gas were much lower than those for manufactured gas, and its heat content was higher. The transition from manufactured to natural gas in a city thus represented a sharp drop in the cost of fuel.[45] The cheapness of natural gas led to its use in place of other fuels in cities where it was available. The 1918 budget study shows that in several of the cities served by natural gas the consumption of gas in thousands of cubic feet was two to four times the national average for families in the same income groups; in heat units the difference would be even larger.

The failure to account for block rates is a second, though less important, reason why our index understates the fall in gas prices. The index measures the rate for the first 1,000 cubic feet per month, though by 1918 the national average consumption for families with incomes below $1,500 was about twice this amount. At some time during our period, block rates were introduced in many cities, giving a lower rate per 1,000 cubic feet for quantities beyond some minimum amount. The introduction of block rates in the range from 1,000 cubic feet to the maximum quantities consumed by working-class families is an additional reduction in price not shown by our index. Block rates for domestic customers are unimportant for the eight sample cities before 1907; they appear only in Milwaukee for 1904–7. We do not have any data on block rates by cities for 1907–14.[46]

[45] For example, in Cincinnati in 1907 the rate for manufactured gas was 75 cents per 1,000 cubic feet for lighting and 50 cents per 1,000 cubic feet for fuel; this gas had approximately 600 btu. per cubic foot. Natural gas was introduced beginning in 1907 at 30 cents per 1,000 cubic feet, and had 1,130 btu. per cubic feet.

[46] The BLS later recomputed its index for 1907–14 on the basis of 3,000 cubic feet per month (*Retail Prices, 1890–1928*, BLS Bulletin 495, August 1929, p. 208). This index falls slightly faster than the index based on 1,000 cubic feet for 1907–11, but the difference is eliminated when the number of cities changes in 1912.

The movement of our gas index can be roughly checked by comparing it with data from the *Census of Manufactures*. This comparison is shown in Table 39. The census data are for average revenue per 1,000 cubic feet in all uses. Our data are derived from the index shown in the last column of Table 38 multiplied by 94 cents, the average price per 1,000 cubic feet in cities covered by the BLS in 1914. We have assumed no change in prices from 1889 to 1890 on the basis of data for two of the cities. The census figures fall somewhat more rapidly than ours, especially between 1889 and 1899. This undoubtedly reflects growing industrial and commercial use of gas at rates

TABLE 39

Comparison of Prices of Manufactured Gas, Census Years, 1889–1914
(dollars per 1,000 cubic feet)

	NBER[a]	*Census of Manufactures*[b]
1889	1.38	1.42
1899	1.16	1.03
1904	1.10	1.00
1909	1.02	0.92
1914	0.94	0.86

SOURCE: NBER series: see text and note 44. Census series: *Census of Manufactures, 1914*, Vol. II, p. 544.

[a] Price of first 1,000 cubic feet for domestic use—NBER price index of manufactured gas, shown in last column of Table 38, multiplied by 94 cents, the average price per 1,000 cubic feet in cities covered by the BLS in 1914.

[b] Average revenue per 1,000 cubic feet in all uses.

below domestic rates and also, perhaps, the introduction of block rates in domestic use. The effect on the level of the census series of including commercial and industrial uses is partly offset by the including of small cities, where rates were generally higher than in the large cities covered by the BLS surveys.

The first three columns of Table 40 show the remaining components of our fuel index. The two coal indexes are the BLS retail indexes beginning in 1907. To these have been linked simple averages of price relatives taken from the wholesale price index for 1890–1907. For bituminous coal, we have used the relatives for Pittsburgh (Youghiogheny) bituminous at Cincinnati, and Georges Creek semibituminous,

TABLE 40

Fuel and Light Price Indexes, 1890–1914
(1914 = 100)

	Coal		*Kerosene*	*Fuel and Light*	
	Bituminous	Anthracite		NBER[a]	Douglas[b]
1890	84	68	101	83	65
1891	92	71	89	85	61
1892	88	77	80	84	63
1893	89	78	74	84	60
1894	79	67	74	76	59
1895	78	58	93	78	66
1896	74	70	105	83	77
1897	71	74	91	80	68
1898	66	70	92	78	64
1899	72	68	89	79	73
1900	88	73	107	91	80
1901	89	81	102	92	79
1902	108	85	98	100	88
1903	122	92	118	112	108
1904	98	92	125	105	93
1905	95	92	112	101	88
1906	94	93	114	101	92
1907	98	92	114	101	95
1908	97	93	112	101	95
1909	94	93	112	100	95
1910	95	94	106	99	95
1911	96	94	86	95	95
1912	96	97	103	99	97
1913	100	101	108	102	99
1914	100	100	100	100	100

[a] A weighted average of the first three columns of this table and the last column of Table 38 (see text for underlying sources and methods).

[b] Converted to the base 1914 = 100, from Paul H. Douglas, *Real Wages in the United States, 1890–1926*, Boston, 1930, p. 38.

f.o.b., New York Harbor. The series for Georges Creek at the mine was not used; it includes no transportation, which makes up more than half the price of the same coal at New York. For anthracite, we used the series for chestnut, egg, and stove sizes. The series for broken anthracite was not used, since this is less suitable for use in stoves and home furnaces than sized coal.

Here and in our other uses of wholesale prices, we have not adopted Douglas's device of adjusting the data to a presumed retail basis. This

adjustment, as mentioned previously, is based on the differences in movement between wholesale and retail price indexes for an identical group of foods. We have no confidence that the differences between these indexes for a commodity as unlike food as coal would be at all similar. The adjustment seems as likely to introduce error as to remove it.

The index for kerosene for 1898–1914 is based on retail prices taken from the reports of the New Jersey Bureau of Industrial Statistics; to this series we have linked the wholesale price of refined petroleum, 150° fire test, water-white for 1890–98. After 1898, these two series are very similar.

We have been unable to find any price series for wood used for fuel in the period. Electricity was of negligible importance in working-class homes before World War I. The wholesale price series for matches was not used for lack of weights; expenditures on them must have been very small.

The weighting of the fuel index is made complicated by the tremendous growth in the importance of gas over the period. To use 1918 weights throughout would greatly overstate the importance of changes in gas prices early in the period, while to use 1890 weights throughout would underweight gas at the end of the period. No data were available that permitted us to derive weights for any intermediate date. We have used, therefore, varying weights obtained by computing percentage weights for 1890 and 1918 and making linear interpolations for intervening years. This is the only point in our cost-of-living index where constant weights have not been used.

The weights for 1890 and 1918 are shown in Table 41. The 1918

TABLE 41

Weights for the Fuel and Light Price Index, 1890 and 1918
(per cent)

	Coal		*Kerosene*	*Gas*
	Bituminous	Anthracite		
1890	42.91	33.66	22.17	1.26
1918	30.57	23.98	19.78	25.67

SOURCE: 1890 based on *Cost of Production: Iron, Steel, Coal, Etc., Sixth Annual Report of the Commissioner of Labor*, 1891, and *Cost of Production: The Textiles and Glass, Seventh Annual Report of the Commissioner of Labor*, 1892; 1918 based on *Cost of Living in the United States*, BLS Bulletin No. 357, p. 391.

weights are derived from the expenditures on fuel and light of families with incomes below $1,500 as shown in Bulletin 357. The expenditures are shown separately for families living in houses and in apartments, in the following categories: bituminous coal, anthracite coal, wood, gas, electricity, and "all other." We omit wood and electricity and give the weight of "all other" to kerosene. For each category, we computed for houses and apartments separately the simple average expenditure of the three income classes "under $900," "$900 and under $1,200," and "$1,200 and under $1,500." We converted these averages into two percentage distributions by categories and combined the distributions, using as weights the number of families with incomes below $1,500 living in houses and in apartments.

The weights for 1890 are derived from the *Sixth* and *Seventh Annual Reports of the Commissioner of Labor*. These reports show budgets by individual families for a considerable number of families in each of several industries. By omitting two high-wage industries, we get a group where the average income of husbands is close to that of all manufacturing workers.[47] The individual family budgets show expenditures on fuel and light separately and specify, in most cases, what kind was used. From this information we have computed the average expenditure per family on gas, coal, and kerosene. Coal was the predominant fuel and kerosene the main source of light, but small amounts of gas were used for both purposes. Expenditures on wood, frequently used for fuel, were omitted in computing our weights. Since these reports do not distinguish between bituminous and anthracite coal, we allocate the weight of coal to the two varieties in 1890 in the proportions shown by the 1918 study.

Our final price index for fuel and light is compared with Douglas's index in the last two columns of Table 40. Both become more stable after 1907, when they are based wholly on retail prices. The sharp peak in the Douglas index in 1903, resulting from a rise in the wholesale price of bituminous coal, is somewhat less pronounced in our index. The former rises considerably more than ours before 1903. The inclusion of crude petroleum in Douglas's and of gas in ours seems to be the principal source of this difference. It seems probable that a better index would rise still less than ours. The use of wholesale prices before 1907 undoubtedly biases our index upward, and the biases in our gas index work in the same direction. However, the omission of wood, the price of which probably rose relative to the

[47] See p. 78.

prices of other fuels, may work in the opposite direction. Wood accounted for roughly 18 per cent of expenditures on fuel in 1890 and roughly 11 per cent in 1918 for families with incomes below $1,500.

Other Components of the Index

Two components of our index remain to be discussed: liquor and tobacco, and all other items. For liquor and tobacco we have only the wholesale prices of three items: plug tobacco, smoking tobacco, and proof spirits. Unfortunately, we have no data before 1913 for finished whiskey or for beer, which probably accounted for most of workingmen's expenditures on liquor. Douglas[48] has combined the three available series into an index which we have used. This index gives the combined wholesale prices before Douglas's adjustment to a presumed retail basis; that is, it is not his "most probable index of the retail price of spirits and tobacco."[49]

The expenditures represented by "all other items" are very diverse. The bulk of them are for services, of which medical care and insurance are the most important. In the 1918 budgets of families in the income class $900–1,200, these accounted for two-fifths of the total. Other important expenditures for services included those for carfare, amusement, and laundry sent out. Commodities account for about one-sixth of the total. Of these, cleaning supplies, soap, and toilet articles are most important, and newspapers next.

A wholesale price series is available for laundry starch beginning in 1890, but there is none for laundry soap until 1913. It might have been possible for us to collect data from primary sources on carfares and the prices of newspapers, but in view of the small importance of these expenditures, it did not seem worthwhile. Therefore, we have not constructed any price index for "all other items."

Douglas implicitly assumes that the prices of unpriced items (rent and sundries) move with the average price of all priced items. Because of the peculiar composition of our unpriced items, in particular their heavy weighting with services, we have assumed, instead, that their prices moved with the price of all priced items other than food.[50]

[48] *Real Wages*, p. 609.

[49] *Ibid.*, p. 38.

[50] This is the same assumption made by Ethel D. Hoover in her new consumer's price index for 1860–80, though items outside the groups represented by some prices are much less important in her index than in ours (see "Retail Prices after 1850," *Trends in the American Economy in the Nineteenth Century*, Princeton University Press for NBER, 1960).

(About 40 per cent of the weight of all priced nonfoods in our index is given to rent, a payment for services.)

Weighting the Components

Of the three available budget studies (1890, 1901, and 1918), the 1901 study is the most suitable for deriving weights for the components of our index, because it lies roughly in the middle of the period we cover. Within this study, two different sets of family budgets could be used. The first set, used by Douglas and by the National Industrial Conference Board, is the set of 11,156 "normal families." A normal family as the term is used in the *Eighteenth Annual Report of the Commissioner of Labor*,[51] is one having a husband at work, a wife, not more than five children, none over 14 years of age, and no dependent, boarder, lodger, or servant; and having expenditures for rent, lighting, fuel, food, clothing, and sundries. The second possible set is that of all 25,440 families studied. (For this set, we must use the housing expenditures of tenants only, because we have no data on the movement of the costs of home ownership.) Neither Douglas nor the NICB states any reason for preferring to use the normal families. The percentage distribution of expenditures for the two sets is shown in Table 42, lines 1 and 3.

TABLE 42

Weights for the Cost-of-Living Index, 1901 Data
(per cent)

	Food	Clothing	Home Furnishings[a]	Rent	Fuel and Light	Liquor and Tobacco[a]	All Other
Normal families	43.1	13.0	3.4	18.1	5.7	3.0	13.7
Douglas, implicit weights	63.2	19.1	5.0	0.0	8.4	4.4	0.0
All families	44.1	13.4	3.4	16.7[b]	5.4	3.0	14.0
NBER implicit weights	44.1	17.9	4.5	22.3	7.2	4.0	0.0

SOURCE: Lines 1 and 3 are from *Eighteenth Annual Report of the Commissioner of Labor*, pp. 367, 505, 509, and 593; line 2 is derived from line 1 and Paul H. Douglas, *Real Wages in the United States, 1890–1926*, Boston, 1930; line 4 is derived from line 3 (see text).

[a] The expenditures on home furnishings and on liquor and tobacco are based in all cases on the budgets of 2,567 families who reported detailed expenditures.

[b] Housing expenditures based only on families in rented housing.

[51] *Report*, p. 18.

We have used the budgets for all families for three reasons: (1) the definition of normal families seems artificially restrictive and lowers the average size of these families; (2) the all-families sample is larger; (3) we estimate that the average income of husbands in normal families was slightly above that in all families, and the average income of husbands in both sets was substantially above the average annual earnings of all manufacturing workers.[52]

The differences between the two distributions of expenditures are not large; on the average, all families spent slightly more on food and clothing and less on rent and fuel than did normal families. These differences seem to arise from the smaller size of normal families, which, in turn, results from the upper limit on the age of children and the exclusion of families having dependent relatives. The average size of normal families is 3.96 persons, of all families, 4.88 persons. Food and clothing claim more of the budget in large families, leaving less for other expenditures.[53]

The largest differences between the expenditure patterns of normal families and all families are for rent and food. Our rent index rises less than most components of our total index and the food index rises more. Given the direction of the differences in expenditure patterns, this means that the use of weights based on normal families would cause our index to rise slightly less than it does.

The major differences between our weights and Douglas's are not those just discussed, but those arising from the assumptions about the prices in the sectors for which there are no price data. The assumption that the cost of unpriced items moves with that of certain priced ones is, in effect, a redistribution of weights, resulting in a new set of implicit weights for the priced items. Line 2 of Table 42 shows the implicit distribution of weights in the Douglas index after the weights for the unpriced groups, rent and all other items, are redistributed among the priced sectors in proportion to their original weight (line 2 of Table 42 is derived from the normal-family weights of line 1). Line 4 of Table 42 shows the implicit weights for our index after the weight of all other items is redistributed to the remaining nonfood

[52] The income from all sources of all families was above that of normal families because the normal families had no income from boarders and lodgers or the earnings of grown children.

[53] See *Eighteenth Annual Report*, pp. 584–585 for tables showing percentage distributions of expenditures in normal families by income class and family size. These show, within income classes as family size rises, a quite consistent fall in the share of rent in all expenditures and a rise in the shares of food and clothing.

sectors in proportion to their original weights (line 4 is derived from the all-family weights of line 3).

Because we have a rent component in our index and Douglas does not, our implicit weights are lower than his for every other sector. However, the only major difference is for food. This difference occurs because Douglas lets food share the weight of his unpriced items and we do not. Our explicit weight for food is one percentage point higher than his, yet food has 63 per cent of the total weight of his index, and only 44 per cent of the total weight of ours.

The Cost-of-Living Index as a Whole

Table 43 and Chart 7 compare two cost-of-living indexes, Douglas's and ours, and the wholesale price index. The major difference between the first two is in the extent of their rise over the full period. The Douglas index rises by one-third, ours by one-tenth. In general, ours moves later, reflecting the inclusion of sluggish rents and the use of fewer wholesale price series. The Douglas index falls from 1890 to 1894, while ours does not fall until 1893, the year in which the depression of the 1890's began. However, the fall in our index is much sharper and longer. The Douglas index begins to rise again 1896, ours not until 1900. After 1900, the movements are similar, though those of the Douglas index are all more pronounced. Our index does not reflect the recession of 1904 until 1905, and it continues to move downward from 1908 to 1909.

In comparing these indexes with the wholesale price index, two points may be noted. First, our index rises less than the wholesale price index over the full period, while Douglas's rises more. Second, Douglas's tends to lead the wholesale price index at turns (1896–97, 1904–5) while ours lags or coincides. The latter would seem to be the normal relationship between a wholesale and a consumer price index. The very heavy weight of food in the Douglas index undoubtedly accounts for these features of its relationships to the wholesale price index.

In closing the discussion of our cost-of-living index, we may examine briefly the way in which it should be interpreted. In the BLS Consumer Price Index, the weights are quantities consumed in an initial base year. Thus, it tells us how much it would cost today to buy the basket of commodities typically consumed in the base period. As is well known, such an index rises more than an index with

TABLE 43

Comparison of Cost-of-Living and Wholesale Price Indexes, 1890–1914
(1914=100)

	Cost-of-Living		*Wholesale*
	NBER	Douglas	*Price*
1890	91	75	81
1891	91	73	82
1892	91	73	76
1893	90	72	77
1894	86	70	69
1895	84	70	70
1896	84	72	66
1897	83	72	67
1898	83	72	69
1899	83	74	74
1900	84	76	80
1901	85	78	79
1902	86	80	85
1903	88	84	85
1904	89	83	86
1905	88	83	85
1906	90	86	88
1907	94	91	94
1908	92	87	91
1909	91	87	97
1910	95	92	99
1911	95	95	95
1912	97	96	101
1913	99	99	100
1914	100	100	100

SOURCE: NBER: see text; Douglas: Paul H. Douglas, *Real Wages in the United States, 1890–1926*, Boston, 1930. Wholesale prices: *Wholesale Prices, 1890–1919*, BLS Bulletin 269, July 1920, p. 15.

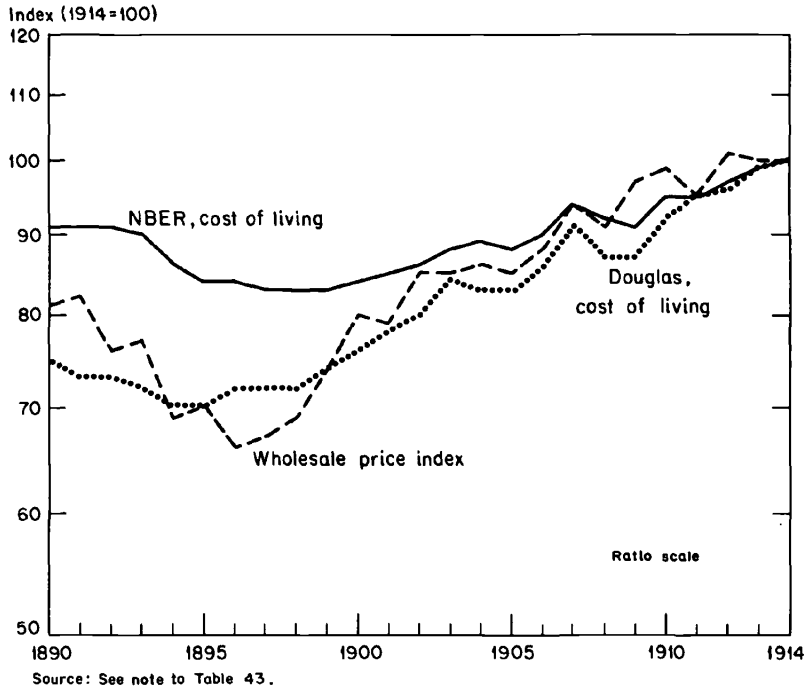
given-year quantity weights because consumers tend to buy more of the things whose prices rise least or fall most.

No such simple interpretation can be given to our index, which uses a mixed system of weights determined by the availability of data rather than by any index-number theory. Our clothing, home furnishings, and rent indexes have fixed expenditure weights with a 1918 base—that is, a base after the end of the period with which we deal. In the case of expenditure-weighted arithmetic averages of price

relatives, no general statement can be made about the bias arising from the choice of a date for the weighting base in the absence of knowledge of the relevant elasticities of demand. The fuel index uses shifting weights based on 1890 and 1918 expenditures; these weights do not create any weighting bias that can be simply stated. For the food index and the weighting of the major groups, fixed 1901 weights

CHART 7

Comparison of Cost-of-Living and Wholesale Price Indexes, 1890–1914



Source: See note to Table 43.

are used. The system of weights as a whole probably produces an index with less of an upward bias than a Laspeyres index, and perhaps one with a downward bias compared to some "ideal" index, but we cannot be sure.

The biases resulting from weighting are probably much less important than those in the measurement of prices. Here again, there are offsetting considerations. There are large differences in movement

between our series for clothing and home furnishings and comparable wholesale series. Some of these arise from differences in the items covered and in the timing of the introduction of new items. However, it is possible that these components have a downward bias of unknown origin. On the other hand, the rent index is undoubtedly biased upward by the failure to control for improvement in the quality of housing, and the fuel index is biased upward by the use of wholesale prices for coal until 1907 and by the omission of natural gas.

Our cost-of-living index in general is certainly less accurate than official indexes for more recent periods. However, the offsetting considerations just discussed do not seem to suggest a clear bias in either direction.