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INFLATION AND THE PRICE INDEXES

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LETTERS OF TRANSMITTAL

JUNE 8, 1966.

To Members of the Joint Economic Committee:

Transmitted herewith for the use of the Subcommittee on Economic Statistics in its current study of Government price statistics is a monograph prepared by Dr. Jules Backman, research professor of economics at New York University, and Martin Gainsbrugh, senior vice president of the National Industrial Conference Board. Their study was prepared for the National Industrial Conference Board under a grant from the Life Insurance Association of America.

The study is particularly pertinent to the subcommittee's study of progress being made in improving the Government price statistics, especially in the context of the present economic situation in which inflation and its measurement are matters of high national concern.

These materials do not necessarily reflect the views of the committee or any of its members.

Sincerely,

WRIGHT PATMAN,
Chairman, Joint Economic Committee.

JUNE 6, 1966.

HON. WRIGHT PATMAN,
*Chairman, Joint Economic Committee,
Congress of the United States, Washington, D.C.*

DEAR MR. CHAIRMAN: The Joint Economic Committee since its organization has had a continuing interest in all tools of economic analysis. High on the list of important measures of economic activity are the prices of the goods and services we use as individuals; the prices of the commodities which move in agriculture, commerce, and industry; and the prices of the goods we exchange with the world.

Perhaps this observation with which the Subcommittee on Economic Statistics opened its report in 1961 should have emphasized also the importance of economic measures to the tax, expenditure, and monetary policy decisions which must be made daily by public and private authorities.

Seldom has the importance of the reliability—and the confidence in the reliability—of our diagnostic tools been as apparent as it is in the current economic situation in which signs of what is popularly called "overheating" of the economy are seen on many fronts. The evidences of inflation are prompting widespread concern as to the possible need for its control by added fiscal measures, selective controls, or an even more restrictive monetary policy.

The subcommittee's hearings on the reliability and usefulness of Government price statistics, in part a review of the progress which has been made in improving these statistics in recent years, are particularly timely today when these statistics are being relied on to

determine policy action or inaction. The hearings in effect seek to answer the question, "How good are our measures for triggering anti-inflationary action?"

The subcommittee has heard testimony from a variety of expert witnesses, both in and out of Government, and in the course of its examination an extremely timely and competent study entitled "Inflation and the Price Indexes" was made available to it. This study was made by Dr. Jules Backman, research professor of economics at New York University, and Martin Gainsbrugh, senior vice president of the National Industrial Conference Board for The Conference Board under a grant from the Life Insurance Association of America. They have had the advice of an advisory committee of specialists on price measurement in Government, at leading universities, and in business. The roster of the Advisory Committee appears after the title page.

The study is a direct reflection of the deep concern which the Nation's life insurance companies and others have over the erosion of fixed sources of purchasing power and goes directly to the root of the subcommittee's concern as to which, if any, of the various price measures often cited is a dependable guide for purposes of national policy, particularly when the several indexes are not moving in harmony.

On the occasion of its earlier study, the subcommittee was fortunate to have available and made great use out of the review, appraisal, and recommendations which had been made by the Price Statistics Review Committee of the National Bureau of Economic Research at the request of the Office of Statistical Standards of the Bureau of the Budget.

The extreme timeliness of the study on measuring price inflation, or the use of price indexes for diagnosing inflation, make the present study particularly significant, not only for the subcommittee's use but for the consideration of others in and out of Government who must make decisions based upon these measures. The subcommittee has consequently felt impelled to make this study available as soon as possible as a part of its hearings, although, of course, neither the subcommittee nor its members necessarily approve or disapprove the findings or the analyses. The subcommittee does not undertake to evaluate the analysis or its recommendations beyond expressing confidence in the spirit of the work of the authors and sponsoring agencies, and underscoring the fact that decisions and action based upon these statistics are, of necessity, being forced upon consumers, businesses, and Government officials.

The subcommittee consequently appreciates the cooperation of The Conference Board in making the study available at this time. I am pleased to transmit this volume to the Joint Economic Committee as a background document for the subcommittee's hearings on the improvement of the price indexes.

Sincerely,

WILLIAM PROXMIRE,
Chairman, Subcommittee on Economic Statistics.

NATIONAL INDUSTRIAL CONFERENCE BOARD, INC.,
New York, N.Y., June 1, 1966.

HON. WILLIAM PROXMIRE,
Chairman, Subcommittee on Economic Statistics, Joint Economic Committee, Congress of the United States, Washington, D.C.

DEAR MR. CHAIRMAN: In connection with the study by your subcommittee of price indexes and the measurement of inflation, we are pleased to make available to you a manuscript which has just been completed under our auspices. In addition to our continuing desire to be helpful to the Joint Economic Committee, we particularly welcome an opportunity to make this material available because of our common interest in improving Government price statistics generally, and the current timeliness of the price measures.

Prosperity and recession alike are not without their own sets of perplexing economic problems that seemingly defy resolution. The most persistent of these throughout the broad wave of economic expansion following World War II is the upward progression of prices and the disturbing extent to which this has cut the purchasing power of the dollar. Escalation in Vietnam may have served to intensify this process, but many businessmen in general, and the financial fraternity in particular, were already deeply concerned about the advancing trend of prices well before the present pressures of partial mobilization intensified national interest in the problem.

Indeed, the study here presented is a direct reflection of the deep concern of the Nation's life insurance companies over the long-term erosion of purchasing power, particularly as it undercuts the value of the accumulated savings entrusted to them. A generous grant from the Life Insurance Association of America early last summer made it possible for The Conference Board to undertake this intensive analysis of the major indexes that are most frequently employed today to determine the extent to which this Nation's battle against inflation is being won or lost. Which, if any, of the various measures so often cited by Washington officials and others is a dependable guide for purposes of national policy, particularly when the several indexes are not moving in harmony? Are any of the existing measures, in whole or in part, sufficiently sensitive to changes in demand and supply relationships to form an early warning system of mounting or diminishing price pressure? How are the existing price measures interrelated, and what can be done to improve their usefulness, singly and collectively, as both thermometers and barometers of inflation?

The Conference Board was particularly fortunate in being able to enlist in this undertaking the services of Dr. Jules Backman, research professor of economics, New York University, and a charter member of the Board's Economic Forum. He and Martin R. Gainsbrugh, who during the past two decades have coauthored a number of Board studies, were ably assisted in this study by Gertrude Deutsch and Gregory Kipnis of the Board's research staff, and Marvin Levine of New York University.

The Trustees of the Board join me in extending our special thanks for the valuable assistance given the authors throughout this project by the Advisory Committee on Prices and Inflation. This committee, comprised of recognized specialists on price measurement in Government service, at leading universities and in business, gave freely of its time, experience, and knowledge to enrich this detailed appraisal.

The complete roster of the Advisory Committee appears on a following page. The views expressed by the authors of this report, however, are not necessarily those of the Advisory Committee or of the institutions they represent.

As time and additional grants permit, the Board proposes to prepare additional studies dealing with related aspects of this persistent problem of inflation. By way of furthering such a program, plans are underway to establish at the Board a Center for the Study of Inflation. High on the agenda for such a center is a proposed companion study by Messrs. Backman and Gainsbrugh of wages, productivity, and inflation. This project would explore not only the link between labor costs and prices but also the extent to which national wage-price guidelines here and the various "income-policies" abroad have influenced price performance. Other studies that might subsequently be undertaken by the Center would deal with the relationship between inflation and such sectors as monetary and credit policy; fiscal and budgeting policy; debt, savings, and investment, to list only a few of the areas that immediately suggest themselves for continuing research in depth.

Sincerely,

H. BRUCE PALMER,
President.

CONTENTS

	Page
I. Price Indexes and Price Inflation: The Problem and Its Setting.....	1
Groups Adversely Affected by Price Inflation.....	5
Price Inflation, 1939 to 1964.....	6
Anatomy of Price Changes, 1957-59 to December 1964.....	10
Changing Economic Environment and the Price Index.....	13
Price Trends in 1965.....	13
The Role of Price Indexes.....	15
II. Consumer Price Index.....	17
Cost-of-Living Index or Price Index?.....	20
Criticisms of the Consumer Price Index.....	22
Effect of Quality Changes.....	23
Timing of Inclusion of New Types of Outlets.....	29
Timing of Addition of New Products to CPI.....	31
Effect of Using Base Year Weights.....	33
Summary.....	34
III. Wholesale Price Index.....	35
Criticisms of WPI.....	38
Inadequate Framework of Reference.....	38
Inadequacies of Data.....	39
Changes in Quality.....	41
Summary.....	42
IV. Implicit Price Index.....	43
Shifting Weights.....	46
Failure To Allow for Changes in Output Per Man-hour in the Construction Industry.....	47
Influence of Government Sector on IPI.....	49
Summary.....	52
V. WPI-CPI Comparisons.....	53
Differences between CPI and WPI.....	53
Differences in Goods and Services Priced.....	53
Universe of Products Covered.....	54
Differences in Weights for Same Products.....	54
Different Products Represented in a Category.....	54
Specification Pricing vs. Pricing by Specification.....	55
Treatment of Excise Taxes.....	56
Geographic Coverage of Prices.....	57
Coverage in Common: CPI and WPI.....	57
Retail Prices vs. Wholesale Prices.....	59
Reasons for Greater Rise in Retail Prices.....	60
VI. WPI-CPI Cyclical Relationships.....	62
The 1913-1957 Period.....	62
The Record Since 1957.....	65
VII. The Measurement of Price Inflation.....	69
Wholesale Price Index.....	70
Implicit Price Index.....	71
Consumer Price Index.....	72
Conclusion.....	73

LIST OF TABLES

Table No.		Page
I-1.	Changes in Security Prices, Wholesale Price Index, and Consumer Price Index, By Years, 1922-1929.....	4
I-2.	Increases in Implicit Price Index, Consumer Price Index, and Wholesale Price Index, Selected Periods 1939 to 1964.....	7
I-3.	Implicit Price Index, Consumer Price Index, and Wholesale Price Index, 1958-1964.....	9

Table No.

	Page
I-4. Implicit Price Deflators for GNP Components, 4th Quarter, 1964.....	12
II-1. Relative Importance of CPI Major Groups, Selected Periods of Expenditures Studies.....	18
IV-1. Composition of the Implicit Price Deflators for Gross National Product in Terms of Base Year Weights, 1958.....	45
IV-2. Major Components of GNP for Which Implicit Price Indexes Do Not Allow for Changes in Output per Man-hour, 1958 and 1964.....	48
IV-3. Federal Civilian Compensation, 1958 and 1964.....	50
IV-4. Changes in CPI and IPI, 1954 to 1964.....	51
V-1. Price Spreads for Beef, Selected Dates, 1953 to 1963.....	61
VI-1. Percent Changes in the Wholesale Price and Consumer Price Indexes, By Cycles, 1913-1964.....	62
VI-2. Unit Labor Cost, 1957-1965.....	66
VI-3. Industrial Production, Manufacturing Sales and Income before Taxes, 1957-1965.....	67

LIST OF CHARTS

Chart No.

1. A Half Century of Price Changes.....	3
2. Security Prices, Wholesale Prices, and Consumer Prices During the Twenties.....	5
3. Price Changes from 1939 to 1964.....	8
4. Prices Since 1958: Three Measures.....	10
5. How Prices Changed from 1957-1959 to December 1964.....	11
6. Wholesale Price Index, 1955-1965.....	14
7. CPI: Relative Importance of Major Groups, Selected Periods Since World War I.....	19
8. Relative Importance of Farm Products, Foods, and Industrials in WPI, 1890 and 1960.....	36
9. WPI: Relative Importance of Major Groups, 1947 and 1960.....	37
10. Cyclical Changes in the WPI and CPI, 1913-1964.....	63

APPENDIXES

A. The Consumer Price Index (CPI).....	75
B. Wholesale Price Index (WPI).....	82
C. Implicit Price Index (IPI).....	90
D. Agricultural Price Indexes.....	107
E. Statistical Tables.....	112

INFLATION AND THE PRICE INDEXES

BY

JULES BACKMAN

AND

MARTIN R. GAINSBROUGH

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CHAPTER I

PRICE INDEXES AND PRICE INFLATION: THE PROBLEM AND ITS SETTING

The term "inflation" has been used to describe both higher price levels and their causes. When inflation is used in the causal sense it refers to an expansion of money and credit in excess of the growth in physical output (monetary inflation), large deficits in the Federal budget (fiscal inflation), and/or increases in labor costs in excess of gains in output per man-hour (wage inflation). Monetary and fiscal inflation are primarily responsible for so-called demand-pull pressures which result in "too much money chasing too little goods." Wage inflation contributes to cost-push pressures by raising unit labor costs.

When inflation is defined as higher prices (price inflation), it describes the results of the pressures created by the foregoing causal forces. It must be recognized, however, that every increase in the general level of prices should not be labeled as "price inflation" nor is it necessarily a matter of national concern. For example, when the economy is recovering from depressed conditions, previous price declines may be reversed. Such a general price rise should not be considered to be inflationary. On the other hand, general price increases in the latter stages of an expansion period are more likely to reflect inflation. Again, the general level of prices may rise because of developments affecting supply in a single sector. For example, a significant part of the price advance in 1965 reflected the decrease in the supply of livestock with the accompanying rise in prices of livestock, hides and skins, and meats.

In this study, we will be concerned primarily with the measurement of changes in the general level of prices in important sectors of the economy when such changes are associated with monetary inflation, fiscal inflation, and/or wage inflation.

Price inflation has been a recurring source of national concern since the outbreak of World War II. Between 1958 and 1964, price inflation subsided because of existing surpluses of men, money, capacity, and machines. These surpluses already had been reduced substantially prior to escalation in Vietnam. The superimposition of demands flowing from the Vietnam war helped to convert many of the remaining surpluses into full utilization and, in some instances, to scarcities. Against this background, renewed pressures for price increases developed.

In response to these developments, the Federal Reserve Board increased the discount rate to "maintain price stability" and to back up the "Government's efforts to prevent inflationary excesses from damaging an economy now carrying the added burden of military

operations in Vietnam.”¹ Similarly, President Johnson has given considerable emphasis to the importance of maintaining price stability:

One of the problems of prosperity we face in 1966 is that of achieving stability of prices and costs at full employment.

The basic precondition for price stability is a fiscal-monetary policy that deters total demand for goods and services from outrunning potential supply. * * *²

The President's concern was highlighted by the statement that if necessary “we should levy higher taxes rather than accept inflation—which is the most unjust and capricious form of taxation.”³

These citations illustrate the importance of price indexes for public policy purposes. Three indexes are most frequently employed to measure the extent of price inflation: (1) the wholesale price index (WPI), (2) the consumer price index (CPI), and (3) the implicit price index (IPI). (See chart 1 for the 50-year history of these indexes.) Despite the almost universal reliance upon these three major measures as gauges of price inflation, it is well to recognize that price inflation can develop in areas not covered by any of these series. The price system most broadly conceived includes, in addition to wholesale and retail prices of typical goods and services, the following types of prices: battleships, bombers and other materiel bought by the Armed Forces; real estate, land and construction costs; prices of securities; wages and salaries; objects of art; and interest rates. It will be recalled that the inflation in the 1920's was reflected in booming stock prices and in land booms such as that in Florida.⁴ In contrast, both wholesale and consumer prices drifted lower toward the close of that decade. (See table I-1 and chart 1.)

¹ William McChesney Martin, “The Federal Reserve's Role in the Economy,” address before 59th Annual Meeting of Life Insurance Association of America, New York City, Dec. 8, 1965, *Monthly Review*, Federal Reserve Bank of New York, December 1965, p. 257.

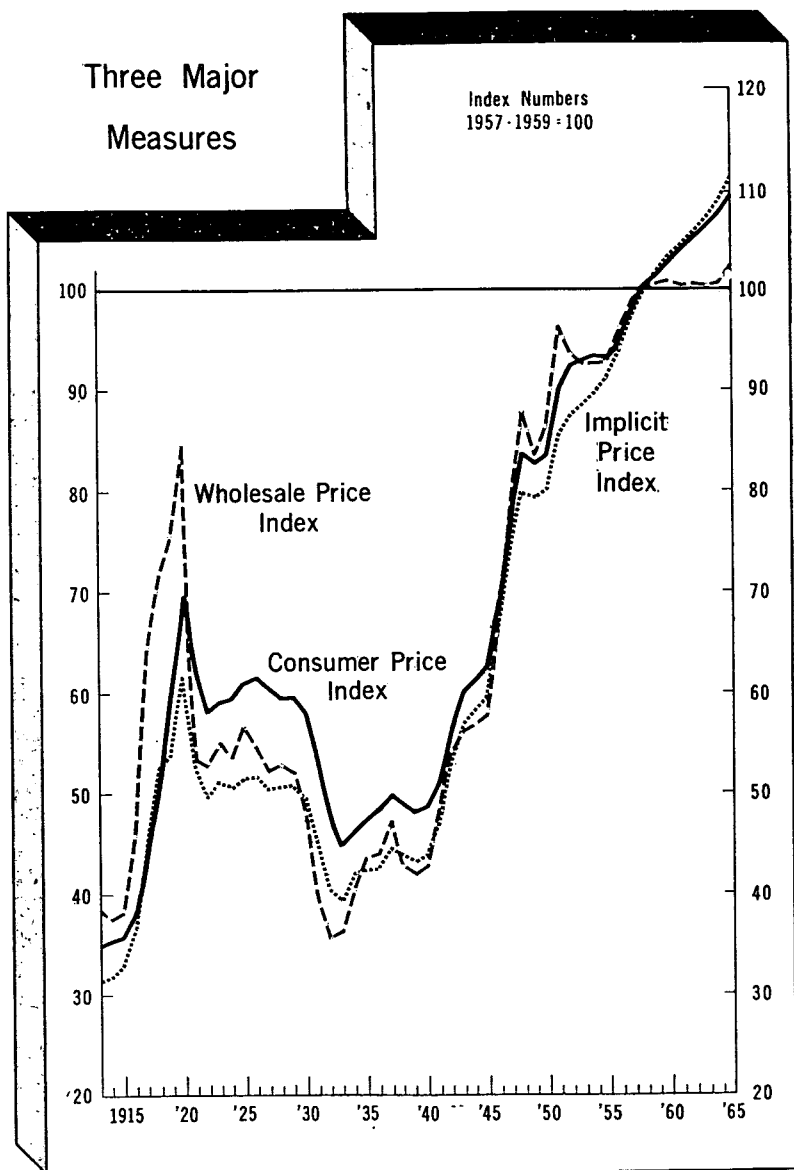
² Economic Report of the President, Washington, D.C., January 1966, p. 12.

³ *Ibid.*, p. 20.

⁴ Carl Snyder, an acute observer of the 1920's, has pointed out that such a frenetic period was characterized by “great activity, particularly of a speculative kind, that gives the illusion of more prosperity than actually exists.” He noted that such speculation was “facilitated by the ease of borrowing money at low interest rates * * *.” Carl Snyder, “Capitalism the Creator,” the Macmillan Co., New York, 1940, p. 198.

Chart 1

A Half Century of Price Changes



INFLATION AND THE PRICE INDEXES

A HALF CENTURY OF PRICE CHANGES

Inflationary pressures may develop without being fully reflected in existing price measures, at least over the short run. During World War II such pressures were partly suppressed through direct controls and did not emerge fully in the official price indexes until free market forces again became operative after the war.

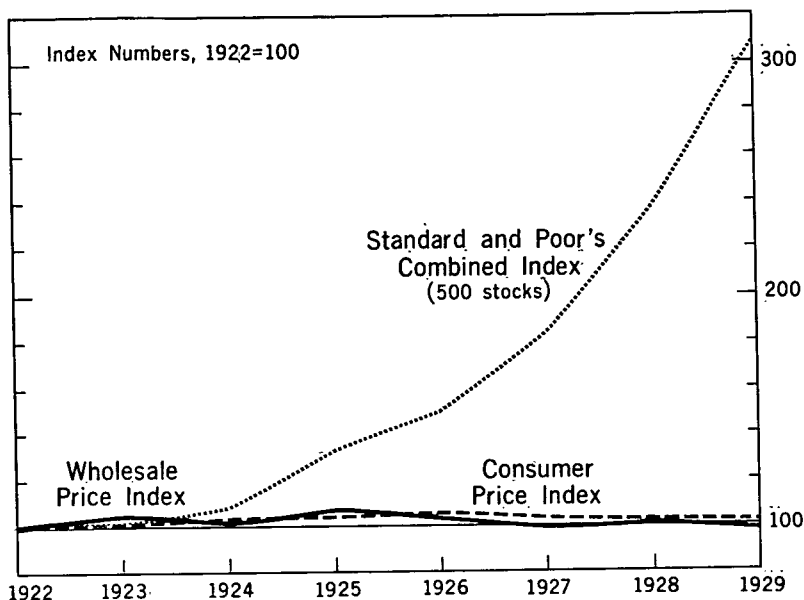
Finally, it is important to keep in mind that psychological forces play an important role in connection with price inflation. The expectation that the price level will rise often lends momentum once the rise starts. And actual increases in the price indexes, in turn, can feed an inflation psychology. Such expectations are reflected in the securities markets and may affect the inventory policies of business. Once a wave of inventory buying develops, for example, the accompanying increase in demand helps to bring about the very rise in prices against which the inventory policy seeks to hedge.

TABLE I-1.—Changes in security prices, Wholesale Price Index and Consumer Price Index, by years, 1922-1929

	Standard & Poor's Com- bined Index 500 stocks	Wholesale price index	Consumer price index
	(1941-43=10)	(1957-59=100)	
1922.....	8.41	52.9	58.4
1923.....	8.57	55.1	59.4
1924.....	9.05	53.6	59.6
1925.....	11.15	56.6	61.1
1926.....	12.59	54.8	61.6
1927.....	15.34	52.3	60.5
1928.....	19.95	53.0	59.7
1929.....	26.02	52.1	59.7
	<i>Percent change</i>		
1922-1929.....	209.4	-1.5	2.2
1925-1929.....	133.4	-8.0	-2.3

Sources: Standard and Poor's, Security Price Index Record, 1964 Edition, New York, April 1964, p. 4; U.S. Department of Labor, Bureau of Labor Statistics, Wholesale Price Index—All Commodities, 1913 Forward, Washington, D.C., p. 1; U.S. Department of Labor, Consumer Price Index—U.S.: All items, 1913 Forward, Washington, D.C., p. 1.

Chart 2
Security Prices, Wholesale Prices and
Consumer Prices During the Twenties



GROUPS ADVERSELY AFFECTED BY PRICE INFLATION

Growing numbers of persons have a stake in price stability because they cannot readily increase their incomes to compensate for higher prices. The following data are of interest in this connection:

The number receiving monthly benefits under the Federal old-age, survivors, and disability insurance program increased from 1,288,000 at the end of 1945 to 20,391,000 in September 1965.⁵

The total life insurance in force in the United States has increased from \$116 billion in 1940 to \$800 billion in 1964. At the end of 1964, over 120 million persons were covered by life insurance.⁶

At the end of 1964, about 28 million workers were covered by private pension plans and the number has continued to increase.⁷

In 1950 the number of persons 65 years and over was 12.3 million; in 1960 the total was 16.7 million. For 1970, the projected total is 19.6 million, and for 1980 the estimate is 23.1 million.⁸

For these groups, as well as government employees and others whose incomes tend to lag behind price inflation, changes in the CPI are of greatest importance. Even modest increases in consumer prices may have important adverse effects on those with fixed incomes as well as the lower income groups. Wage earners protected by escalator clauses in their contracts or by reopening clauses to renegotiate their wages are less vulnerable than formerly to price inflation. However, they

⁵ Social Security Bulletin, September 1954, p. 42, and January 1966, p. 46.

⁶ Life Insurance Fact Book, 1965, Institute of Life Insurance, New York, 1965, pp. 16, 17.

⁷ Ibid., p. 36.

⁸ U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1965, Washington, D.C., 1965, pp. 6, 23.

still can suffer a loss in the purchasing power of their savings including the value of their pensions and life insurance.

It is often forgotten that an annual increase of 1 percent in prices cumulates into a rise of 10.5 percent in a decade; a 2 percent annual increase is equal to 10.4 percent in 5 years and 21.9 percent in a decade. Such price increases represent substantial reductions in the purchasing power of the dollar. As the period is extended, the loss in purchasing power cumulates into ever larger proportions. Thus, there is reason for complaining even when price inflation creeps rather than gallops. The difficulties created are matters of degree. The disruptions to economic activity become increasingly greater, the larger the magnitude of the price inflation.

Although business concerns often are better able to protect themselves against the ravages of price inflation, they, too, may be adversely affected by steady rises in the general level of prices, particularly if they cannot make compensating adjustments. Business decisions are affected to an important extent by such developments. Attitudes toward inventory accumulation (speculative hoarding) and future plans for capital expansion will be significantly influenced by the price movements anticipated. The effort to provide protection against price inflation can distort growth patterns as companies engage in the activities most likely to conserve their assets. When major price inflations develop, price relationships are distorted, costs cannot be controlled, and the risks of doing business are increased.⁹ Unless they are protected against cost increases, producers become more reluctant to enter into future commitments. As a result, total national output would tend to fall below realizable levels. In studying these trends and adjusting accordingly, businessmen follow closely changes in both the WPI and the CPI.

PRICE INFLATION, 1939 TO 1964

World War II and the postwar years have been viewed generally as a period of marked price inflation. All three major indexes by which price inflation is gaged have more than doubled. For the past quarter of a century, the consumer price index has recorded the smallest rise, 123 percent; the implicit price index in contrast has risen by 152 percent. The increase in the wholesale price index was about halfway between the other two indexes (138 percent). The broad sweep of all three indexes has been upward and hence there can be no question that the United States has experienced a severe price inflation over the past quarter century, even though somewhat different degrees of price inflation can be derived depending upon the price index used for measurement.

Popular as it is to view the course of postwar prices against the level of 1939, it is well to remember that prices then reflected the distortions caused by the Great Depression. At that time, price comparisons of a similar nostalgic sort were made with 1926. In fact, 1926 was retained as the base period for most official price indexes for a decade or more, in the belief that price relationships were then in better balance or more "normal" than in any year following World War I. Viewed against 1926 the increases in the three major price indexes by 1964

⁹ The use of the last-in-first-out (lifo) method of costing for inventories can insulate a company in part against distortions in current operating statements caused by price changes in inventories held.

were: Consumer Price Index, 75 percent; Wholesale Price Index, 83 percent; Implicit Price Index, 113 percent.¹⁰

During World War II and the early postwar years, all three indexes advanced sharply with the major increase recorded by the WPI. Wholesale, consumer, and implicit prices all reached their first postwar peak in 1948. Partly as a result of continuing rent control and the regulatory lag in public utility rates, the CPI tended to lag behind other indexes during this period. (See table I-2 and chart 2.)

TABLE I-2.—*Increases in Implicit Price Index, Consumer Price Index, and Wholesale Price Index, selected periods 1939 to 1964*

[Percent increases]

Period	Implicit price index	Consumer price index	Wholesale price index
1939-48	84.3	73.1	108.3
1948-58	25.7	20.2	14.2
1958-64	8.9	7.3	.1
1939-64	152.2	123.3	138.2

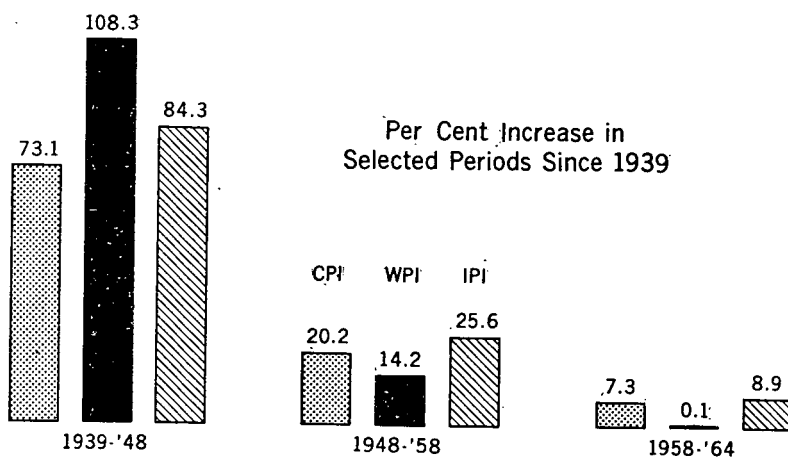
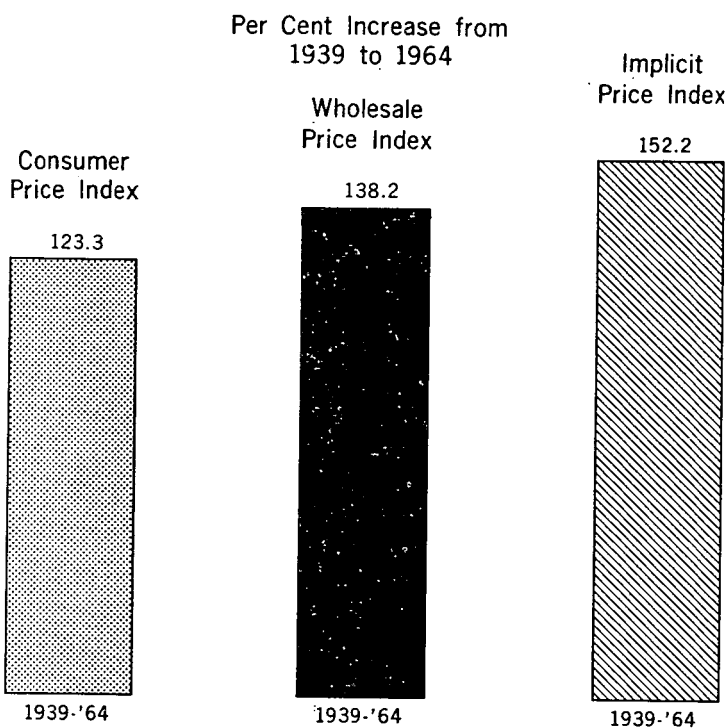
Source: Derived from appendix table E-1.

After reaching the first postwar peak in 1948, prices recorded moderate fluctuations until the Korean War started in mid-1950. During the following months, prices moved up sharply. The CPI and WPI remained relatively stable from 1952 to 1955 when new advances developed; the IPI continued to rise throughout the period. Between 1948 and 1958 and again between 1958 and 1964, the rise in the CPI was greater than that in the WPI but smaller than shown by the IPI.¹¹

¹⁰ The IPI for 1926 was estimated from unrevised data as presented by John W. Kendrick in "Productivity Trends in the United States," National Bureau of Economic Research, Princeton University Press, Princeton, N.J., 1961, pp. 295 and 297. If the change is taken from the earliest official series which begins with 1929, then the 35-year rise in the IPI is 115 percent as compared with 81 percent in the CPI and 93 percent in the WPI. The increase of 115 percent in the IPI reflects 94 percent for Personal Consumption Expenditures and 177 percent for all other sectors of GNP.

¹¹ The increase in the IPI for Personal Consumption Expenditures alone was 82.5 percent for 1939-48, 21.5 percent for 1948-58, 7.2 percent for 1958-64 and 137.7 percent for 1939-64. The closeness of the movements to those for the CPI in the two latter subperiods is indicative of the degree of consonance between these two measures of price change in recent years. It also shows that the larger rise in the IPI is attributable to changes in the nonpersonal sectors.

Chart 3
Price Changes from 1939 to 1964



It is evident that, prior to 1958 except for several years, there was never any question when price inflation was taking place because all three indexes were advancing at the same time. The only question in each period was the degree of price inflation. Between 1958 and 1964, a markedly different picture emerged. In terms of the WPI, there was little or no price inflation while the CPI and IPI advanced between 1 percent and 2 percent annually. The persistence of the annual increases in the IPI and CPI during the period since 1958 is clearly shown in table I-3 and chart 3.

TABLE I-3.—*Implicit Price Index, Consumer Price Index, Wholesale Price Index, 1958-1964*

	Implicit price index		Consumer price index		Wholesale price index	
	1957-59=100	Year-to-year change	1957-59=100	Year-to-year change	1957-59=100	Year-to-year change
		<i>Percent</i>		<i>Percent</i>		<i>Percent</i>
1958.....	100.3	-----	100.7	-----	100.4	-----
1959.....	101.9	1.6	101.5	0.8	100.6	0.2
1960.....	103.6	1.7	103.1	1.6	100.7	.1
1961.....	104.9	1.3	104.2	1.1	100.3	-.4
1962.....	106.0	1.0	105.4	1.2	100.6	.3
1963.....	107.4	1.3	106.7	1.2	100.3	-.3
1964.....	109.2	1.7	108.1	1.3	100.5	.2
Percent change 1958-64.....	8.9	¹ 1.4	7.3	¹ 1.2	.1	(²)

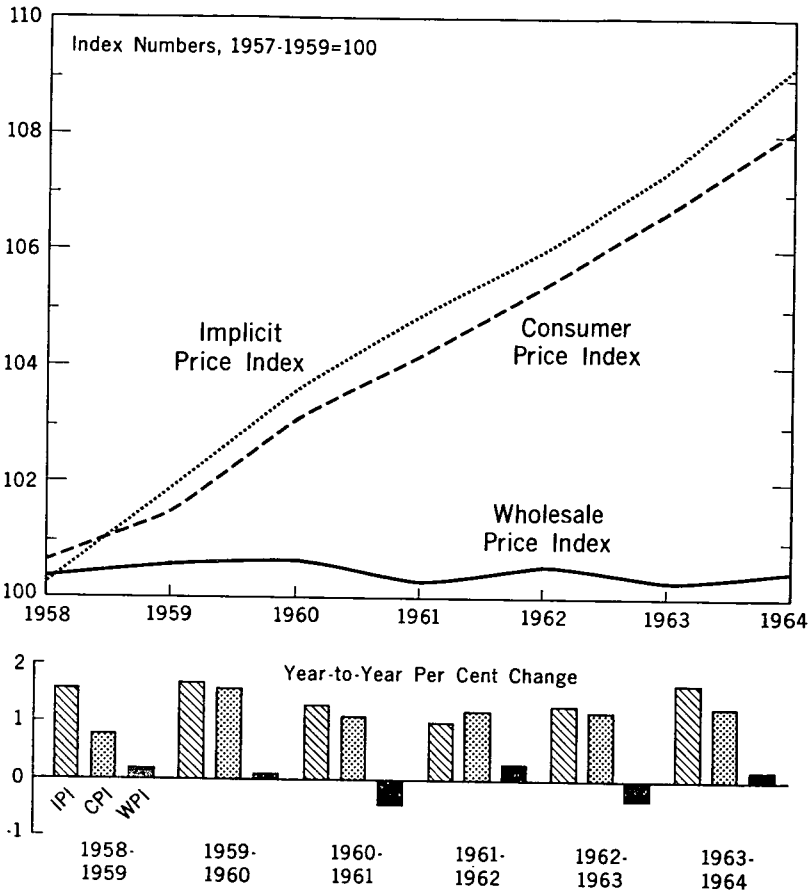
¹Annual (compound) rate.

² Less than .05 percent.

Sources: U.S. Department of Labor, Bureau of Labor Statistics and U.S. Department of Commerce.

Chart 4

Prices Since 1958: Three Measures



ANATOMY OF PRICE CHANGES, 1957-59 TO DECEMBER 1964

The overall changes reported in the CPI and the WPI over any given period reflect the net effect of varying rates of change in the components of the indexes. Chart 4¹² shows the rise in the main components and the subgroups of the CPI and WPI between 1957-59 and December 1964. (See appendix tables E-2 and E-3.)

The rise of 8.8 percent in the CPI represented increases in each of the five major groups which make up that index. These groups recorded increases ranging from 6.6 percent for apparel and upkeep to 14.3 percent for health and recreation. Prices in each of the 14 subgroups also increased—ranging from 3.3 percent for women's and girls' apparel and upkeep to 20.3 percent for medical care and public transportation. Thus, the rise in the CPI reflected a general increase in prices in every important sector covered by the index.

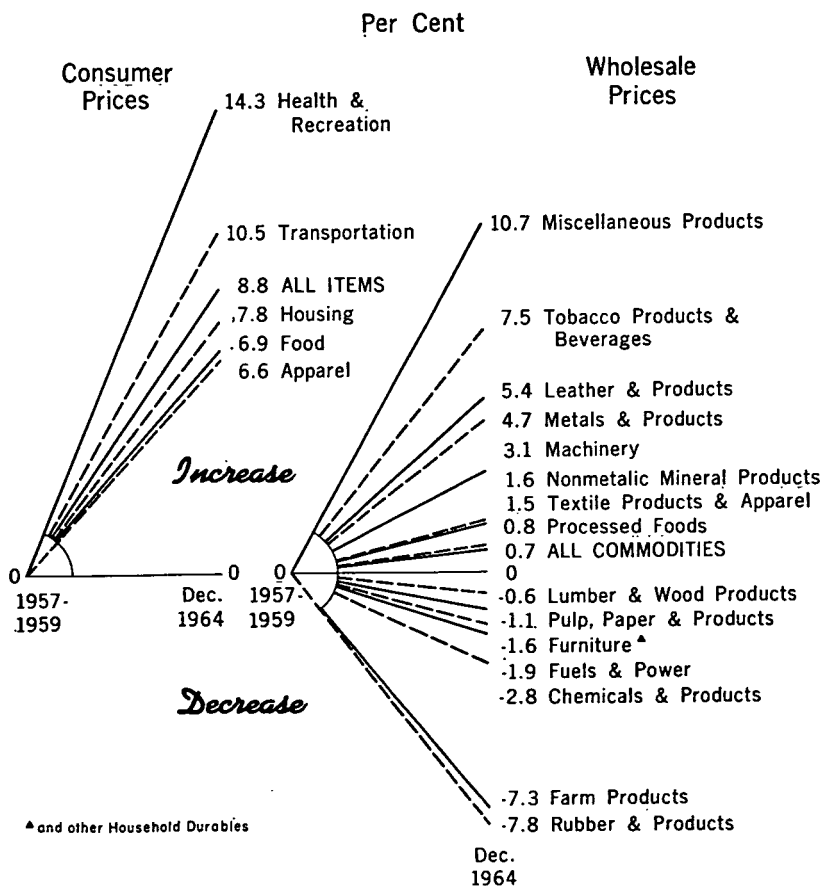
¹² The numbers shown are slightly different from those in chart 3 because that chart ended with the year 1964 while chart 4 has December 1964 as the terminal point.

The anatomy of the WPI was markedly different. As of December 1964, a rise of 0.7 percent had taken place from the 1957-59 average level. Of the 15 major groups which comprise the index, declines were recorded for 7 and increases for 8. The range of changes was between an increase of 10.7 percent for miscellaneous products and a decrease of 7.8 percent for rubber and rubber products.

It is evident that the reported stability in the WPI over this period concealed wide changes in price levels for the major groups of products. This diversity of change was in marked contrast to the increases reported for each of the major components of the CPI.

Although the WPI fluctuated within a very narrow range between 1958 and 1964, there was a marked disparity between the behavior of products by stage of processing. (See appendix table E-4.)

Chart 5
How Prices Changed from 1957-'59
to December, 1964



Change, 1958 to 1964

	Percent
Crude materials	-7.4
Intermediate products	+1.3
Finished goods	+1.0
Total index	+ .1

The nominal change reported for the WPI was the result of the decline in prices of crude materials; prices of finished goods drifted upward.

Within each major group, there were widely varying changes in the component subgroups. Thus, for example, although the index for tobacco products and bottled beverages rose 7.5 percent, prices of nonalcoholic beverages rose by 28.1 percent while the index for alcoholic beverages increased only 0.5 percent. There are 87 subgroups in the WPI. Between 1957-59 and December 1964 declines were recorded for 33 of these subgroups. Appendix table E-3 also shows that within every major groups except tobacco products and bottled beverages, there was at least one subgroup for which prices declined.

Unlike the CPI for which the overall index reflected the price increases in all major groups and their important components, the WPI reflected a wide diversity of pressures which resulted in price declines for many important groups of products.

Each of the major components of the IPI also rose. The increase ranged from 0.1 percent to 17.5 percent (see table I-4).

TABLE I-4.—*Implicit price deflators for GNP components, 4th quarter, 1964*

Item	4th quarter, 1964
Gross national product	109.6
Personal consumption expenditures	107.7
Durable goods	100.1
Nondurable goods	105.3
Services	113.6
Gross private domestic investment	108.5
Fixed investment	108.5
Nonresidential	106.6
Structures	113.0
Producers' durable equipment	103.5
Residential structures	113.4
Nonfarm	113.6
Farm	107.3
Change in business inventories .....	.....
Net exports of goods and services .....	.....
Exports	102.9
Imports	101.7
Government purchases of goods and services	117.5
Federal	114.6
State and local	120.6

Source: Department of Commerce, Survey of Current Business, August 1965, p. 53.

The stability of the WPI in the 1958-64 period, in contrast to the continued rise in the CPI and IPI, underscores the question this study is designed to explore, namely, how to measure price inflation? Public officials and others justified our fiscal and monetary policies during that period in part upon the unchanged level of the WPI. Others, particularly those concerned with the purchasing power of contractual savings or with problems of the retired or those dependent

on past savings, were concerned about the rise in the CPI in the 6-year period.

CHANGING ECONOMIC ENVIRONMENT AND THE PRICE INDEX

The price inflation of World War II and the earlier postwar years was fanned by a sharp expansion in money and credit, fiscal inflation, wage inflation,¹³ deferred demand from wartime reconstruction needs abroad, absence of foreign competition, and shortages of industrial capacity and consumer goods. All of these helped build up the pressures measured on the price gauges.¹⁴

By the mid-1950's the economic environment had become one of adjustment to peacetime competitive forces. Surplus capacity replaced tight supplies. Deferred demands were sated. Domestic and foreign competition were intensified. Pressure from higher labor costs disappeared in manufacturing industries and was significantly abated for the entire economy. Unemployment drifted upward with each new cycle and remained well above the 4-percent rate considered "frictional" in character. Although some fiscal inflation was still being federally administered under the thesis of a constructive budget deficit, its relative impact was diminished as the economy expanded in size.¹⁵

PRICE TRENDS IN 1965

In 1965, increases in demand combined with decreasing supplies of some products (for example, meats and hides) pushed some important groups of prices upward. The WPI, which had been relatively stable for 6 years, increased by 2.0 percent in 1965.¹⁶ (See chart 5.) The CPI rose 1.7 percent in 1965 or fractionally more than in the preceding few years. An increase of 4.3 percent in the wholesale prices of farm products and of 4.1 percent for processed foods was accompanied by a rise of 2.3 percent in retail food prices.¹⁷ Other groups of retail prices continued to move up, generally between 1 and 2 percent as they had been doing for several years. (See appendix table E-2.)

The new rise in the WPI reflected primarily the increase of 3.9 percent in the prices of crude materials including farm products; prices of intermediate products rose by 1.3 percent. Finished goods prices rose by 1.2 percent largely because of the increase in food prices; other nondurable goods prices advanced 1.2 percent but prices of durable goods were about unchanged. It is clear, therefore, that the size of the rise in the WPI in 1965 was significantly influenced by the higher prices for crude materials and foods. However, unlike the experience in the preceding 6 years, every component of the WPI (except furniture and other household durables which declined 0.3

¹³ Wage inflation develops when total hourly labor costs in the economy rise more than output per man-hour.

¹⁴ See Jules Backman and Martin R. Gainsbrugh, *The Forces Influencing the American Economy*, New York University, 1965, passim.

¹⁵ For example, on a national income basis, the Federal deficit of \$5.9 billion in 1954 was 1.6 percent of gross national product (\$364.8 billion) while the deficit of \$3.8 billion in 1961 was only about two-thirds of 1 percent of GNP (\$520.1 billion); the ratio in 1964 was somewhat lower.

¹⁶ The percentage increase in actual prices probably was larger because there was a considerable amount of shading of list prices prior to 1965. Since many of the products are included in the WPI at list price, the return to list price would not be measured in those instances—as the decline also was not measured. The *Wall Street Journal* (Oct. 13, 1965) summarized the types of unrecorded upward price adjustments in these words: "Common, too, are changes in such things as discounts, minimum-acceptable order sizes, charges for delivery, special services, repair of purchased equipment, and many, many more."

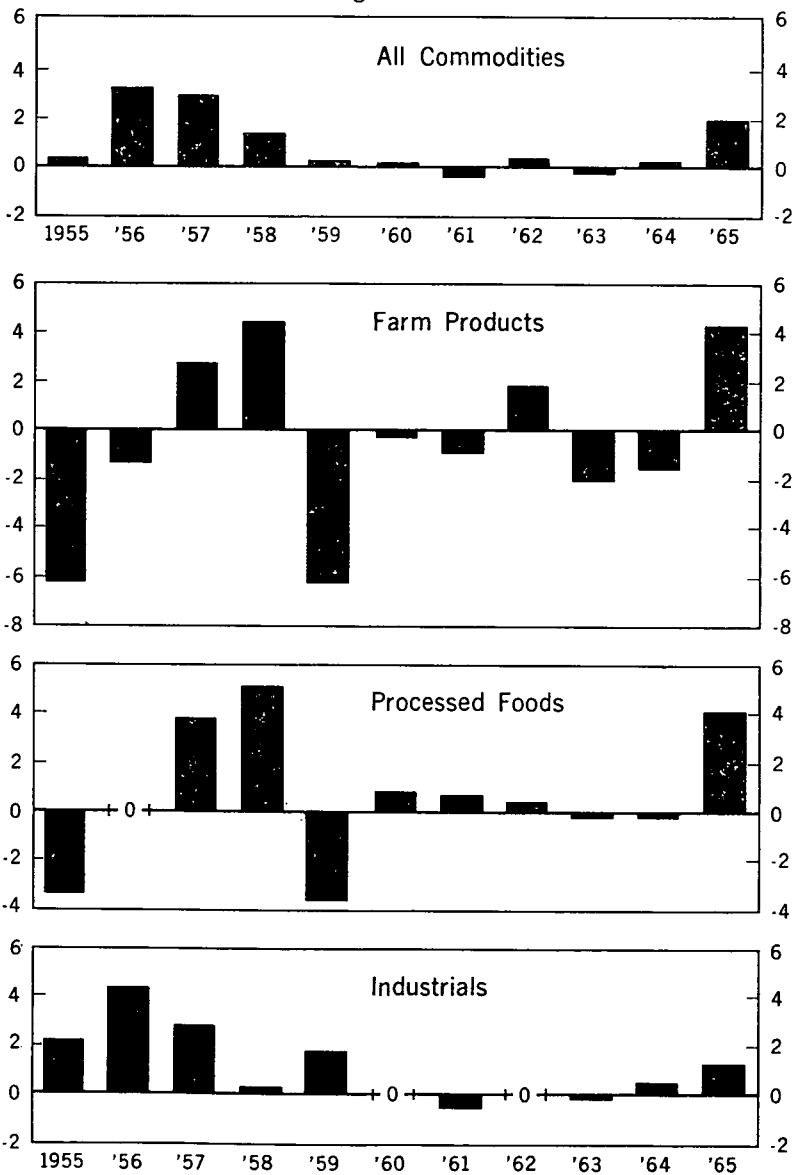
¹⁷ The rise between December 1964 and December 1965 was greater than that shown by annual averages. In that 12-month period, the WPI increased by 3.4 percent, farm products 11.1 percent, and processed foods 5.5 percent; retail food prices increased 3.5 percent.

percent and nonmetallic mineral products which remained unchanged) rose during 1965.¹⁸ (See appendix table E-3.)

Chart 6

Wholesale Price Index

Per Cent Change From Previous Year



¹⁸However, many individual prices did decline. A study of 1,418 wholesale prices showed that between October 1964 and October 1965, 19.9 percent decreased and 29.8 percent were unchanged while 50.3 percent advanced. In the preceding year (October 1963 to October 1964) the figures were 21.5 percent, 32.9 percent, and 45.6 percent, respectively. Survey of Current Business, January 1966, p. 22.

Thus, in 1965 the WPI resumed its historic relationship to the CPI by rising more rapidly. And, as often has been true in the past, the sharp rise in prices of materials, which are most responsive to changing conditions of supply and demand, led the advance. The price advance in 1965 developed against a background of economic pressures which included: a reduction in excess capacity in manufacturing industries; reduction in supplies of meats, hides, and some nonferrous metals; a tightening of labor markets; some increases in unit labor costs; a sharp rise in money and credit; and the escalation of the war in Vietnam. Government pressures to limit or to prevent price rises, particularly for aluminum, copper, and steel, and the wage-price guideposts probably helped to abort some prospective price rises in key industries.

THE ROLE OF PRICE INDEXES

Today, as in the early stages of the Korean War, such pivotal questions of national policy as the need for price or wage controls will again be influenced by judgments based on the degree of price inflation—or its absence—as reflected in the official price measures. It is all the more urgent, therefore, to be aware of the limitations and reservations surrounding each of these indexes and to understand the reasons for their diverse behavior.

Increases in the price indexes do not necessarily mean that the Nation is experiencing a general price inflation. Sometimes, the overall index moves up because of special conditions affecting a particular sector. For example, adverse weather, on occasion, has cut the supply of fruits and vegetables with dramatic effects upon their prices and, in turn, upon the total index. Similarly, the marked rise in farm products (particularly livestock) and foods (particularly meats) in 1965 reflected some decrease in supply. General monetary and fiscal restraints do not provide the tools to contain such price rises.

Similarly, in analyzing the rise in the CPI—which automatically escalates some wages and creates a demand for higher pay in other cases—one important factor is the rising cost of services. Specific measures of a structural kind, rather than monetary or fiscal action, may be needed to prevent further large rises in costs of certain services, particularly medical care. For example, an increase in training facilities to supply more workers may be indicated. In the agricultural area and for stockpiled raw materials some price changes occur as a result of Government programs. These price increases must be dealt with by changing the program rather than through monetary or fiscal policy.

By examining the changes in the sectors of an index—or even the changes in individual prices—such trouble spots can be identified so that specific measures may be devised to counteract them.

Which index or indexes should be given primary emphasis for public policy purposes? Much of the difference in viewpoint on the degree of price inflation in the early 1960's stemmed from the variance in performance of the three price indexes. In evaluating the success of the wage-price guidepost policy, or the impact of Federal stabilization programs, what price measure is most meaningful to policymakers in Government, to decisionmakers in business, and to the

average consumer? To answer these questions, it is essential to determine what is measured by each index—what they measure in common—what the differences are among them—and how all of these considerations condition their use as gages of price inflation.

This study is concerned with an analysis of the behavior and the anatomy of the three major price indexes. It does not seek to review definitively all aspects of the broader question of popular interest: Have we been experiencing price inflation? Such an analysis would necessitate a study in depth of the extent and nature of monetary and fiscal pressures, and of wage inflation. It would also involve a study of the extent to which basic inflationary pressures have been reflected in securities prices, land values, and prices other than the goods and services embraced in the three price series that are here intensively examined.

CHAPTER II

CONSUMER PRICE INDEX

The U.S. Bureau of Labor Statistics publishes each month a comprehensive index of the retail prices paid by consumers. Such an index has been calculated by the Bureau for about half a century. According to BLS:

The index covers prices of everything people buy for living: food, clothing, automobiles, homes, housefurnishings, household supplies, fuel, drugs, and recreational goods; fees to doctors, lawyers, beauty shops; rent, repair costs, transportation fares, public utility rates, etc. It deals with prices actually charged to consumers, including sales and excise taxes. It also includes real estate taxes on owned homes, but it does not include income or personal property taxes.¹

The CPI plays an important role in collective bargaining, particularly during periods of rising prices. In addition, contracts contain clauses which provide for automatic adjustments—cost-of-living escalator clauses—every 3 or 6 months.² The CPI is used to convert money wages into real wages, and thus to determine the extent to which workers are sharing in the rising levels of living. As will be noted later, a number of components of the CPI are used to build up the implicit price index. Finally, the rent component is sometimes used as part of an escalator clause in long-term leases.

Over the years, the goods and services priced, the cities surveyed, and the weights used have been changed markedly (see appendix A). The types of families whose expenditures form the basis for weighting have been altered from wage-earner families initially to middle-income wage and salary workers, including single persons living alone.

Table II-1 shows the changes in relative importance for major components of the CPI which have resulted from past consumer expenditures studies. Within less than a half-century, the share of expenditures required for food, housing, and apparel—most commonly regarded as subsistence oriented—has been cut from 85 percent to about 66 percent.³ Conversely, the remaining expenditures—largely optional in character—have more than doubled in importance, from 15 percent in 1917-19 to 33.7 percent in December 1963.

The major change was the marked reduction in relative importance of food from 40.7 percent of the total weight in the 1917-19 period to 22.4 percent in December 1963. During this period, the relative

¹ U.S. Department of Labor, Bureau of Labor Statistics, the Consumer Price Index (revised January 1964). Washington, D.C., September 1964, p. 1.

² In 1965 about 2 million workers were covered by such contracts, mainly in the automobile, automotive parts, farm and construction equipment, aerospace, trucking, and meatpacking industries. Monthly Labor Review, December 1965, p. II-1. At various times railroad workers, steelworkers, and others also have had contracts including these clauses.

³ Because of the sharp rise in food and apparel prices during World War I, the proportion of consumer expenditures accounted for by subsistence oriented goods probably was relatively high during the 1917-19 period. Between 1914 and 1917-19, the CPI increased 49.9 percent, food prices by 63.4 percent and apparel prices by 86.4 percent.

importance of transportation, medical care, personal care, and reading and recreation increased. (See table II-1 and chart 7.)

TABLE II-1.—*Relative importance of CPI major groups, selected periods of expenditures studies*

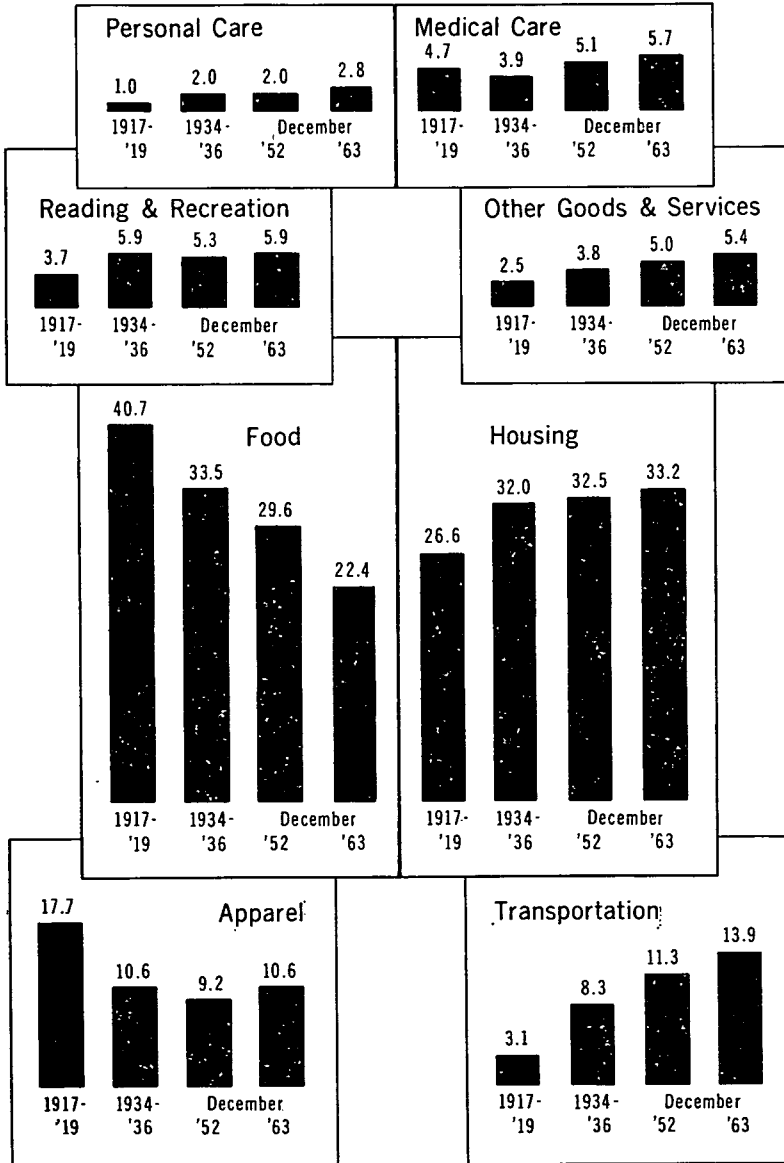
Group	1917-19	1934-36	December 1952	December 1963
All items.....	<i>Percent</i> 100.0	<i>Percent</i> 100.0	<i>Percent</i> 100.0	<i>Percent</i> 100.0
Food.....	40.7	33.5	29.6	22.4
Housing.....	26.6	32.0	32.5	33.2
Apparel.....	17.7	10.6	9.2	10.6
Transportation.....	3.1	8.3	11.3	13.9
Medical care.....	4.7	3.9	5.1	5.7
Personal care.....	1.0	2.0	2.0	2.8
Reading and recreation.....	3.7	5.9	5.3	5.9
Other goods and services.....	2.5	3.8	5.0	5.4

Sources: U.S. Department of Labor, Bureau of Labor Statistics, "Cost of Living in the United States," Bulletin No. 357, Washington, D.C., 1924, *passim*; "Money Disbursements of Wage Earners and Clerical Workers, 1934-36," Summary Volume, Bulletin No. 638, Washington, D.C., 1941, p. 2; Relative Importance of Consumer Price Index—Components, December 1962 and 1957-59 Average, and Selected Prior Periods for Major Groups, p. 1; Major Changes in the Consumer Price Index, March 1964, p. 7.

Chart 7

CPI: Relative Importance of Major Groups

Selected Periods Since World War I



Within each of the groups, moreover, major changes have been made in the kinds of goods and services priced as new products have been added or have replaced older ones.

Between major revision dates, although the weights are kept constant, the relative importance of the components changes as the prices of a group rise more or less than the average for the entire index. For example, between 1934-36 and 1947-49, the relative importance of the food component increased from 33.5 percent to 42.7 percent as food prices rose more rapidly than other prices; during the same period, the housing component declined in relative importance from 32.0 percent to 26.9 percent largely because rents lagged far behind other prices due in large part to rent control.⁴

When BLS has undertaken comprehensive revisions of the CPI, the significant changes in the types of goods and services have made it impossible to construct meaningful indexes measuring identical baskets of goods and services for extended earlier periods. Data available for the 1930's, 1950 to 1952, and for 6 months of 1964, however, suggest that for overlapping short periods, differing changes in the CPI before and after a revision were due more to changes in the composition of goods and services priced than to changes in the weights assigned to major components. (See app. A).

A review of the evolving CPI indicates that because of the changing structure of the economy care must be used in attempts to determine long-term price trends of price inflation when the CPI is used. Substantive changes in consumer incomes and the pattern of consumer spending, both in terms of the quantity and quality of goods and services acquired and in their relative weights, may limit the usefulness of long term comparisons based on the CPI. These changes in consumer spending patterns have reflected the rise in incomes that has brought millions of wage-earning families into the middle-income groups (resulting in the so-called inverted income pyramid), the marked rises in the levels of living as real incomes have risen, and the technology which yielded the host of new products which have quickly moved from the luxury class to important components of the way of life of the urban wage earner and clerical worker.

COST-OF-LIVING INDEX OR PRICE INDEX?

Because the market basket and hence the weights remain unchanged for long periods of time, a decade or more, the underlying validity of the index has been challenged by some observers. Thus, in response to changes in prices, consumers purchase different combinations of goods and services while the availability of new and improved goods as well as changing fashions result in frequent substitutions. Because of such developments, the National Bureau of Economic Research Price Statistics Review Committee suggested in 1961 that " * * * it is quite possible that the cost of maintaining a fixed standard of living has fallen despite the fact that the price of a fixed market basket has risen." Accordingly, it recommended that changes in the index be made which would " * * * modify the CPI in the direction of a welfare index," that is, one which would measure changes in the cost of

⁴ A special adjustment in the CPI in 1951 made corrections for the downward bias in the rent component.

living rather than be confined to changes in prices which affect only one element in the cost of living.⁵

There has been considerable debate among economists and statisticians as to the relative merits of a cost-of-living index and a fixed-market-basket index.⁶ In essence, a cost-of-living index would reflect both changes in prices and in the pattern of expenditures. The fixed weight index is designed to reflect primarily price changes.

Ewan Clague has distinguished between the CPI and a cost-of-living index as follows:

Since the market basket of the base period is held constant until the next weight revision, the CPI in effect maintains the pattern of expenditures of the base period in its subsequent pricing. In contrast, a cost-of-living index would hold the level of living constant but allow the pattern of expenditures (or the market basket) to change as prices or consumer preferences and the market change.⁷

That consumers change their patterns of expenditures when prices change at different rates or when new or improved products appear is a matter of common observation. Rising prices for meats, for example, can cause some consumers to shift to chicken or to fish. The sharp rise in meat prices will be reflected in a rise in the CPI although the consumer by careful substitution may be spending about the same total amount for food. In fact, he must shift to substitutes when the price rise is due to shortages. However, unless he considers these products to be perfect substitutes, he will obtain reduced satisfactions from the substitute product. Although a true cost-of-living index promptly would reflect these changes in the types of goods bought by consumers, the CPI does not do so.

Changes in the cost of living can be approximated in practice by a consumer price index. However, the important factors which a theoretical cost-of-living index would account for—substitutions in response to price change and new products (if consistent with existing taste and environmental factors)—cannot be considered in a fixed-weight CPI.

The difference between an index oriented to measuring a cost-of-living change and one oriented to measuring price changes boils down to a matter of details, mostly in handling changes in products, the timing for inclusion of new products and new outlets, and the updating of weighting patterns. As in many other problems, these decisions

⁵ "The Price Statistics of the Federal Government," prepared by the Price Statistics Review Committee of the National Bureau of Economic Research, New York, 1961, pp. 51, 55.

⁶ See, for example, Abner Hurwitz, "Constants and Compromise in the Consumer Price Index," *Journal of the American Statistical Association*, December 1962, p. 821, and Bruce D. Mudgett, *Index Numbers*, John Wiley & Sons, New York, 1951, pp. 74-5. For an exposition of the approach of the Bureau of Labor Statistics, see Sidney A. Jaffe, "The Consumer Price Index—Technical Questions and Practical Answers," in *Government Price Statistics*, pt. 2, Subcommittee on Economic Statistics, Joint Economic Committee 87th Cong., 1st sess., Washington, D.C., May 1961, pp. 603-11.

⁷ Testimony of Ewan Clague, then Commissioner of Labor Statistics, "Government Price Statistics," op. cit., pt. 2, p. 579. The CPI weights are those prevailing in the base period (Laspeyres index) while a cost-of-living index would use the current weights (Paasche index). The algebraic notation of a Laspeyres index is:

$$I_{1:0} = \frac{\sum(p_1q_0)}{\sum(p_0q_0)} \times 100$$

The "q" terms are quantities in the base time period, "0". The prices of these items in the period which the index compares are p_1 and p_0 . The ratios are multiplied by 100 to convert them to an index.

The general form of a Paasche index is:

$$I_{1:0} = \frac{\sum(p_1q_1)}{\sum(p_0q_1)} \times 100$$

The p and q are prices and quantities respectively. The subscripts 0 and 1 indicate the base period and the current period which is to be compared with it. Thus $\sum p_0q_1$ denotes the sum of the values obtained by adding up the quantities of the current period, each multiplied by its price in the base period. The composite ratio of prices must be multiplied by 100 for the index computation.

rest on judgment and there is not always a complete consensus as to the proper course of action.

It is not practical to calculate a monthly price index which allows for all shifts in purchases in response to changes in prices. However, the periodic comprehensive expenditures studies do make it possible to change the weights assigned to each product or group of products. At the time of these revisions, the CPI reflects more closely changes in the cost of living. Unfortunately, about 10 years elapsed before the last major change and an even longer period before the previous change was made. More frequent changes in base weights would overcome in part the disparity between a cost-of-living index and the CPI by shortening the time period during which a significant change in of pattern of spending is not fully reflected in the index. *The continued preparation by BLS of a consumer price index with more frequent changes in the weights appears to be more practical than an attempt to measure the actual changes in the cost of living.*⁸

CRITICISMS OF THE CONSUMER PRICE INDEX

Repeatedly, it is asserted that the CPI has overstated the actual rise in prices because of various imperfections in its compilation. These alleged imperfections are: (a) a failure of the CPI to reflect fully the quality improvements which have taken place, (b) a failure to add new items and to subtract old items from the index rapidly enough, (c) delays in reflecting the effect of new methods of distribution at lower prices (discount house and supermarket), and (d) a built-in overstatement of price rises because the index is constructed by using fixed base period weights. It has been claimed that if these defects were eliminated, the CPI might show no price inflation during much of the decade ending in 1964.

Thus, in 1958, Prof. Albert E. Rees of the University of Chicago stated: "It is certainly not inconceivable that the true level of prices is now lower than it was 5 years ago."⁹ (The price rise in that period was about 6 percent.) In 1959, the staff of the Joint Economic Committee agreed that the price indexes overstated the amount of price inflation but held that the entire rise could not be accounted for by "statistical deficiencies."¹⁰

In 1961, the NBER Price Statistics Review Committee called attention to several alleged biases in the CPI. The congressional hearings on its report contain frequent references to an alleged upward bias of the CPI. The subcommittee report concluded:

The panel of academicians * * * felt that failure to account adequately for [quality improvement and introduction of new products] may have left the Consumer Price Index with an upward bias during the last 10 years.* * * Yet, other witnesses emphasized that we do not have quantitative evidence such bias existed or that there were not offsetting factors in the opposite direction.¹¹

⁸ We recognize that more frequent consumer expenditures studies are costly but these costs are relatively small compared with the benefits to be derived from an improved CPI.

⁹ Albert E. Rees, "Price Level Stability and Economic Policy" in *Compendium on the Relationship of Prices to Economic Stability and Growth*, Joint Economic Committee, Congress of the United States, 85th Cong., 2d sess., Washington, D. C., Mar. 31, 1958, p. 656.

¹⁰ Staff Report on Employment, Growth and Price Levels, Joint Economic Committee, Congress of the United States, 86th Cong., 1st sess., Washington, D. C., Dec. 24, 1959, p. 109.

¹¹ Government Price Statistics, report of the Subcommittee on Economic Statistics of the Joint Economic Committee, Congress of the United States, 87th Cong., 1st sess., Washington, D. C., July 21, 1961, p. 10.

Early in 1965, the President's Council of Economic Advisers offered the following:

None of our price indexes can reflect all of the improvement that occurs in the quality of goods, nor can an index make allowance for the rise in the value of the dollar that comes from the development of new products * * *.

Although the effects of these factors on our price indexes cannot be measured, their direction is clear. *Their presence makes it doubtful that the actual purchasing power of the dollar changed perceptibly in the period 1961-64.*¹² [Italics added.]

It should be noted that the CEA offered no statistical evidence to support its conclusion that the reported rise of 1 to 1½ percent annually in the CPI in the 1961-64 period was fully offset by decreases in the prices of new products and improvements in quality which were not adequately reflected in the price indexes. Nor is any such statistical evidence available. At best one can make informed guesses or have hunches about the magnitude of any overstatement which is present in what may be conceded to be imperfect price indexes.

EFFECT OF QUALITY CHANGES

The measurement of changes in quality has been a persistent problem historically for all price indexes, whether or not the problem was explicitly recognized. It has become more important in recent years because technological advances have resulted in greater frequency of change and the widespread belief that the index overstates the true rise in terms of constant utility. This judgment has been enhanced by competition in product design, style, etc., rather than in price and the fact that advertising and sales efforts are directed to emphasizing the "new," the "better," and the "different." At the same time, it must be recognized that difficulties of servicing and maintaining these more complex modern products have resulted in less than satisfactory overall performance in some cases because of the poorer quality of some services. Thus, quality changes have involved deterioration as well as improvement. The identification and the measurement of these changes have been difficult both in concept and in operation.

It has been asserted that failure to allow for improvements in the quality of consumer goods and services resulted in an overstatement by a considerable margin or completely of the rise in the consumer price index through 1965. In 1961, for example, the Price Statistics Review Committee observed:

If a poll were taken of professional economists and statisticians, in all probability they would designate (and by a wide majority) the failure of the price indexes to take full account of quality changes as the most important defect in these indexes. And by almost as large a majority, they would believe that this failure introduces a systematic upward bias in the price indexes * * *. *We have very little evidence at our disposal with which to support—or deny—the belief in progressive quality improvement.*¹³ [Italics added.]

However, early in 1965 President Johnson stated:

Consumer prices have inched upward at an average rate of 1.2 percent a year since early 1961, and 1.2 percent in the past 12 months. *(Much of this increase probably reflects our inability fully to measure improvements in the quality of consumer goods and services).*¹⁴ [Italics added.]

¹² Economic Report of the President, Washington, D.C., January 1965, p. 54.

¹³ "The Price Statistics of the Federal Government," op. cit., p. 35.

¹⁴ Economic Report of the President, Washington, D.C., January 1965, p. 4.

Similarly the Chase Manhattan Bank reported:

Most experts believe that an accurate measure of quality improvements, if it could be constructed, might show an annual increase of at least 1 percent per annum, and perhaps 1½ percent or more.¹⁵

On the other hand, a BLS study in 1961 concluded:

We find no evidence to support the argument that, because of quality improvements, the all-items CPI has not properly reflected price trends in the last 5 or 10 years.¹⁶

Similarly in 1964, C. Ashley Wright, of Standard Oil Co. (N.J.), concluded:

It seems fair to say that there exists no substantial scientific basis for the commonly held view that the (consumer price) index is biased upward * * *. The weight of such evidence as exists seems to establish a slight presumption in favor of a view or views quite opposed to the prevailing one.¹⁷

Ewan Clague, former Commissioner of Labor Statistics, has emphasized that adjustments for quality changes cannot be completely separated from the mechanics of compiling the CPI:

Even if one accepts the conclusion that quality of merchandise and services available to the consumer has been steadily improving over time, one cannot then leap to the conclusion that the index is biased upward. The interaction of quality change with the index mechanics for making price comparisons must be taken into consideration * * * indications are that the procedures which have been followed in the CPI do not involve biases systematically in either direction. Under some circumstances, use of linking procedures—sometimes called splicing—tends to a downward bias in a period of rising prices.¹⁸

The claimed bias due to quality changes also has been criticized on conceptual grounds. Milton Gilbert of the Bank for International Settlement has stated:

* * * I believe these challenges are conceptually wrong; they rest on the assumption that intangible quality improvements can be brought into the sphere of quantitative measurement.¹⁹

Gilbert's position ignores the fact that some types of quality change are subject to quantitative measurement as we note later.

Types of quality change.

What is meant by "quality"? It may be defined in terms of the physical characteristics of the article or service as purchased by consumers, or in terms of its performance characteristics, that is, of the service it provides to the consumer, or in terms of how much satisfaction the consumer derives. Without clarification on these points discussion of quality can have little meaning. Among the more important types of changes in quality are the following:

1. Changes which are intangible in nature—these include changes such as those affecting style, fashions, prestige, or taste.²⁰

¹⁵ Business in Brief, July-August 1965, pp. 4-5. Adelman and Griliches concluded in 1961: "*It is not at all improbable that correctly measured there has been no real rise in the general price level since 1952.*" (Italics added.) (Between 1952 and 1960, the WPI as reported rose by 7.1 percent and the CPI by 11.5 percent). Irma Adelman and Zvi Griliches, "On An Index of Quality Change," Journal of the American Statistical Association, September 1961, p. 545. See also comments by Sherman J. Malsel and George W. Mitchell, members of the Federal Reserve Board in Recent Federal Reserve Action and Economic Policy Coordination, Hearings before the Joint Economic Committee, Congress of the United States, 89th Cong., 1st sess. Washington, D.C., December 1965, pt. 1, pp. 22, 80, and 83.

¹⁶ Ethel D. Hoover, "The CPI and Problems of Quality Change," Monthly Labor Review, November 1961, p. 1185.

¹⁷ C. Ashley Wright, "Quality Changes and the Consumer Price Index," Proceedings of the Business and Economic Statistics Section of the American Statistical Association, Washington, D.C., Dec. 27-30, 1964, p. 231.

¹⁸ "Government Price Statistics," op. cit., pt. 2, pp. 588-589.

¹⁹ Milton Gilbert, "The Problem of Quality Changes and Index Numbers," Monthly Labor Review, September 1961, p. 992. Disagreement with Gilbert's position is expressed by Zvi Griliches of the University of Chicago in "Quality Change and Index Numbers: A Critique," Monthly Labor Review, May 1962, pp. 542-544.

²⁰ Hoover, op. cit., p. 1176.

2. Changes in physical terms. Included in this category are changes which permit a consumer to derive greater enjoyment from the use of a product (for example, a radio with clearer reception or better tone) or which permit a better functioning of the product (e.g. a more efficient motor), and changes which affect size of package, accessories, type of material, weight, and calorie content.²¹

3. Lower cost for related expenditures (e.g. a wash and wear shirt which requires no expenditures for laundering). The net effect of this type of improvement in quality may be to reduce the consumer's total expenditures.

4. Lower cost for a substitute product (e.g. compact cars). The result is an immediate reduction in the cost of a given service although the quality of the substitute product may not be equal to that of the product being replaced.

5. An improved performance which permits a lower *total cost* for use of the specific good or service although the *initial purchase price* may not be reduced, or may even be increased (e.g. a tire which is useful for a greater number of miles so that the net cost per mile is reduced,²² fewer days in the hospital, improved drugs).

These changes in quality may move in the direction of deterioration as well as improvement. The impact that quality changes should have depends to a large extent upon whether the CPI is viewed as a price index or a cost-of-living index and on the techniques for handling quality changes. The intangible changes in quality in the first category are generally ruled out as immeasurable in the construction of an index like the CPI.²³ Under the present concept of the CPI, style changes which serve no purpose other than to make the product appear new and different are not considered quality changes for which adjustments should be made. Hence, any differences in prices that may be associated with such changes are reflected as price changes in the CPI. Changes in taste, however, do not affect the index since the concept requires that the same goods and services be included in the market basket over time.

The changes in physical terms, the second category, sometimes can be incorporated in the index. For example, adjustments for changes such as an improvement in the reception of a radio or a better functioning motor would be made in the CPI if BLS could find a meaningful way to approximate the monetary worth of the improvement. In connection with other types of physical change, each situation is evaluated separately. When the size of food packages changes, for example, adjustments can be made. But adjustments for such physical characteristics as flavor or color create a different problem.

Sometimes it is difficult to eliminate the effect of changes in quantity because they are so closely interrelated with other changes. For example, prior to the 1963 revision BLS included Blue Cross and Blue Shield premium rates in the index as a measure of the cost of health insurance. In computing the index, changes in coverage of benefits were excluded. "Changes attributed to increased utilization were treated as a price change." However, this approach was criticized because it "failed to eliminate the effect of increases in quantity of medical services provided." The result was to overstate the rise in prices. As part of the revision, BLS now prices the services received directly—instead of using the premiums—and thus has eliminated this bias from the CPI.²⁴

²¹ Sidney A. Jaffe, "The Consumer Price Index—Technical Questions and Practical Answers," a paper presented at the annual meeting of the American Statistical Association, December 1959, and reproduced in "Government Price Statistics," op. cit., pt. 2, p. 608.

²² The improved performance of tires reflects the great improvement in the quality of our roads as well as the intrinsic characteristics of the tire.

²³ Sidney A. Jaffe has reported that: " * * * changes in style are not evaluated and factored out of the price comparisons as quality differences." "The Statistical Structure of the Revised CPI," Monthly Labor Review, August 1964, p. 922.

²⁴ James C. Daugherty, "Health Insurance in the Revised CPI," Monthly Labor Review, November 1964, pp. 1299-1300.

The third type of quality change will tend to reduce total consumer expenditures. In time, this type of quality change will be reflected in a price index either by a reduction in the weights assigned to the related costs (e.g. laundering) and/or by adjustment for the improved quality of the new product.²⁵ Sometimes, the hoped for economies might not be realized promptly or the articles do not live up to the claims made. For example, when they were first introduced, wash and wear shirts often did not retain their wash and wear qualities after several launderings. Thus, there may be a question of timing before such new products are accompanied by a reduction in consumer expenditures.

The fourth type of quality change—lower cost for a substitute product that was not available in large quantities when base weights were determined—has a direct effect on the total cost of living. Thus, a compact car provides a lower cost means of transportation, whether or not the handling of the car is as easy or the ride is as comfortable as in a larger car. Where the quality of the lower priced substitute product is equal to that of the product it is replacing, a price index should reflect the lower price. Where the quality is significantly different, problems arise in making adjustments. If the lower price is possible only because of lower quality, it is not appropriate to compare price directly either in a price index or a cost-of-living index.

The fifth type of quality change, which reduces the total cost but not the initial purchase price, also reduces the total cost of living. A tire that is useful for 20,000 miles would cost less over time than one which can be used for only 10,000 miles if the initial cost for the latter were more than half as much.²⁶ But even this case is not clear cut because the prices paid for tires must cover the costs of providing safety, comfort, appearance, and warranty as well as mileage. The same situation prevails in connection with hospital costs for which improved quality of medical care²⁷ makes it possible for a patient with a given type of illness to be discharged from the hospital in a shorter period of time.²⁸ However, as against the savings in the cost of hospital care there may be offsetting costs such as postoperative home care, transportation costs, and so forth.

The above discussion indicates that basic to the treatment of the various types of quality change is the role or purpose assigned to the CPI. The major objective of BLS has been to maintain the CPI as a measure of price change. If the CPI were to be constructed as a cost-of-living index—a current measure of what it costs consumers to live—then all of the measurable effects of quality change would be reflected in the trends reported. On the other hand, if it is to be primarily a

²⁵ When the reduced weights are assigned, they usually are linked in so that they do not affect the level of the CPI. They will influence the significance of future price changes for the item affected.

²⁶ Gilbert criticizes this approach because it is based on "the idea that we can substitute a measure for a unit of output other than the one in which the transaction is made." Gilbert, *op. cit.*, p. 995. See also Comments by George Jaszi and Edward F. Denison in *Models of Income Determination*, Conference on Research in Income and Wealth, National Bureau of Economic Research, Princeton, N.J., 1964, pp. 409, 413.

²⁷ "The higher hospital and doctor charges reflected in the consumer price index may overstate the true increase in the cost of medical care when account is taken of the rising effectiveness of the care received. With the dramatic improvements in medical technology that have taken place over the postwar period, many patients get more real 'services' from each day's stay in the hospital, or each visit to the doctor, than before." Economic Report of the President, January 1966, p. 87.

²⁸ Gilbert criticizes the claim that the CPI should allow for improved medical care by stating: "Recovering from an illness is not a unit of output nor its cost a price for the obvious reason that the buyer does not contract for a recovery and is not even sure of getting one when he purchases medical care." Gilbert, *op. cit.*, p. 994. Griliches disagrees because "Both the direct and indirect monetary costs of [an operation] are measurable." Griliches, *op. cit.*, p. 543. Gilbert's answer is that " * * * the major misconception in this idea is the implication that, at any given stage of medical practice, there is a known basket of medical services prescribed for the treatment of a given ailment." Milton Gilbert, "Quality Change and Index Numbers: The Reply," *Monthly Labor Review*, May 1962, p. 545.

price index, many of the changes in physical characteristics will be measured in the CPI but the effect of quality changes on total expenditures will not be fully reflected in the index.

Quality of Automobiles.

Statistical studies to determine the quantitative significance of quality improvement have been made only in connection with automobiles. A study of quality changes for automobiles based upon a regression study concluded that the CPI index for automobile prices overstated by a wide margin the actual rise after adjustment is made for improvements in quality as measured by such "major numerical 'quality' variables" as horsepower, weight, and length of wheelbase.²⁹ This study covered the period ending in 1960. However, in a later study Griliches extended his data through 1961.

It is interesting to note that from 1958 to 1961, his quality indexes for automobiles recorded little change so that after his adjustment for quality change the rise in the CPI automobile index was less than 1 percent. This is approximately the same rise as that reported by BLS for the 1958-61 period.³⁰ On this basis, the alleged bias in the automobile price index did not contribute to any overstatement in the entire CPI during that period.

Moreover, beginning with the 1960 models, BLS began receiving greater cooperation from automobile manufacturers in evaluating quality changes.³¹ During the same period, the profusion of variations within each of the car categories has made it possible to match up fairly closely from year to year cars having comparable lengths, weights, and horsepower. As a result, changes in the factors measured by Griliches can be more readily incorporated in its index by BLS by selecting "comparable" cars for model year comparisons on the basis of market data. This is a more satisfactory approach than the use of regression techniques. It is probable that for the entire period since 1958, there has been little or no bias in the automobile price index in contrast to that alleged for the preceding post-World War II years.

Areas of Unchanged Quality or Quality Deterioration.

In the past, the Consumer Price Index has been affected by quality deterioration as well as by quality improvement. Thus, during World War II, the shortage of consumer goods was accompanied by quality deterioration for many products. As a result, the reported index was criticized for *understating* the rise in prices. A technical committee (headed by Wesley C. Mitchell) of the President's Cost of Living Committee made a detailed study of this problem and concluded:

* * * that family expenditures in general have not been pushed up by deterioration of qualities and price increases for the full range of qualities, more than two or three points beyond the increase indicated by the BLS index.³²

²⁹ The following "tentative" conclusion was offered: "For the 1937-60 period as a whole, quality change accounted for about one-third (using end period weights) to about three-fourths (using beginning period weights) of the recorded price change in the CPI." Zvi Griliches, "Hedonic Price Indexes for Automobiles: An Econometric Analysis of Quality Change," Staff Paper 3 in "The Price Statistics of the Federal Government," op. cit., pp. 178-179, 187, 188. The pioneering study in this area was Andrew T. Court, "Hedonic Price Indexes With Automotive Examples," in *The Dynamics of Automobile Demand*, General Motors Corp., New York, 1939. Lazare Teper has pointed out that "The so-called hedonistic approach for the elimination of quality effects does not yield unique solutions and relies on subjective quantification of quality determination." "Government Price Statistics," op. cit., pt. 2, p. 668.

³⁰ Zvi Griliches, "Notes on the Measurement of Price and Quality Changes," in "Models of Income Determination," op. cit., p. 397.

³¹ For an analysis of the BLS procedures in adjusting for quality changes of automobiles see Margaret S. Stotz, "Introductory Prices of 1966 Automobile Models," *Monthly Labor Review*, February 1966, pp. 178-81.

³² Report of the President's Committee on the Cost of Living, Office of Economic Stabilization, Washington, D.C., 1945, p. 260. For the effect on each of the major components of the index see p. 287.

It is instructive to note that despite the enormous pressures for quality deterioration during a major war, the overall impact was determined to be relatively small. The estimated understatement covered a 3-year period (January 1941 to December 1943) and was equal to 1.6 percent to 2.4 percent of the CPI or less than 1 percent a year. This record must be kept in mind when quality improvement currently is estimated to be as much as 1½ percent annually.

In recent years, it also has been noted that quality changes may create a downward bias as well as an upward bias. Thus, a Joint Economic Committee staff report in 1959 concluded “* * * that at least some counterbalancing biases are probably present in the data; changes are not always in an upward direction, nor are changes in styling always a net benefit to consumers.”³³

And a BLS study has observed:

For some of the CPI items, there is a question as to whether quality has been maintained. Curtailed schedules and increased travel time by public transportation in many cities, particularly commuter travel from suburban areas, is quality deterioration to many people. The dissatisfactions expressed on maintenance and repair of automobiles and appliances suggest that quality improvements have not been general for these services.³⁴

It should be added that there has been a deterioration in the degree and quality of many other types of services ranging from household help to services and repairs by painters, carpenters, and others. BLS also notes that: “Some consumers complain that particular products have to be replaced more often than was formerly the case, even going so far as to call the situation built-in product obsolescence.”³⁵ To the extent that inventories are thinner than in the past, consumers often find they must wait to receive the goods they desire rather than to get them at the time of purchase. This is a deterioration in service.

Price line goods provide another area of possible downward bias. As costs of materials and labor rise, prices of these goods may remain unchanged but the higher costs are absorbed by reducing quality.³⁶

Finally, there are many items for which quality appears to have recorded little or no significant change. According to BLS, these include many foods³⁷ (e.g., flour, round steak, bacon, apples, oranges, potatoes, sugar, and eggs), newspapers, proprietary drugs such as aspirin and milk of magnesia, electricity, men’s haircuts, railroad coach fares,³⁸ postage, and movie admissions.³⁹ To this list could be added mortgage interest, real estate taxes, piano lessons, magazines, alcoholic beverages, funeral services, legal services, and many others.

How important are these sectors of the economy? There is no readily available answer to this question because so much of the evaluation of quality change tends to be subjective rather than ob-

³³ Staff Report on “Employment, Growth, and Price Levels,” op. cit., p. 100.

³⁴ Hoover, op. cit., p. 1184. Many complaints are reported against auto dealers because of “shoddy, slapdash service and employee discourtesy,” *The Wall Street Journal*, Oct. 11, 1965, pp. 1, 10.

³⁵ “Government Price Statistics,” op. cit., pt. 2, p. 589. See also Vance Packard, “The Waste Makers,” Pocket Books, Inc., New York, 1963, passim. Professor Stigler, on the other hand, has concluded that built-in obsolescence is “* * * a much exaggerated phenomenon,” “Government Price Statistics,” op. cit., pt. 2, p. 543. While it may be exaggerated, it still exists.

³⁶ Wright, op. cit., p. 231. See also Jaffe, “Government Price Statistics,” op. cit., pt. 2, p. 610.

³⁷ Some foods undoubtedly have improved in purity and freshness.

³⁸ When railroads add air conditioned cars there is an improvement in the quality of the ride. However, the continuous reduction in the frequency of service in many areas and curtailment of dining services reduce the quality of the railroad service.

³⁹ Hoover, op. cit., p. 1183-84. In December 1960, these products had a weight of 15.9 percent in the CPI as compared with a weight of 2.9 percent for new cars, 2.9 percent for appliances, and 4.9 percent for medical care—the latter are the goods and services most often cited as illustrating quality improvement.

jective.⁴⁰ For what it is worth, there is tabulated below the relative weights in the CPI assigned in December 1963 to the types of goods and services listed above. There will undoubtedly be disputes over the inclusion of some items (what company or industry is willing to acknowledge that its latest model is not the best ever?). But we hasten to add that there undoubtedly are errors of exclusion as well as of inclusion. This tabulation is intended to be illustrative rather than definitive.⁴¹

Goods:

	Percent
Food (flour, round steak, bacon, frankfurters, apples, oranges, potatoes, sugar, and eggs)	2.27
Fuels .....	.73
Over-the-counter drugs .....	.50
Newspapers and magazines .....	.71
Alcoholic beverages	2.64
Total goods	6.85

Services:

Electricity	1.41
Gas	1.30
Drycleaning and pressing, laundry	1.47
Auto insurance, etc	2.64
Auto repairs .....	.98
Transit, railroad and bus fares, and taxis	1.04
Men's haircuts and women's beauty parlor	1.23
Bowling, golf, TV repair, etc .....	.99
Movies .....	.59
Mortgage interest	2.83
Funeral services .....	.28
Legal services .....	.13
Piano lessons .....	.21

Total goods

15.10

Total goods and services

21.95

In evaluating the extent of the upward quality bias annually or over time, therefore, it is necessary to keep in mind not only the offsetting deteriorations in quality of some goods and services, but also the large sectors of the economy to which the quality bias appears to have little application. As was noted earlier, BLS has been equally concerned with adjustments for quality improvement and for quality deterioration.

On net balance, there may be some upward bias because of quality improvement. But such a bias would appear to be more significant for a cost-of-living index than for a consumer price index. *There is no solidly based evidence to support the conclusion that the net quality bias was large enough to offset fully, or even to a substantial extent the steady rise in the CPI between 1958 and 1964.*

TIMING OF INCLUSION OF NEW TYPES OF OUTLETS

The development of the food chain, food supermarket, and the discount house has created a substantial number of retail establishments where prices tend to be lower for many products than in the

⁴⁰ How does one measure the quality of movies? Has the quality of foreign films been better than American movies, as some suggest? If so, are the trends offsetting?

⁴¹ This list is drawn largely from Hoover, op. cit., p. 1184.

more traditional outlets.⁴² Prices in these types of stores are reflected in the CPI, but they have not been given their full weight because of the long periods between comprehensive expenditures studies.⁴³ To the extent the CPI fails to reflect fully this shift in the pattern of distribution, the index would tend to overstate the magnitude of price increases and to understate the magnitude of price decreases over time.⁴⁴ On the basis of an examination of the experience with retail food distribution, Willard D. Arant, manager of the economic research department of Swift & Co., concluded, "Most of the reductions in consumer prices brought about by the growth of mass distribution in the United States in recent decades have not been measured by the CPI. * * * The upward bias in the index is probably a small fraction of 1 percent per year."⁴⁵

Between 1948 and 1958, the proportion of total food sales accounted for by food chainstores increased from 34 percent to 44 percent. BLS has attempted to make "a crude estimate" of the bias introduced by this factor. The changes in the food component between December 1955 and December 1961 were estimated for five cities (Atlanta, Baltimore, Cincinnati, St. Louis, and San Francisco). The BLS food price index as reported increased by 8 percent, while the index adjusted for the increased proportion of chainstore volume rose only 7.3 percent in the 6-year period. BLS concluded:

This alternate measure reflects not only price change in the same types of stores but also the price effect of the increased proportion of total food store sales by chains in the postwar period, and shifts in importance among chainstores. The difference of 0.7 percentage points in the two measures of price change over a 6-year period gives an approximate reduction of 0.1 percent per year as the effect of changes in distribution. Since food at home accounts for about one-fourth of total expenditures for all goods and services, the effect on the total U.S. CPI would be approximately 0.2 percentage points for the 6-year period, or about 0.025 percent per year * * *.⁴⁶

In this study, BLS gave main consideration to the impact of the growth in the relative importance of food chainstores rather than to independent food supermarkets.⁴⁷ Between 1953 and 1963, the number of independent supermarkets was estimated to have increased from 7,000 to 12,900.⁴⁸ To the extent prices were lower in such supermarkets,⁴⁹ the difference in the food component would be somewhat greater than shown by the BLS study.

The growth of the discount house also may contribute to an overstatement in the index resulting from changing distribution patterns.

⁴² A special BLS study of 85 foods in 5 cities showed that in 54 percent of the cases the lowest price was reported by a chainstore or large supermarket. However, "for 32 percent of the cases, prices from one or more chains or supermarkets were as high or higher than those reported by independent stores." The study warned that because of price differentials among brands "comparisons based on price for one brand per store do not provide a precise measure of differences in price levels among stores." Ethel D. Hoover and Margaret S. Stotz, "Food Distribution Changes and the CPI," *Monthly Labor Review*, January 1964, p. 59.

⁴³ The Price Statistics Review Committee recommended " * * * a study of the practical means for determining the changes in the relative importance of the various types of outlets in various marketing areas at frequent intervals." *Op cit.*, p. 58.

⁴⁴ Abner Hurwitz concludes: "For the period during which supermarket and discount merchandising became prevalent, the level of the Consumer Price Index was probably higher than a true consumer price index would have been." *Op cit.*, p. 823, fn. 5.

⁴⁵ "Government Price Statistics," *op cit.*, pt. 2, pp. 699, 701.

⁴⁶ Hoover and Stotz, *op cit.*, p. 59. See also Sidney A. Jaffe, "The Statistical Structure of the Revised CPI," *Monthly Labor Review*, August 1964, p. 923.

⁴⁷ * * * a few large independent supermarkets, formerly included in the sample of independent stores, were transferred to the chainstore category with appropriate weights," *ibid.*, p. 61.

⁴⁸ Standard and Poor, *Industry Surveys: Retail Trade—Chain Stores*, Dec. 24, 1964, p. R75 (based on a survey by Progressive Grocer).

⁴⁹ Willard D. Arant estimated in 1961 that prices in supermarkets were roughly 10 percent lower than in smaller stores. "Government Price Statistics," *op cit.*, pt. 2, pp. 699, 727.

Sales of discount stores are not compiled by the Government. Trade publications estimated the total at \$10.8 billion in 1964, as compared with \$4.6 billion in 1961.⁵⁰ These stores generally are located in the larger cities and metropolitan areas, and hence could have a somewhat larger effect upon the CPI than indicated by their total sales alone.

In connection with the 1964 revision of the CPI, BLS adjusted its pricing procedures to take into account the changing pattern of distribution. However, it has noted that "repetitive sampling at frequent intervals to take account of the gradual impact of distribution pattern changes is too costly, and a sample of stores, once selected, must be retained for a number of years."⁵¹ Thus, so long as new methods of distribution, which feature price appeal, develop and grow in relative importance, a small bias may be present in the CPI. However, the magnitude of this bias seems to be fractional, and hence should not introduce a significant distortion in the index over 5- or 10-year periods.

Moreover, in evaluating the significance of this "bias," it must be kept in mind that these newer types of outlets often provide less convenience than shopping at local neighborhood stores and offer less service than the small retailer. For example, until very recently, many discount houses offered little or no service. Often they did not have samples on the floor, permitted no returns of merchandise, and added a charge for deliveries. As the discount houses have added to the services offered, it is interesting to note that they have required larger gross margins and presumably their average prices have had to rise correspondingly.⁵² Thus, the general reduction in the quality of service offered must be considered as at least a partial offset to the lower prices available in supermarkets and chains.

TIMING OF ADDITION OF NEW PRODUCTS TO CPI

Our economy has been characterized by a continuous flow of new and improved products. The number of new products has increased dramatically as the expenditures for research and development have been expanded and as mass advertising and promotion have led to more rapid acceptance of such products. New products fall into two broad categories: (1) Those which are substantially similar to existing products and hence may provide a direct substitute for them, for example, man-made fibers, and (2) those which have not been available before, for example, television.

Products in the first group tend to be priced in line with existing products⁵³ as was true for the various broad spectrum drugs.⁵⁴ However, products of the second type may be priced at relatively higher levels in the early days of their history because of the limited supplies

⁵⁰ Standard and Poor, *Industry Survey: Retail Trade—Department, Mail Order, etc.*, June 24, 1965, p. R107 (based on a survey by Discount Merchandise).

⁵¹ Hoover and Stotz, *op. cit.*, p. 63.

⁵² Standard & Poor's has reported that the increase in services has resulted in an "increase in expense ratios of discount department stores." (Standard & Poor, *Industry Surveys*, "Retail Trade—Department, Mail Order, etc." June 24, 1965, p. R102.) In this connection, the gross margin of E. J. Korvette, Inc., has increased fairly steadily from 17.5 percent of sales in the year ending Aug. 2, 1959, to 20.3 percent in the year ending Aug. 2, 1964. (Moody's *Industrial Manual*, 1965, p. 1730.) This rise may have reflected in part a change in the mix but data are not available to determine the significance of this factor.

⁵³ Hurwitz states that some critics "place undue significance on the biasing effects of substitutes on the index." Hurwitz, *op. cit.*, p. 820.

⁵⁴ For example, price to the consumer for achromycin was \$8.50 when it was first sold in November 1953. This was the same price then charged for aureomycin which had declined in several steps from \$25 per 16 (250 milligram) capsules in 1948 to \$8.50 in 1951. Federal Trade Commission, *Economic Report on Antibiotics Manufacture*, Washington, D. C., June 1958, p. 192.

available and then be reduced in price as large scale output and mass markets develop. The prices for television sets in the earlier postwar years and of color television sets in the 1960's are illustrative.

If BLS introduces such a new product into the CPI early in its history, then the subsequent decline in its prices will result in a downward tendency for the index. If, on the other hand, a considerable period of time elapses before it is included, then this favorable impact is lost and the CPI would tend to overstate general increases in the price level or to understate the magnitude of decreases.

Prof. Albert Rees constructed *retail* price indexes for homefurnishings and clothing for the period 1890-1914. He found that his price indexes declined more or rose less than the BLS *wholesale* price indexes for the same groups of products. In part he explained this divergent behavior as follows:

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.⁵⁵

The NBER Price Statistics Review Committee concluded "that in practice the problem is decisively that of introducing new products too late and retaining old products too long."⁵⁶ It recommended that new products should be "introduced into a price index when they first appear in any of the markets patronized by the index population."⁵⁷

Ewan Clague conceded that new-products create a problem but concluded that:

The main aspect of the "new-product" problem * * * is related to innovations which occur infrequently * * *.⁵⁸

He then went on to note that:

As a practical necessity, the index maker is forced to establish procedures which restrict the sample of priced items to those which have demonstrated that they have gained some degree of acceptance by consumers, and for which availability of a continuous price history for some reasonable time into the future seems likely.⁵⁹

Obviously, some bias due to this factor is unavoidable.

In connection with the 1964 revision of the CPI, the BLS allocated consumer expenditures into 52 classes, the weights of which will remain constant. However, within a class, BLS may choose a new sample of items periodically. Sidney Jaffe of BLS points out:

This could occur when new products or new services within the group come into the market in significant dollar volume.⁶⁰

Thus, the upward bias in the CPI due to a delay in pricing new items should be smaller than in the past.

⁵⁵ Albert Rees, *Real Wages in Manufacturing, 1890-1914*, National Bureau of Economic Research, Princeton University Press, Princeton, N.J., 1961, p. 95.

⁵⁶ "The Price Statistics of the Federal Government," op. cit., p. 38. See also testimony of Martin J. Bailey of the University of Chicago in "The Relationship of Prices to Economic Stability and Growth, hearings before the Joint Economic Committee, Congress of the United States, Washington, D.C., 1958, p. 84.

⁵⁷ "The Price Statistics of the Federal Government", op. cit., pp. 52-53.

⁵⁸ Testimony in "Government Price Statistics," op. cit., pt. 2, p. 590.

⁵⁹ *Ibid.*, p. 591.

⁶⁰ Jaffe, *Monthly Labor Review*, August 1964, p. 918.

The fact that BLS is fully aware of this problem probably also should be significant in preventing a repetition of the long delays that developed in the past.⁶¹ Thus, with the passage of time, the expenditures studies have become more comprehensive and BLS has been making a larger number of changes between those studies.⁶² Nevertheless, there is a time lag built into revisions. For example, the CPI was revised in 1964 on the basis of an expenditures study covering 1960-61.

The magnitude of the upward bias attributable to the delayed inclusion of items in the index is difficult to measure. Henry Anderson estimated that "living costs have declined by about one-tenth of a percent as a result of the introduction of compacts." He also concluded, "The overall reduction in living costs due to product-line expansion may, in the course of a 5-year period, well reach a total of several percent points."⁶³

Product-line expansion may permit a consumer to meet his needs at somewhat lower cost⁶⁴ and may provide an important source of economy for some consumers. This factor probably has a greater influence upon long term than upon short term trends of the CPI. For the reasons noted above, particularly the intensified efforts of BLS to price new products early in their growth, it probably will be a less important factor in the future.

EFFECT OF USING BASE YEAR WEIGHTS

The use of base year weights in compiling the CPI tends to result in some overstatement of the actual rise during periods of advancing prices. As was noted earlier, the base weights are derived from expenditures studies which have been made at intervals of a decade or more. It is assumed that consumers continue throughout each such period the same pattern of purchases as revealed by the last expenditures study and hence that those fixed weights cannot be applied until a new study of consumer expenditures is made a number of years later. However, because of the wide variety of goods available in the American economy, consumers frequently shift among various products within a given family of products. This is particularly true among food products. Price relationships play an important role in these shifts to substitute products or to other classes of products.

Thomas R. Saving has illustrated the manner in which this bias develops as follows:

If the price of beef increases and that of pork and chicken does not, the CPI assumes that the consumer continues to purchase meats in the same proportions as he did before the price increase in beef. In reality, it is more likely that consumers will now purchase less beef and more of the other types of meats, which (at least in terms of beef) are now cheaper. Therefore, the effect of the increase in the price of beef on the cost of living will tend to be overestimated by the CPI. On the other hand, if the price of beef had fallen, with the prices of other meats remaining constant, it is likely that consumers would start consuming less

⁶¹ New automobiles were not included in the CPI until 1940 and used cars not until 1952. "The Price Statistics of the Federal Government," op. cit., p. 38.

⁶² Ewan Clague has testified that in 1960-61 BLS added to the CPI compact cars, 8 new food items, liquid detergents, and a number of new drugs. "Government Price Statistics," op. cit., pt. 2, p. 591.

⁶³ Henry Anderson, "Product Diversification and the Cost of Living," Journal of the American Statistical Association, September 1963, p. 819.

⁶⁴ Unless the new products are of poorer quality than those they replace. If the decrease in quality is less than the difference in price, then the consumer will have a lower net cost.

of the other meats and more beef. In this case the fixed-market-basket assumption leads to an underestimation of the decrease in the cost of living.⁶⁵

As this illustration shows, the changes in the weighted average price paid by the consumer would in reality increase less than shown by the index when such substitutions develop. Whether the consumer will believe that he maintains an unchanged level of living when he shifts to beef or from beef is another question.

Although there is recognition of the bias which may develop in the CPI because of changing patterns of consumption during periods of marked movements of the general price level, satisfactory data are not available to show the extent of this bias. Here again, changes in base weights at more frequent intervals would act to minimize the significance of this problem.

SUMMARY

It is impossible to determine with any precision the quantitative effect of the various criticisms discussed above. When allowance is made for the sectors of the index which are not affected and for those goods and services which appear to have experienced an offsetting deterioration in quality, *the net effect upon the entire index appears to be very minor.*

In connection with evaluating any existing bias, a much broader question is raised. Should the CPI attempt to measure changes with such minute precision that we must be concerned about fractional overstatements or understatements in the reported changes? Or does the index at best give only an approximate guide of the magnitude of actual changes in any given month or short period of time and hence the significance of small changes should not be overestimated. We have in mind the frequent headlines in recent years proclaiming that the CPI is at a new high although the actual change may have been only one-tenth of 1 percentage point.

Everyone agrees that the index is not perfect. But this conclusion does *not* have as a corollary that the imperfections invalidate the existing index. Assume, for example, that prices are reported to have risen 1.3 percent. Is it not likely that in light of the difficulties of measurement, what is really meant by the statistics is that the actual change is of the magnitude of 1 to 1½ percent?⁶⁶ And if the latter is true, how important are these alleged biases?

⁶⁵ Thomas R. Saving, "Consumer Price Index," The Michigan Economic Record, Bureau of Business and Economic Research, Michigan State University, East Lansing, Mich., March 1963, p. 1. See also William H. Kruskel and Lester G. Telser, "Food Prices and the Bureau of Labor Statistics," the Journal of Business, July 1960, pp. 258-59.

⁶⁶ Prof. Richard Ruggles has recommended that because of its "proximate nature" the CPI "should be reported in terms of full percentage points rather than in tenths of percentage points as is now done." "The Price Statistics of the Federal Government," op. cit., p. 48, fn. 8. Murray L. Weidenbaum of Boeing Airplane Co., testified he sees "some merit" to this approach. However, Lazare Teper testified he preferred the present practice of reporting changes in tenths of 1 percent. "Government Price Statistics," op. cit., pt. 2, pp. 729, 732. It must be recognized that in some periods, because of the rounding-out process, the use of full percentage points would result in changes in the index when the actual change is only a small fraction of a point. This problem could be overcome by reporting the index in a half-point range each month.

CHAPTER III

WHOLESALE PRICE INDEX

A wholesale price index compiled by the U.S. Department of Labor is available continuously since 1890. According to BLS:

"Wholesale," as used in the title of the index, refers to sales in quantities, not to prices received by wholesalers, jobbers, or distributors * * *. The prices used in constructing the index are those which apply as nearly as possible to the first significant commercial transaction in the United States. Later transactions for the same item at other stages in the distribution cycle are not included. However, as raw materials are transformed into semifinished and finished goods, the resulting products are represented according to their importance in primary markets.¹

The WPI or its components are used in many long-term contracts² to provide automatic upward or downward adjustments in prices as economic conditions change. Many companies are more interested in the components of the index than in the entire WPI since they use them "to adjust materials contract prices."³ Components of the WPI also are used in estimating the implicit price index as is noted later.

Comprehensive revisions have been made periodically in the wholesale price indexes. These are made necessary because of the dramatic changes in the structure of our dynamic economy, including the significant alterations in production methods, the steady flow of new and improved products, the shifts in foreign trade, and other developments. BLS revises the weights used in the WPI as data become available from industrial censuses every 5 years. Thus, it now keeps the index reasonably up to date in its weighting.

The coverage of the index gradually has been extended and the relative weights assigned to individual products, subgroups, and major groups have changed markedly.⁴ For example, between 1890 and 1960, the relative importance of farm products declined from 29.0 percent to 10.6 percent and food products fell from 25.5 percent to 14.0 percent. In contrast, industrial prices have increased steadily in relative importance from 45.4 percent to 75.4 percent. (See text table in appendix B and chart 8 for changes between 1890 and 1960; and chart 9 for change between 1947 and 1960.)

Since industrial prices tend to fluctuate less widely than prices of farm products and processed foods, the changes in coverage of the WPI have tended to make the index more stable. The full extent of these tendencies cannot be determined because comparable data can-

¹ U.S. Department of Labor, Bureau of Labor Statistics, "Wholesale Prices and Price Indexes, 1954-56," Bulletin No. 1411, Washington, D.C., June 1965, pp. 7, 8.

² Early in 1964 Ewan Clague reported that: "A few years ago, a survey of users of the Wholesale Price Index produced the estimate that upward of \$14 billion of contracts had provisions for adjustment of prices on the basis of WPI data." U.S. Senate, Subcommittee of the Committee on Appropriations, hearings on labor-health, education and welfare appropriations for 1965, 88th Cong., 2d sess., Washington, D.C., 1964, p. 57.

³ "A survey made by the Department of Labor indicated that 75 percent of the users wanted the price indexes by commodity groups, and that half of all users considered the prices for individual commodities essential." "The Price Statistics of the Federal Government," op. cit., p. 63.

⁴ Allan D. Searle, "Weight Revisions in the Wholesale Price Index, 1890-1960," Monthly Labor Review, February 1962, p. 181.

not be obtained for long periods of time. However, the general effect of changes in the weights of farm, food, and industrial products may be illustrated. Thus, the rise in the Wholesale Price Index from 1939 to August 1948 was 119.8 percent. If the structure of the economy had been the same as during World War I, with the same weights for these three broad groups, the rise would have been 135.3 percent. (See appendix B.) It must be emphasized that this exercise in weighting is very rough and is intended to illustrate in general terms how changes in weights may affect the index rather than to provide an exact or even approximate measure of the differences.

Chart 8

Relative Importance of Farm Products, Foods, and Industrials in WPI, 1890 and 1960

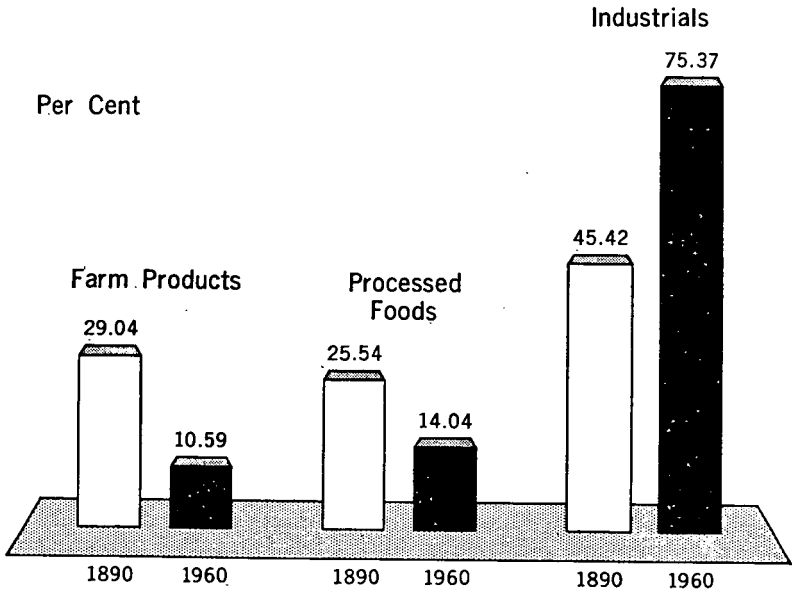
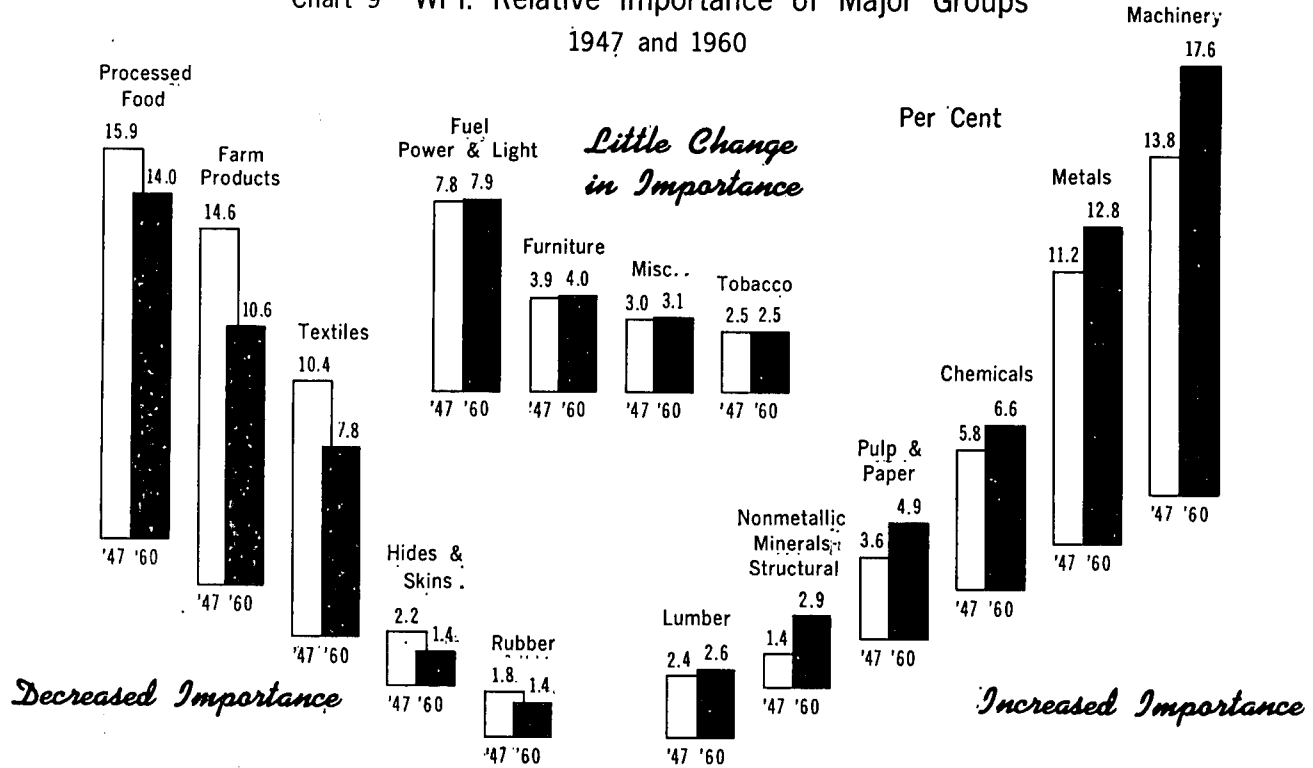


Chart 9- WPI: Relative Importance of Major Groups
1947 and 1960



CRITICISMS OF WPI

Several criticisms of the WPI have been made:

1. It lacks an adequate conceptual base or framework of reference.
2. There are inadequacies in the data collected.
3. It contains a bias because it does not reflect adequately changes in quality.

It should be noted that statistical data are not available to determine whether the impact of these alleged defects would affect the WPI to the same extent as those noted in connection with the CPI.

INADEQUATE FRAMEWORK OF REFERENCE

The WPI has been criticized because of its inadequate framework of reference. Conceptually, the WPI is not designed to be a cross-section of the economy. As the Price Statistics Review Committee has pointed out:

* * * The universe of the WPI has never been clearly defined * * * ease of collection has been a major determinant of which prices to include * * *.

From the viewpoint of economic analysis, the Wholesale Price Index does not appear to be a meaningful economic construct. The transaction coverage is not descriptive of any definable set of producers or purchasers in the economy. Nor does the present WPI universe have a logical structure of subclasses which are appropriate to the analysis of economic developments: for example, indexes of buying and selling prices of industries, which would allow analysis of changes in "value added." There is no principle to determine how many steps in the fabrication of a raw material should be included.⁵

The WPI is a composite of costs and prices. Thus, it includes prices of iron and steel scrap which are costs to the steel industry as well as the selling prices of finished steel. Similarly, it includes the prices of copper and brass, and of the plumbing equipment fabricated out of such products. When increases in the price of raw materials are passed on to intermediate goods and in turn to finished goods, an excessive weight is given in the composite index to the resulting chain of related price increases.

A complete restructuring of the index is required, including a different approach to weighting, to overcome this deficiency. It has been recommended that: "The structure of the overall index should be revised to reflect the prices of a condensed input-output table for the commodity producing industries."⁶ *This is a constructive proposal.* Although Ewan Clague testified this recommendation should be given favorable consideration, he warned that:

* * * this would entail a substantial expansion of the coverage of nonretail price statistics, that the weighting factors needed for this purpose are not now available, and that an index based on commodity groupings probably would have to be continued indefinitely, since the new form of index would not replace it for many important uses.⁷

Subsequently, BLS has prepared a number of industry-sector price indexes. These indexes initially have been "built on the price data for

⁵ "The Price Statistics of the Federal Government," op. cit., p. 64. See also H. E. Riley, "The Price Indexes of the Bureau of Labor Statistics," in compendium on "The Relationship of Prices to Economic Stability and Growth," Joint Economic Committee, Congress of the United States, 85th Cong., 2d sess., Mar. 31, 1958, p. 116. For a list of products which were not included in the WPI in 1961, see testimony of George Jaszi, "Government Price Statistics," op. cit., pt. 2, pp. 624-25.

⁶ "The Price Statistics of the Federal Government," op. cit., p. 21.

⁷ "Government Price Statistics," op. cit., pt. 2, p. 559.

individual commodities already collected for the WPI" and accordingly their scope is still "restricted." However, it has been reported that "ultimately the scope of the new BLS program will be defined in terms of the SIC system * * *."⁸ These new indexes will reduce the infirmities of the present data and should facilitate comparisons with other economic data such as output per man-hour and average hourly earnings and permit deflation of shipments and national accounts data.

The expansion of coverage of the index to cover construction, transportation, trade, and services would increase the usefulness of the composite index, especially as a deflator of that part of the total gross national product to which it applies. It would also improve considerably the usefulness of the WPI as a measure of price trends for the entire economy.

Moreover, *it would be invaluable if we could develop indexes of prices—particularly finished goods—entering into international trade. What prices are actually charged for products sold by foreign companies in this country? What prices do we charge for exports?* The serious international balance-of-payments problem of recent years and the growing intensity of foreign competition in many American markets have created the need for special purpose indexes which measure price changes that affect our international economic position. The availability of such indexes also is required to improve the quality of coverage of the IPI.

INADEQUACIES OF DATA

The WPI is a composite of prices for products with precise specifications, such as the nonferrous metals, and of products for which price information is less satisfactory. George Stigler has concluded that for electronics and machinery equipment, for example, "we frankly do not have a good system of pricing."⁹ Similarly, H. E. Riley, formerly Chief of the BLS Division of Prices and Cost of Living, reported that:

An important problem area includes heavy industrial equipment, ships, locomotives, and aircraft. Most of these products are manufactured to order, and no "market price" is established for them. Each ship differs from every other ship. Each purchaser of aircraft specifies particular features to be included in his order. The value of these unique products is included in the weight base, but their price in the current index computation is imputed to the price movement of their components or other items of a generally similar type.¹⁰

Prices are obtained from sellers rather than from the actual purchasers. Although BLS seeks to obtain actual transaction prices together with discounts and allowances¹¹ and does obtain such information for many products, it is not always successful. One reason for this failure according to Riley is that:

The use of mail-price reporting has imposed some limitations on our ability to obtain accurate data. There is evidence that some manufacturers may have allowed special discounts or sales rebates to their dealers and have not reported the fact in filling out the monthly price schedule.¹²

⁸ Bennett R. Moss, "Industry and Sector Price Indexes," Monthly Labor Review, August 1965, p. 974.

⁹ "Government Price Statistics," op. cit., pt 2, p. 544.

¹⁰ Riley, op. cit., p. 115.

¹¹ "Cash and seasonal discounts are deducted from the price when it is determined that most buyers avail themselves of the reduced prices," Bulletin, No. 1411, op. cit., p. 8.

¹² Riley, op. cit.

Thus, for some, list prices are reported rather than actual prices. A study by Martin Bailey showed that:

* * * the WPI index of steel prices rose 101.5 percent from 1947 to 1957, whereas the index of receipts per ton (calculated from numerous subclasses of steel products, with constant weights), rose only 89.3 percent.¹³

BLS has recognized this problem but has not obtained sufficient funds to be able to rectify it.

One fruitful area of research is the collection of prices actually paid by buyers so that the changes may be compared with those reported by BLS. Such a study would be particularly helpful if it covered periods from the bottom to the peak of the cycle and from the peak to the trough because it is in such time spans that the deviations from BLS reported prices probably tend to be greatest.

Some scattered efforts have been made to determine the accuracy of BLS quotations although the significance of such studies is difficult to interpret because of their very limited coverage. Prof. Harry E. McAllister of Washington State University attempted to determine the validity of using WPI data to measure short-term fluctuations in prices by comparing those prices with prices actually paid by purchasers. In connection with this study, he warned that:

* * * purchasing agents bargain on packaging and transportation costs as well as the cost of the commodity itself in the buying of items. A change in any one of these three elements of cost is considered by the purchasing agent to be a price change.¹⁴

These limitations must be kept in mind in connection with McAllister's conclusions:

* * * 43 items were considered that showed price stability for the BLS series for six consecutive months or more during the 1957-59 period. For 12 of these 43 products, the company experience was identical with that for the BLS—no price changes were observed. The others did, however, show differences in their movements with the company series exhibiting on the average about twice as many price changes and an amplitude about 40 percent greater * * *.¹⁵

Among the developments which result in deviations from list prices are the sale of only small lots at the list price, adjustment of delivery terms, shipment of larger quantities than called for by the invoice, use of different trade names, offering varying concessions to different buyers, and so forth.¹⁶

One study has attempted to evaluate the adequacy of BLS wholesale prices by comparing them with prices quoted in bids for government contracts. The evidence compiled was "limited in time, frequency of observations, and in commodity coverage." However, the study concluded "* * * within these limits there are important differences in level, frequency, and magnitude of change between the BLS series and the contract price series."¹⁷

There are many weaknesses to using bids on government contracts to check on the accuracy of wholesale prices. These have been well summarized by Lazare Teper as follows:

¹³ Cited in "The Price Statistics of the Federal Government," op. cit., p. 70.

¹⁴ Harry E. McAllister, "Statistical Factors Affecting the Stability of the Wholesale and Consumers' Price Indexes," Staff Paper 8, in "The Price Statistics of the Federal Government," op. cit., p. 394, fn. 9.

¹⁵ *Ibid.*, p. 394.

¹⁶ John A. Flueck, "A Study in Validity: BLS Wholesale Price Quotations," Staff Paper 9, in "The Price Statistics of the Federal Government," op. cit., pp. 422-424, 431. For a number of illustrations of price shading in the years 1963 to 1965 see Testimony of Jules Backman in Hearings on Economic Concentration before the Subcommittee on Antitrust and Monopoly, Committee on the Judiciary, U.S. Senate, pt. 2, 89th Cong., 1st sess., Mar. 17, 1965, pp. 571-72, 896-98. See also United States Steel Corporation, 1964 Annual Report, p. 5.

¹⁷ Flueck, op. cit., p. 431.

* * * items purchased by the Government may vary in specifications, quantities bought and terms of payments, to cite but a few factors. Not infrequently, high bids are made solely for the purpose of remaining on the bidders' lists and not with a view of getting or trying to get an award. As such they do not provide realistic quotations of prices but merely serve to represent the bidder's interest in future bids. Low bids offer another extreme, such as a desire of a company to utilize a part of its otherwise unused capacity without affecting price levels in the civilian markets. Bid prices are also frequently related to other conditions (a given price may be quoted only if the entire contract is awarded to the bidder; several prices may be quoted for the different fractional quantities of the proposed award, with price not infrequently rising the larger the awarded quantity).¹⁵

A detailed study of electrical apparatus prices between 1954 and 1959 "revealed dramatic differences" between the BLS index and the actual prices for a common power circuit breaker and for other types of apparatus. Dean and DePodwin concluded that the difference between catalog prices and actual prices " * * * is demonstrably so great that any conclusions about short-term price rigidity, or 'administered prices' drawn from the BLS Wholesale Price Index are clearly faulty."¹⁹ Despite large "white sales"—sales at sharp discounts from list prices to public utility customers—of electrical apparatus in 1954 and in 1958, the BLS index for these products remained relatively unchanged. The general stability of the BLS index for electrical apparatus during such periods suggests it reflected largely list prices rather than actual prices.²⁰ Moreover, price comparisons over time are difficult to make because heavy electrical products so frequently incorporate significant technical changes.

Finally, important questions have been raised about the price collection procedures. The NBER Price Statistics Review Committee has pointed out that:

When frequency of price change is tabulated against number of reporters from whom the prices are collected, it is found that the frequency of price change for intermediate and finished manufacturers is twice as great if there are three or more price reporters than if only one price report is collected.²¹

Early in 1966, there were about 200 priced items in the WPI based upon a single reporter. However, not all of these prices are published index series.

Although the studies cited above indicate that the WPI does not always reflect accurately actual prices, comprehensive studies are not available to determine the extent to which such deviations take place and their varying magnitude in periods of prosperity and of recession. BLS has been aware of this problem but has not had sufficient resources to correct it fully.²²

CHANGES IN QUALITY

The WPI seeks

"to measure price changes between two periods of time, without reflecting the influence of change in quality, quantity, terms of delivery, level of distribution, unit priced, or source of price. To accomplish this, the index calculations between two periods of time are based on the relative changes in prices of items with identical or nearly identical specifications."²³

¹⁵ "Government Price Statistics," op. cit., pt. 2, footnote 4, pp. 672-73.

¹⁹ Charles R. Dean and Horace J. DePodwin, "Product Variation and Price Indexes: A Case Study of Electrical Apparatus," in 1961 Proceedings of the Business and Economic Statistics Section of the American Statistical Association, December 29, 1961, pp. 272, 278.

²⁰ Jules Backman, *The Economics of the Electrical Machinery Industry*, New York University Press, New York, 1962, pp. 132-35, 151-53.

²¹ "The Price Statistics of the Federal Government," op. cit., pt. 1, p. 70.

²² George J. Stigler of the University of Chicago is making a study of wholesale prices, comparing buyers' and sellers' prices.

²³ "Bulletin No. 1411," op. cit., p. 8.

BLS states that:

When new commodities are introduced or when specifications of existing commodities are changed, every effort is made to insure that only price changes influence the index. The method of introducing an altered article or a change in selling terms is called a substitution. A substitution may be made by direct comparison or by linking.²⁴

Nevertheless, the staff of the Joint Economic Committee has called attention to improvements in quality in metals and industrial machinery and has suggested:

On balance * * * some degree of upward bias is probably involved.²⁵

Professor Griliches has concluded that the WPI automobile price index has overstated the actual rise in automobile prices because it failed to reflect fully the improvements in quality. Between 1937 and 1950, the WPI index for automobiles showed an increase of 83.0 percent as compared with the rise of 52.7 percent in the Griliches index; between 1954 and 1960 the increase was 19.7 percent for the WPI and about unchanged for the recalculated index.²⁵

As was noted in connection with quality changes in the CPI, beginning with the 1960 models, BLS has been getting greater cooperation from the automobile companies in evaluating quality changes. The large increase in the number of car categories also has made it possible to match up fairly closely cars of comparable lengths, weights, and horsepower. As a result, it is probable that there has been little additional bias in this index since 1960.

In connection with the discussion of the CPI, various types of quality changes were discussed. Many of these changes also affect products in the WPI and hence we will not repeat the earlier discussion. Although there probably is some quality bias in the WPI, it does not appear to be of a major factor because many products (e.g., chemicals, nonferrous metals, grains, cotton, etc.) are priced in terms of specifications which remain unchanged over time. Changes in the prices of such products are not affected by the quality factor.

SUMMARY

The WPI does not provide a satisfactory measure of the general level of prices because of its inadequate framework of reference, inadequacies in the data collected, and a failure to reflect fully all changes in quality. The index could be considerably improved by expanding its coverage to include construction, transportation, trade, services, and prices of products entering into international trade. Further research to determine the prices actually paid by buyers would indicate the extent to which the sellers' prices now used to compile the index reflect the actual fluctuations in prices in our economy. By changing the WPI, so that its subindexes conform to the Standard Industrial Classification, comparisons would be facilitated with other economic variables and it would be more useful as a deflator of the national accounts.

²⁴ *Ibid.*, p. 9.

²⁵ "Staff Report," *op. cit.*, p. 108.

²⁶ Griliches, *op. cit.*, p. 184; however, BLS has noted that for such goods as automobiles "price increases or decreases * * * which result from the addition of features which formerly sold at extra cost or from the deletion of equipment which was standard, are not reflected in the index." "Bulletin No. 1411," *op. cit.*, p. 9.

CHAPTER IV

IMPLICIT PRICE INDEX

The third major indicator of price change in the economy is the comparatively new series, published initially in 1951, known as the "implicit price index" (IPI).¹ This series is compiled by the Office of Business Economics (OBE) of the Department of Commerce in connection with its national accounts statistics.² Indexes are published for total gross national product (GNP), for 2 major sectors (personal consumption expenditures and government), for 14 groups of expenditures, and for various components of these groups.³

Conceptually, the IPI measures the general price level of all final goods and services (including Government) produced during a specific period. Thus, it is the only official index which attempts to measure overall price behavior of all goods and services in the Nation. The other major price series, as noted earlier, are restricted to narrower universes.

The IPI is not independently derived by a direct price collection program. Rather, it represents the ratio between current-dollar GNP and constant-dollar GNP⁴ multiplied by 100. The result is considered to be an aggregate price index which is affected by changing expenditure patterns each year.

Under the OBE deflation process, the current-dollar value for each of the hundreds of the final products included in the GNP is divided by a price series (or the closest approximate substitute) for that product. Often several individual price indexes are combined to get a suitable deflator for just one product group as defined in the GNP.⁵ For example, data collected during this study revealed that some 225 price indexes⁶ are used in deflating the 60 subgroups of personal expenditures on goods.

The resulting price adjusted figures for each subgroup are then combined into designated subtotals and finally to total constant-dollar GNP. When these deflated data are divided into the corresponding figures expressed in current dollars, an average price relationship emerges or is "implicit."⁷

¹ Sometimes also called "implicit price deflator," "GNP deflator," or "gross product deflator."

² For a description of the IPI see George M. Cobren, "The Deflation of the Gross National Product by the Department of Commerce," Proceedings of the Business and Economics Section of the American Statistical Association, 1958, pp. 312-19.

³ For annual data from 1929 to 1964 and quarterly data from 1947 to 1964, see Survey of Current Business, July 1964, p. 34 and August 1965, pp. 52-53.

⁴ By stating GNP in these two ways, the usefulness of this measure for economic description and analysis is greatly expanded. Conceptually GNP represents the total national output of goods and services (end-products) valued at current market prices (that is, at the price prevailing at the time the expenditures are made). Consequently, changes over time in current-dollar GNP may be due to changes either in the prices or the physical volume of goods and services produced, or to changes in both of these factors. For many purposes—productivity measurement for one—it is essential to isolate the movements in GNP which result solely from changes in quantities. This is done by attempting to remove the influence of price thus leaving a measure indicative of real or physical output.

⁵ A complete description and technical analysis of the deflation procedures used by the OBE is presented in appendix C.

⁶ When price information is not available, cost or quantity data are utilized. A cost index substitution is made for the deflation of new construction, for example.

⁷ This seemingly roundabout method is necessary because of the present lack of any suitable price index for the various sector accounts of gross national products which consist of many different products, each having its own particular price fluctuation and each fluctuating as to expenditures each year.

In contrast, the consumer and wholesale price indexes are fixed-weight indexes in which the contents of the "market basket" are kept constant. They are specifically designed to measure *directly* changes in prices of identical or comparable items over time. Because of its indirect derivation, the quality of the IPI is closely correlated to that of the various price series used in reducing national output to constant dollars.

The basic price indexes used are drawn from existing data assembled by other Federal agencies and by private organizations for purposes other than the deflation of the GNP (see table IV-1). No original prices have ever been collected with the explicit objective of deriving "real" product figures. As an illustration, 67.3 percent of personal consumption expenditures for goods in 1958 were deflated by components of the BLS Consumer Price Index, 4.5 percent by components of the BLS Wholesale Price Index, 10.1 percent by the index of prices paid or received by farmers issued by the Economic Research Service, U.S. Department of Agriculture, and the remaining 18.2 percent by a variety of series compiled by other public and private agencies.

TABLE IV-1.—Composition of the implicit price deflators for gross national product in terms of base year weights, 1958

	Dollar value (billions of dollars)	Implicit price deflator	Percent importance in terms of base year weights of: ¹					
			BLS		Agricultural prices	Other prices	Implicit prices	Earnings indexes ²
			Consumer prices	Wholesale prices				
Gross national product.....	447.3	100	45.6	12.3	6.8	13.5	9.3	12.5
Personal consumption expenditures.....	290.1	100	67.3	4.5	10.1	2.4	10.9	4.9
Goods.....	178.0	100	67.5	3.8	16.5	2.2	10.0	.....
Services.....	112.0	100	67.0	5.5	(*)	2.7	12.3	12.4
Gross private domestic investment.....	60.9	100	3.1	29.8	1.4	60.9	4.8	.....
Fixed investment.....	62.4	100	3.0	32.6	(*)	59.6	4.7	.....
Nonresidential.....	41.6	100	4.5	48.9	(*)	40.4	6.1	.....
Structures.....	16.6	100	.....	.....	.....	86.1	13.9	.....
Producers' durable equipment.....	25.0	100	7.5	81.4	(*)	10.1	1.0	.....
Residential structures.....	20.8	100	.....	.....	.....	98.2	1.8	.....
Nonfarm.....	20.1	100	.....	.....	.....	98.5	1.5	.....
Farm.....	.6	100	.....	.....	.....	91.2	8.8	.....
Net change in business inventory.....	-1.5	100	.....	148.3	-57.0	8.7	.....	.....
Exports.....	23.1	100	3.6	.....	.....	72.4	24.0	.....
Imports.....	-20.9	100	.....	.....	.....	86.9	1.31	.....
Government purchase of goods and services.....	94.2	100	6.5	25.2	.....	19.1	4.5	44.7
Federal.....	53.6	100	6.5	37.0	.....	10.4	7.7	38.4
State and local.....	40.6	100	6.4	9.8	.....	30.5	0.3	53.1

¹ Detail may not add to totals due to rounding.

² Includes implicit earnings indexes for Government compensation.

*Less than 1/10 of 1 percent.

NOTE.—The data contained in this table are drawn from Appendix C. The reader is directed to this section if he is interested in technical details underlying these computations.

The price information obtained from these sources falls short of the requirements for deflation of the national accounts both in the detail required and in coverage. Frequently, the OBE must adjust or adapt existing price series and even impute price movements for products not priced in existing series. Since adequate price data are not available for some sectors, the quality of the individual item deflators ranges from excellent for many parts of personal consumption expenditures to highly questionable for government and exports and imports. As the U.S. Department of Commerce has recognized, there is vital need for a program to improve the quality of price data used to deflate the national accounts. The development of a WPI based upon an input-output matrix, the development of indexes for products entering into international trade, and improvements in the price data for government and construction are required.

The method of calculating the IPI may affect the degree of change over time: (1) use of shifting weights; (2) failure to allow for changes in output per man-hour in the construction industry, and (3) influence of government sector, particularly the use of employee compensation to measure the price for government employee services.

SHIFTING WEIGHTS

The Implicit Price Index is a weighted aggregative index number with current-year weights (Paasche's formula).⁸ The weights are the proportions in which components are entered into national accounts each year. The IPI traces the change in the value of physical goods and services in any given year as compared with their value in the base year (1958 in the series published since mid-1965). Comparisons of the implicit deflator for years other than 1958 reflect the shifting composition of output as well as price change. The difference that changing or "current-year" weights make in the price change shown tends to be small for short periods of time (unless there are abrupt shifts in the product mix). For example, between 1958 and 1964, the rise in the IPI as reported was 8.9 percent; if the weights in the base year 1958 are used for 1964 data, the rise is only 8 percent. (For the private sector alone, the increases were 7.2 percent and 5.9 percent respectively.) However, the use of "current-year weights" may result in significantly smaller increases for long-period comparisons as Simon Kuznets has shown:

I am inclined to argue that it is not a genuine bias. The less than threefold rise in the national product valued in 1929 prices * * * compared with a fourfold rise in the national product valued in 1869 prices reflects the lower relative valuation assigned in 1929 to a unit of A compared with a unit of B. But all measures of growth in a sense reflect observations of a current generation looking into the past. We are interested in observing the path of historical development as it leads from the past to the present, and a series that values the past as leading up to the present, values it, therefore, in terms of the present. We may be interested in the 1869 national product at its own current valuation, and in its components as reflected in the then current price structure. But it does not make sense to talk of the 1929 product in 1869 prices, because 1929 was not within the framework of the 1869 generation in the sense in which 1869 is in the framework of the present generation. In other words, I would be inclined to view all measures of the past, when a comparable series is wanted, as oriented toward the present; and to use the present as the base for price valuation, accepting the implication that the magnitude of growth, the length of the path traversed

⁸ The Paasche character of the IPI is hybridized to the extent that some segments of the GNP are deflated by price indexes for groups of items combined with weights of some previous period.

would thus seem shorter to me as a member of the present generation than it might to my predecessor of 1869 were he to be resurrected and acquainted with what has happened while retaining the value scale of 1869.⁹

In contrast to the IPI, the CPI and WPI are essentially based upon "fixed" or "constant" base-year quantity weights (the Laspeyres formula). These indexes are designed to measure only price changes between any two periods. The weights underlying the CPI and WPI are revised periodically to reflect recent demand patterns. But the same fixed proportions of the commodities or services priced are maintained between such revisions. Thus, the difference in the weighting technique alone differentiates the IPI from the CPI and the WPI.

A current-year weighting system usually introduces an opposite effect into an index number than does the use of base-year weights, a fact established by Irving Fisher in his intensive study of index numbers.¹⁰ (See discussion in chapter II for the effect on the CPI.)

The use of current-year weights tends to yield a smaller rise in an index over time because, for commodities whose prices advance the most over the period, the physical quantities would tend to decline more or advance less in the current year from the base year as compared with those items with price declines (or comparatively small price advances).¹¹ As a result, price increases tend to be underemphasized and price declines to be overemphasized. These two tendencies work in the same direction—toward a lower index for current-year weights than would be obtained by base-year weighting.

The longer the period between changes in the base weights used for the CPI and the WPI, the more likely it is that they will record different relative changes than the IPI and in the opposite direction—this would be particularly true for the private sector part of the IPI.

FAILURE TO ALLOW FOR CHANGES IN OUTPUT PER MAN-HOUR IN THE CONSTRUCTION INDUSTRY

Over 20 percent of GNP is deflated by "cost" indexes (i.e., by combining measures of cost of materials, and/or labor into an imputed price series) without any adjustment for changes in output per man-hour. The result is an overstatement of the degree of price change during periods of rising output per man-hour and understatement of price changes when output per man-hour falls. The failure to adjust for changes in output per man-hour is most important for new construction and payments for services of Government employees. (See table IV-2.) To the extent that output per man-hour has risen in these two sectors, there is an overstatement of the price rise and hence the growth in real GNP has been understated.

⁹ See his paper, "Long-Term Changes in the National Income of the United States of America Since 1870," appearing in the *Income and Wealth of the United States, Trends and Structure, Income and Wealth Series II*, International Association for Research in Income and Wealth, Bowes & Bowes, Cambridge, England, 1952, pp. 46-47.

¹⁰ Irving Fisher, "The Making of Index Numbers," Houghton Mifflin Co., Boston, Mass., third edition, revised, 1927.

¹¹ This indicated effect would be reversed, however, if physical quantities between the base year and the current year did not change or if the quantity movements paralleled the price movements.

TABLE IV-2.—Major components of GNP for which Implicit Price Indexes do not allow for changes in output per man-hour, 1958 and 1964

	1958		1964	
	Billions of dollars	Percent of GNP	Billions of dollars	Percent of GNP
1. Structures.....	53.2	11.9	68.6	10.9
Private.....	37.4	8.4	48.6	7.7
Residential.....	20.8	4.7	27.5	4.4
Nonresidential.....	16.6	3.7	21.1	3.4
Public.....	15.8	3.5	20.0	3.2
Federal.....	3.6	.8	3.6	.6
State and local.....	12.2	2.7	16.4	2.6
2. Government employee compensation.....	42.1	9.4	62.9	10.0
Federal.....	20.6	4.6	27.2	4.3
State and local.....	21.5	4.8	35.7	5.7
3. Total of 1 and 2.....	95.3	21.3	131.5	20.9
4. GNP.....	447.3	100.0	628.7	100.0

Source: U.S. Department of Commerce, Survey of Current Business, August 1965, pp. 25, 37, and 39.

It is particularly difficult to obtain a satisfactory index of prices to use as a deflator for construction. The units built are nonstandard or heterogeneous products and "quality" changes (e.g., convenience and efficiency) have been substantial. Accordingly, there is no real price measure for most of the components in this sector. In lieu of such information, current-dollar expenditures for nearly all types of construction are deflated by indexes of wage rates and building material prices. These components are weighted on the basis of their relative importance in the cost of a unit of a specified type of construction during some period in the past. Such a method of deflation makes little allowance for changes in output per man-hour. As a result, the implicit price index for construction overstates the actual rise in prices. It is for these reasons, that the construction deflator has been described as "defective in almost every possible way."¹²

The changes in the construction components of the IPI as compared with the total IPI between 1947 and 1963 were as follows:¹³

[1958=100]

	1947	1963	Percent increase
IPI.....	74.6	107.1	43.6
Nonresidential structures.....	64.4	111.8	73.6
Residential structures.....	71.7	112.0	56.2

Because of the difficulties in determining a satisfactory price index and the nonstandardized nature of construction, adequate indexes of real output of the industry have not been available on a continuous basis. Without such data, output per man-hour data also have been inadequate. Nevertheless, several efforts have been made to estimate output per man-hour. While the magnitude of

¹² Comments on the general deficiencies of available construction cost indexes can be found in the report of the Price Statistics Review Committee, "The Price Statistics of the Federal Government," op. cit., pp. 87-93. See also Zvi Griliches, "Notes on the Measurement of Price and Quality Changes" in Models of Income Determination, Conference on Research in Income and Wealth, National Bureau of Economic Research, Princeton University Press, Princeton, N.J., 1964, pp. 385-89 and Cobren, op. cit., p. 315.

¹³ Survey of Current Business, August 1965, p. 53.

the changes varies depending upon the definition of construction, the assumptions of the study, and the time period covered, studies generally agree that output per man-hour has increased in the construction industry:

Haber and Levinson estimated in 1956 that "in recent decades" output per man-hour had risen 1.5 percent annually for residential construction and 2 percent annually for the commercial, industrial, and large apartment sections of the industry.¹⁴

Alterman and Jacobs estimated that for the period 1947 to 1955, output per man-hour for contract construction¹⁵ increased 2.5 percent annually.¹⁶

John Kendrick estimated that output per man-hour increased less than ½ of 1 percent annually for contract construction between 1937 and 1948 and 3.6 percent annually between 1948 and 1953.¹⁷

Douglas C. Dacy estimated that between 1947 and 1963 output per man-hour for contract construction increased by 3 percent annually.¹⁸

Clearly, if adjustments were made for any of these estimated increases in output per man-hour in construction, the increase in prices would be much smaller than shown by the implicit price indexes for construction.

Dacy has compiled a price index for construction after allowing for the rise he estimates in output per man-hour. Between 1947 and 1963, his price index for construction increased by 34.2 percent in contrast to the rise of 73.6 percent in the implicit price index for non-residential construction and 56.2 percent for residential construction. Since private construction accounts for about 8 percent of gross national product (see table IV-2), such a smaller increase in prices would have reduced the rise in the total IPI between 1947 and 1963 from 43.6 percent to 41.2 percent.

The foregoing estimate is not intended to provide a precise refinement of the IPI. Rather it is designed to indicate that if the construction price index were to allow for the rise in output per man-hour, it would probably result in a smaller rise in the IPI. The scattered data for output per man-hour indicate the need for intensified efforts to devise satisfactory price indexes for construction to remove this important defect from the IPI.

INFLUENCE OF GOVERNMENT SECTOR ON IPI

The implicit index for Government goods and services is probably the least satisfactory of any component of the IPI because of (a) the lack of availability of comparable price indexes for goods and (b) the use of employee compensation to estimate prices for Government services.

Goods and services purchased by Government are deflated by existing price indexes. But these indexes are not too satisfactory since often they are not comparable to the categories of goods bought. As one observer has pointed out:

Many of these, such as military and space items, are uniquely governmental in nature. They are often custom-made and, because little is known about their

¹⁴ William Haber and Harold M. Levinson, *Labor Relations and Productivity in the Building Trades*, University of Michigan, Ann Arbor, 1956, p. 203.

¹⁵ Contract construction is not coextensive with the value of new construction since it does not cover all new construction and it includes maintenance and repair, which is not final product.

¹⁶ Jack Alterman and Eva E. Jacobs, "Estimates of Real Product in the United States by Industrial Sector, 1947-55," in *Output, Input, and Productivity Measurement, Studies in Income and Wealth*, vol. 25, National Bureau of Economic Research, Princeton University Press, 1961, pp. 284, 290.

¹⁷ John W. Kendrick, *Productivity Trends in the United States*, National Bureau of Economic Research, Princeton University Press, 1961, pp. 489-98.

¹⁸ Douglas C. Dacy, "Productivity and Price Trends in Construction Since 1947," *The Review of Economics and Statistics*, November 1965, p. 408.

specifications, it is difficult to obtain prices of comparable items from period to period.¹⁹

An even greater problem is encountered in connection with government payrolls. Payments for civilian and military personnel totaled \$62.9 billion in 1964. This was an increase of \$20.8 billion since 1958. How much of this increase represented a gain in physical output of the public sectors? How much of the increase was simply a higher price for the same output (labor service) than in 1958? The deflated figures for compensation of Government employees are derived by extrapolating the base year payrolls (at which time the current-and-constant-dollar figures are, of course, the same) on the basis of change in the number of full-time equivalent employees.²⁰ This is illustrated for fiscal civilian compensation in table IV-3.

TABLE IV-3.—Federal civilian compensation, 1958 and 1964

[Dollar figures in millions]

	1958	1964
1. Civilian compensation (current dollars).....	\$10,074	\$14,361
2. Index of full-time employment.....	100.0	106.7
3. Civilian compensation (constant dollars) (\$10,074 × line 2).....	\$10,074	\$10,748
4. Implicit price index.....	100.0	133.6

By dividing the compensation in current dollars (line 1) by the total in constant dollars (line 3), the Implicit Price Index is obtained. The net result, therefore, is to make the Implicit Index the equivalent of the increase in average employee compensation between 1958 and 1964, since the effect of increased employment is eliminated.

As is shown in the table IV-3, the Implicit Price Index for Federal civilian employment increased by 33.6 percent between 1958 and 1964. The increases for other major components of the Government sector were as follows:

Component	IPI percent increase, 1958-64
Employee compensation.....	28.1
Military.....	18.0
State and local.....	29.8
Federal civilian.....	33.6
Government purchases.....	6.3
New construction.....	10.9
Other goods and services.....	4.4
Government IPI.....	16.0

The increase of 6.3 percent in the prices for Government purchases is not out of line with the price increase of 7.2 percent in the private economy.²¹ However, if purchases of new construction are also removed, Government purchases of other goods and services is seen to rise only 4.4 percent (purchases of other goods and services account

¹⁹ Geoffrey F. Faux, "Measuring Changes in the General Price Level," in BLS Bulletin No. 1351-1, September 1963, p. 18.

²⁰ This procedure is carried out at the following level of detail: for Federal Government—civilian compensation and six categories of military compensation; for State and local government—school compensation and nonschool compensation.

Full-time equivalent employment measures the number of man-years of full-time employment of wage and salary earners and its equivalent in work performed by part-time workers. Full-time employment is defined simply in terms of the number of hours of work which are customary at a particular time and place.

²¹ Private economy is defined as GNP less Government purchases of goods and services.

for 71 percent of total Government expenditures, other than that for employee compensation, in constant dollars). *It is clear, though, that the marked increase in the implicit price index for Government services is due to the very large increases derived for employee compensation, and, to a lesser extent, increases in new construction.*

No allowance is made for change in output per man-hour in connection with Government payrolls because satisfactory data for changes are not available. One estimate indicates that output per employee increased 17 percent between 1947 and 1958.²² Similarly, Faux claims that " * * * available evidence suggests that improvement in the efficiency of many Government operations has been considerable."²³ Since there is some evidence that productivity of Government workers has increased, it is regrettable that lack of comprehensive satisfactory data does not permit a productivity adjustment in estimating the implicit deflator for Government.

The results are also affected by the failure to make allowance for changes in the composition of product-mix of employment. Such an adjustment is not made because it is very difficult to standardize for grade structure. Although there has been no great change in total full-time public employment over the past decade, there may well have been a shift to a greater proportion of higher-paid employees (with increased education, skill, and experience). Such a shift would not be reflected in the constant-dollar total, and hence also would lead to an overstatement of the IPI.

All that is being measured in the Government IPI is the relative increase in compensation of Government employees between two dates. And this increase is being evaluated as a price as though it were comparable to the prices of clothing, meat, or steel.

The disparity between the changes recorded by the CPI and the IPI is largely accounted for by the substantial increase reported for compensation of general Government employees. (See table IV-4.)

TABLE IV-4.—Changes in CPI and IPI, 1954 to 1964

[1958=100]

	1954	1958	1964	Percent increase		
				1954-58	1958-64	1954-64
CPI.....	92.9	100	107.3	7.6	7.3	15.5
Total IPI.....	89.6	100	108.9	11.6	8.9	21.5
Gross private product (total IPI less Government employee compensation).....	90.8	100	107.1	10.1	7.1	18.0
Government employee compensation.....	79.3	100	127.6	26.1	27.6	60.9

NOTE.—In this table, Government purchases of goods and services from business are included as part of gross private product as shown on p. 215 of the Annual Report of the Council of Economic Advisers, January 1966. Elsewhere in this study, such spending has been regarded as part of Government product.

²² Henry D. Lytton, "Recent Productivity Trends in the Federal Government: An Exploratory Study," *The Review of Economics and Statistics*, November 1959, p. 341.

²³ Faux, *op. cit.*, p. 18. It should be noted, however, that a study of the Post Office Department, which accounts for 24 percent of the civilian employees in the Federal Government, concluded that output per man-hour had increased only 0.3 percent annually from 1952 to 1962. Executive Office of the President, Bureau of the Budget, "Measuring Productivity of Federal Government Organizations," Washington, D. C., 1964, p. 14. Subject to some qualifications, Solomon Fabricant in 1952 concluded that "total productivity, output per combined unit of all resources, appears to have risen in Government." "The Trend of Government Activity in the United States Since 1900," National Bureau of Economic Research, New York, 1952, p. 99.

Between 1954 and 1964, the implicit price index derived for Government employee compensation (services) increased by 60.9 percent as compared with an increase of 21.5 percent for the total IPI. Since compensation of Government employees accounted for about 10 percent of the weight of the IPI, the tremendous increase in this area had the effect of increasing the overall rise of the IPI by 3½ percentage points.

Exclusive of compensation for Government employees, the implicit price index increased only 18 percent between 1954 and 1964 or not much more than the rise recorded by the CPI. (In the 1958-64 period, the increases in these two indexes were about the same.)

In light of the significant effect of the unsatisfactory index used to measure the price of compensation of Government employees, *changes in the IPI must be interpreted with great care. The IPI excluding Government employee compensation probably is a better measure of the general magnitude of price changes than is the IPI for the entire economy.*

SUMMARY

Significant distortions are introduced into the IPI by the failure to allow for increases in output per man-hour in construction and in Government services. Moreover, many of the price deflators in the private sector are not strictly comparable to the dollar totals to which they are applied. As a result, *the total IPI provides a very unsatisfactory measure of changes in the general level of prices in the United States. Improvement in the quality of these price indexes is necessary.* A comprehensive price index covering the national accounts is vitally needed to improve our measures of real economic growth and output per man-hour. Hence *every effort must be made to eliminate the defects of the present IPI.*

CHAPTER V

WPI-CPI COMPARISONS

The WPI and the CPI usually have recorded changes in the same direction but the magnitude and timing of the changes have varied. Although there are many differences in the products and sectors covered, the changes in the two indexes often are compared. Yet, prior to the present study, no analysis has been available to determine the extent to which these two indexes measure the changes in prices of the same or similar products at the wholesale and retail level. In this chapter, we review first the differences between the two indexes, then we present the results of a detailed study of the extent to which the two indexes have items in common and the price changes for these items. Finally, there are reviewed the reasons for the persistent upward movement of retail prices as compared with wholesale prices in recent years.

We would like to emphasize that the objective of this analysis is to determine the facts so that the diverse movements of the two indexes will be understandable. We do not intend to suggest that the entire coverage of the two indexes should be identical. However, *it would facilitate comparisons between wholesale and retail prices and make such comparisons more meaningful if, within a category, the two indexes covered the same products to a larger extent where that is feasible.*

DIFFERENCES BETWEEN CPI AND WPI

There are many differences between the WPI and the CPI which condition their behavior and their use as measures of price inflation. These include: (1) differences in the goods and services priced, (2) universe of products covered, (3) differences in weights for some products, (4) different products represented in a category, (5) specification pricing vs. pricing by specification, (6) treatment of excise, sales, and property taxes, and (7) geographic coverage of prices. Since they are designed to measure different universes, it is not surprising that the WPI and CPI often vary in magnitude and timing of changes reported.

DIFFERENCES IN GOODS AND SERVICES PRICED

The WPI covers basic raw materials (such as farm products and nonferrous metals), processed products (such as chemicals and textiles), and various types of machinery and equipment, as well as goods, such as apparel and processed foods, which ultimately are bought by consumers. Of the total weight in the WPI as of December 1962, 11.54 percent was assigned to raw materials, 42.72 percent to intermediate goods, and 45.74 percent to finished goods. Only the finished-goods category includes items comparable to those in the CPI.

In contrast, the CPI measures the retail prices of goods and services. It includes prices of services, a category which is not included in the

WPI except for electricity. Since such services have a weight of 34.0 percent in the CPI and only 1.6 percent in the WPI, this is a major distinction between the two indexes. It is a particularly important difference because the prices of services in recent years have risen more than the prices of goods and at the same time the relative weights of services also have increased. In December 1964, for example, the CPI index for prices for services was 116.2 (1957-59=100) as compared with 105.7 for commodities.

UNIVERSE OF PRODUCTS COVERED

The WPI attempts to reflect the changes in prices of the entire output of a group of products with the relative weights of the constituent products determined by their relative importance in the value of manufacturers' shipments in the preceding Census of Manufactures. The CPI, on the other hand, covers selected qualities of products bought by urban workers' families. The qualities priced and the weights allocated to specific products in the group are determined by periodic studies of consumer expenditures. Thus, for example, the WPI index of automobile prices reflects prices of most automobile models while the CPI excludes the most expensive cars. The WPI has a broader universe for specific products because it covers exports as well as the domestic sales.

DIFFERENCES IN WEIGHTS FOR SAME PRODUCTS

One result of the difference in coverage in the two indexes is the varying weights assigned to components of what appear to be but are not necessarily the same category of products. This tendency may be illustrated by footwear. In the WPI footwear index, women's and misses' footwear had a weight of 53.3 percent in December 1957 while in the CPI footwear index the weight was only 40.3 percent. In contrast, children's shoes had a weight of 10.2 percent in the WPI footwear index and 24.3 percent in the CPI footwear index.¹ Similarly, different weights are assigned to different types of shoes within each user category. For example, men's work shoes had a weight of 6.5 percent in the WPI footwear index but in the worker-oriented CPI footwear index, the weight was 11.7 percent.²

DIFFERENT PRODUCTS REPRESENTED IN A CATEGORY

Usually the products priced within a group are not identical for the CPI and the WPI so that different price patterns may emerge. This could be particularly important for groups like fresh fruits and vegetables for which changing conditions of supply may have dramatic effects on price changes.³ For example, both the CPI and WPI include prices for the following fresh fruits: apples, bananas, grapefruit, oranges, grapes, and strawberries. Fresh orange juice and watermelons are priced only for the CPI while lemons, peaches, pears, and cantaloupes (weight 0.121 percent) are priced only for the WPI.⁴

¹ Ethel D. Hoover and Harry Kahan, "Footwear: Prices and Average Factory Values," *Monthly Labor Review*, February 1959, p. 153.

² *Ibid.*

³ Seasonal price patterns were not removed from these data through 1965. However, beginning in January 1966 "seasonally adjusted national indexes are shown for selected groups and subgroups where there is a significant seasonal pattern of price change." Thus, in January 1966, the index for fruits and vegetables unadjusted was 111.3 (1957-59=100) while seasonally adjusted it was 113.9. U.S. Department of Labor, Bureau of Labor Statistics, *The Consumer Price Index*, January 1966, pp. 2, 3.

⁴ The total weight of fresh fruits is 0.531 percent in the WPI as compared with 0.760 percent in the CPI.

It would facilitate comparisons between the two indexes, if the WPI priced the same fresh fruits as the CPI.

The WPI often prices separately products which may be grouped under one broad category in the CPI. Thus, the WPI includes separate prices for cooking ranges and for gas ranges while the CPI prices only ranges. The WPI prices automatic washers and wringer-type washers while the CPI prices only washing machines.⁵

SPECIFICATION PRICING VS. PRICING BY SPECIFICATION

In pricing for the CPI, BLS does not price identical products over time or in all outlets. Rather, it outlines the main characteristics of the products and then the agent selects the item in the category with the greatest volume.

A specification is a detailed description of the physical characteristics of an item which determine its quality and price. It may include features which aid in identifying an item from one pricing date to the next and from one store to another. For a few items the brand name or the model number, as for automobiles, also becomes part of the defined quality. A specification does not delineate a precise quality since to do so would preclude obtaining enough price quotations. Instead it defines a relatively narrow range of qualities, within which prices are averaged for the index and outside of which they are not * * *. BLS specifications involve an elaborate system of regular and alternate specifications, choices of noncomparable features within a general specification, and city and outlet deviations.⁶

In connection with BLS pricing of retail food prices, it has been reported:

Variations in food habits and in the brands selected among cities cause differences from city to city in computed average prices that do not represent real price differentials for the same quality. Nor are prices collected for the same brand in all outlets. The single price reported to BLS for each store is for the brand selling in largest volume at that particular store * * * different sizes may be priced in different stores.⁷

On the other hand, for products in the WPI—

* * * the specification describes the characteristics of the commodity, which define quality and other price-determining factors * * * the index calculations between two periods of time are based on the relative changes in prices of items with identical or nearly identical specifications.⁸

For many farm products, metals, chemicals, and drugs, specifications are precise and remain unchanged. For other fabricated products greater consistency in quality is possible for wholesale prices because they are obtained from limited numbers of sellers. In contrast, retail price data must be obtained from a variety of outlets in cities with widely varying tastes and customs. Thus, changes in quality are more likely to affect the significance of the CPI than of the WPI.

In the case of the WPI, however, although specifications are very precise (often taken from price lists or catalogs) there is lacking the current give-and-take between the reporting firm and the Bureau as to whether there are other specifications or products which are currently more important and should be substituted, as well as whether there are special discounts or extras. In the WPI, there is no simple

⁵ James C. Daugherty, "Price Trends and the Postwar Market for Appliances," *Monthly Labor Review*, November 1963, p. 1260.

⁶ Doris P. Rothwell, *The Consumer Price Index Pricing and Calculation Procedures*, U.S. Bureau of Labor Statistics, Mar. 17, 1964 (mimeo), p. 7.

⁷ Doris P. Rothwell, "Calculation of Average Retail Food Prices," *Monthly Labor Review*, January 1965, p. 61.

⁸ Bulletin No. 1411, op. cit., pp. 7-8.

administrative mechanism for obtaining these various changes unless they are volunteered by the reporter or are uncovered by the staff in reports in the trade press. *The definitiveness of sellers' prices as presently obtained would be improved by more personal visits than are presently made.*

TREATMENT OF EXCISE TAXES

In calculating the WPI, "excise taxes are excluded from the price."⁹ In contrast, the CPI includes excise taxes, sales taxes, and real estate taxes on owned homes. These taxes usually are built into the retail price¹⁰ and hence the consumer is paying for goods and indirectly for government services. The Consumer Price Index includes the following taxes which had a weight of 6.44 percent in December 1963:¹¹

1. Taxes related to the acquisition of goods and services such as sales taxes, retail excise taxes, custom duties and all manufacturers and processors taxes that are shifted to the consumer as part of the retail price.
2. Licenses and fees such as auto registration, drivers' permits, airplane taxes, etc.
3. Taxes on real property.

In addition, the CPI includes direct payment for goods and services received such as water, electric power, gas, garbage disposal, and local transportation.¹²

In recent years, various States and localities either have introduced the sales tax or increased the rate. As of December 1, 1965, there were 39 States with a sales tax. (See appendix tables E-5 and E-6.) In addition, in some of these States as well as others, localities were given the right to impose such a tax. When New York State imposed a 2 percent sales tax in 1965, Herbert Bienstock, director of the New York Office of BLS estimated that 0.5 percent was added to the New York index in August 1965.¹³

Between 1956 and 1965, 24 States increased the gasoline tax, usually by 1 or 2 cents a gallon (see appendix table E-7), and 43 States increased the tax on cigarettes, usually by 3 to 5 cents a pack. (See appendix table E-8.) These increases affected the CPI but not the WPI.

The changes in excise taxes have been significant enough on occasion to elicit BLS comment on their impact. Thus, in June 1965 it was noted that:

Prices of consumer durable goods declined 0.3 percent on the average, as new car prices showed the combined effects of rising concessions near the end of the model year and the *excise tax reduction * * **. Household services, especially mortgage interest, *property taxes*, and insurance continued to gain, as did costs of medical care services. *Increasing State excise taxes* and higher prices for some cigarettes caused tobacco products, to average 0.8 percent more in June."¹⁴ [Italics added.]

It has been estimated that between December 1963 and October 1965, the rise in State and local taxes "contributed about 0.4 per-

⁹ Bulletin No. 1411, op. cit., p. 8. However, for imported goods the WPI includes customs duties where they are applicable.

¹⁰ U.S. Department of Labor, Bureau of Labor Statistics, The Consumer Price Index (revised January 1964), September 1964, p. 1.

¹¹ James C. Daugherty, "Effect of Taxes on the CPI," Monthly Labor Review, February 1966, pp. 183-84. See also "Taxes and the Consumer Price Index," Monthly Labor Review, January 1963, pp. 53-54.

¹² Daugherty, op. cit., p. 182.

¹³ New York Herald Tribune, Sept. 30, 1965, p. 38.

¹⁴ U.S. Department of Labor, Bureau of Labor Statistics, Washington, D.C., The Consumer Price Index, June 1965, U.S. City Average and Selected Areas, p. 1.

centage points to the total 2.6 percent advance" in the CPI. However, this rise was "largely offset by a downward influence of 0.3 percentage points resulting from the 1965 reduction in Federal excise taxes."¹⁵

The form of tax employed in procuring revenues for the various governmental units has far more direct bearing on the course of the CPI than on the WPI. Increased resort to income taxes would do little to alter the relative course of the two indexes. In contrast, the greater the resort to excise taxes, the wider might be the relative deviation in the trend of the two measures.

GEOGRAPHIC COVERAGE OF PRICES

With a few exceptions (e.g., bread, milk), the prices of products in the WPI are essentially regional or national in nature and tend to be uniform in quality. In contrast, the CPI is a composite of prices on a local basis obtained from 56 areas; it is necessary for BLS to price different qualities of a product in different sections of the country. Between 1957-59 and December 1964, the increase in the CPI was 8.8 percent—in large cities the increase ranged between 4.8 percent in Detroit and 11.6 percent in San Francisco-Oakland. For the same period, the cost of medical care increased by an average of 20.3 percent with a range of 16.3 percent in St. Louis to 30.7 percent in Baltimore. Reading and recreation prices rose by 23.0 percent in New York and fell 0.2 percent in Chicago.

COVERAGE IN COMMON: CPI AND WPI

The CPI and the WPI price many of the same products but in terms of weighted importance most items are exclusive to only one index. As was noted earlier, the most obvious illustrations of exclusive coverage in the two indexes are raw materials in the WPI and services (except for electricity) in the CPI. But even within the groups that are common to both indexes, there are many differences in the products priced. Prior to the present study, no detailed analysis has been available to show the extent to which the WPI and the CPI price the same or similar products. Yet the changes in the two indexes often are treated by analysts as though they are fully comparable. To fill this gap we have analyzed the products for which prices are obtained for each index to determine the extent to which they cover the same or similar products.

Appendix table E-9 was prepared by BLS at the request of the authors. It shows broad groups of products in the WPI, with their relative weights, and an identification of those which are subsequently bought by final consumers. Clearly, only these products can be priced for the CPI. We have added to the table the products included in the CPI and their weights.

In broad terms, categories of products which are bought by final consumers and hence potentially may be included in the CPI, account for only 35 percent of the weighted importance of the WPI and 53 percent of the weighted importance of the CPI.

¹⁵ Daugherty, *op. cit.*, p. 182.

Among the important categories of products priced for the WPI but not for the CPI are the following:

	<i>Percent</i>
Farm products except most fresh fruits and vegetables and eggs.....	8. 749
Textile fibers, yarns, and fabrics.....	3. 141
Hides and skins and leather.....	. 443
Bituminous coal, coke, and crude petroleum.....	1. 239
Chemicals and allied products other than paints, drugs, soap, and cosmetics.....	4. 929
Crude rubber, synthetic rubber, and industrial rubber products.....	1. 089
Lumber and wood products.....	2. 562
Pulp and paper products.....	4. 555
Metals and metal products with a few minor exceptions.....	12. 674
Machinery and motive products other than passenger cars, electric lamps, and batteries.....	14. 329
Commercial furniture.....	. 395
Nonmetallic minerals.....	2. 865
Grain and vegetable feeds.....	1. 035

It should be emphasized that the percentages shown in appendix table E-9 are derived by matching up product groups in the two indexes with the same or a similar name. Hence, these percentages show only the maximum relative importance of products in common. But identical names do not assure comparability of the items covered. For example, the electric power indexes are not comparable, because CPI prices residential power while the WPI prices industrial and commercial electricity, which do not necessarily have the same price behavior as residential rates. It is necessary, therefore, to compare the groups with similar names, item by item, to determine the extent to which similar or identical products are being priced.

Appendix table E-10 presents in greater detail what appear to be comparable products in the CPI and the WPI, and their weights in each index. The detailed product-by-product comparisons result in the elimination of many items contained in the groups listed in appendix table E-9. For example, when the specific meat products priced for the two indexes are analyzed, it is found that some items are priced for only one of the indexes. Thus, the proportion of meat products common to both indexes is smaller than shown by the broad group indexes:

Weights of meats in CPI and WPI

	WPI (percent)	CPI (percent)
Appendix table E-9.....	3. 331	4. 450
Appendix table E-10.....	2. 682	3. 000
Appendix table E-10 (excluding frankfurters and loin roast).....	1. 833	2. 680

Because prices have been introduced into the indexes at different times, it is not always possible to compare price movements since the 1957-59 base period. For example, frankfurters in the WPI are on a January 1960 base and loin roast in the CPI is on an April 1960 base. Thus, for some periods in the recent past, the two indexes had fewer items in common than at the present time.

Products which appear to be comparable and hence are included in both indexes accounted for a maximum of only 25.5 percent of the weighted importance of the WPI and 33.5 percent of the CPI.¹⁶

¹⁶ These ratios compare with 35 percent for the WPI and 53.0 percent for the CPI when the analysis is limited to broad groupings, as in appendix table E-9.

These data represent the maximum proportions of the total weights accounted for by products which are priced for both indexes. As indicated earlier, the price index for some categories, such as electric power and automobiles, are not fully comparable in the two indexes. Moreover, the many footnotes to appendix table E-10 indicate that some of the "comparable" products shown were not exactly the same, but rather represented a matching up of what appear to be similar products. For example, beef prices in the WPI are matched up with steaks, roasts, and hamburger in the CPI because meatpackers sell carcasses rather than cuts of meat.¹⁷ A weighted index was determined for a bed, dresser, and chest in the WPI and matched up with a bedroom suite in the CPI. Although such products are not identical for both indexes, it is believed that they will follow similar patterns of price change and hence it is meaningful to compare the indexes.

On the other hand, it must be recognized that some items which are omitted from the tabulation because they do not appear to be directly comparable may represent the changes in prices of similar groups of products.

It was suggested earlier that BLS probably could increase the extent to which the WPI and the CPI price the same products. Direct comparisons would then be possible on a greater scale between wholesale and retail prices. It is recommended that in future revisions of the two indexes this objective be kept in mind.

RETAIL PRICES VS. WHOLESALE PRICES

Appendix table E-10 also shows the price indexes for December 1964 reported by BLS for each of the important subgroups of prices (within the WPI classification), for the items in common, and calculated weighted indexes for items in common within a group. The price indexes for the year 1964 are also shown for fruits and vegetables, meats, and dairy products. These products are characterized by seasonal price movements and hence figures for a single month may show a distorted relationship, or in some instances may not be available (e.g., the CPI did not price strawberries in December 1964).

The CPI food index as reported for December 1964 had increased 6.9 percent over the average for the 1957-59 period; the WPI food index (includes fresh and dried fruits and vegetables and eggs) rose only 0.1 percent. BLS reports prices for nine subgroups of food products.¹⁸ For eight subgroups, the December 1964 CPI had advanced more or declined less than its counterpart in the WPI (dairy products provided the only exception to this relationship). Thus, the pattern of retail prices rising more than wholesale prices was characteristic of food prices generally. Thirty-nine direct comparisons were possible for food products. For 27 products, the retail prices rose more than the wholesale prices.¹⁹ The weighted indexes for the products in common generally showed the same relative relationships between the CPI and WPI as the indexes for the subgroups reported by BLS (packaged beverages was the only exception to this general pattern).

Direct comparisons between BLS *nonfood components* of the CPI and WPI are more difficult to make since the classifications of the two

¹⁷ It has been pointed out in a USDA study that "live and retail prices are not directly comparable." J. Bruce Bullock and Duane Hacklander, "Price Spreads for Beef," U.S. Department of Agriculture, Miscellaneous Publication No. 992, February 1965, p. 5.

¹⁸ All fruits and vegetables are treated as one group for this purpose.

¹⁹ If annual price indexes are used for four seasonal products, then 41 comparisons are possible; 27 showed larger increases for retail prices.

indexes are different and BLS does not publish indexes for comparable subgroups. For 16 groups of products for which the subgroup indexes appear to be comparable, 11 showed a greater rise for retail prices and 5 had greater rises for wholesale prices. Fifty-four nonfood products are listed as common to the CPI and WPI. For 36 products, the retail price had risen more than the wholesale price through December 1964; for one product (men's oxford shoes) the increase was the same for the two indexes.²⁰

By December 1964, the goods component of the CPI as reported had risen 5.7 percent from the average level in 1957 to 1959. During the same period, among the WPI components, the food index increased 2.2 percent, other consumer nondurable finished goods by 2.1 percent and consumer durable finished goods remained about unchanged. For 62 out of 88 products for which prices could be compared, retail prices rose more than wholesale prices. *Clearly, the disparate behavior of the CPI and the WPI during the 7 years ending December 1964 was not attributable solely to the sharp increase in the prices of services, although the latter did account for part of the larger rise reported in the CPI.*²¹

REASONS FOR GREATER RISE IN RETAIL PRICES

The larger rise in retail prices than in wholesale prices reflects the rising costs of transportation, packaging, processing, warehousing and retailing generally.²² Higher labor costs have created pressures at all levels of distribution. It has been pointed out that:

* * * the many more marketing services now provided, such as more convenient packaging, further processing to more nearly final use forms, and more effective storage, have added to the proportion of the food dollar that goes for marketing charges.²³

The processing costs incurred for frozen foods and for such bakery products as "bake and serve" are illustrative. Moreover, frozen foods are usually subject to less price fluctuation than their perishable counterparts.

As a result of the increased costs and greater services rendered in connection with food products, the farmer's share declined from 43 percent in 1954 to 37 percent in 1964.²⁴

The importance of these added costs is well illustrated by the increase of 19.9 percent in the cost of food away from home as compared with 8.9 percent for food at home between 1957-59 and December 1965. Higher labor costs in restaurants have contributed to these trends.

In explaining the diverse movements of wholesale prices of farm products and retail food prices between late 1962 and 1964, the Federal Reserve Bank of Atlanta has observed:

* * * Wholesale prices for farm products, of which food is the primary component, have declined since late 1962. By the time food has gone through the processing stage * * * the downward movement in farm product prices has been

²⁰ Of the 17 products for which wholesale prices rose more or declined less than retail prices, 4 were toilet goods, 4 were appliances (including television), 2 were housefurnishings, 5 were clothing, 1 was nonalcoholic beverages, and 1 was natural gas.

²¹ By December 1964, all services had risen 16.2 percent as compared with the rise of 5.7 percent for all commodities from the 1957-59 level. The all-items index increased 8.8 percent.

²² Exceptions are the self-service supermarkets and discount houses.

²³ Pearl C. Ravner, "Price Trends and the Business Cycle in Postwar Years," Monthly Labor Review, March 1962, pp. 246-47.

²⁴ "Farm-Retail Spreads for Farm-Food Products," Marketing and Transportation Situation, August 1965, p. 7.

counterbalanced so that the wholesale price of processed food has hardly changed at all. Going one step further, the price of processed food after it has gone through the distributive process and is taken home by the housewife has drifted upward slightly * * * the price includes transportation and retail markups.

Finally, we discover an even stronger upward price trend when food is prepared by a chef and mingled with soft music and candlelight or even when it is dished up by a short-order cook and served to the tune of a jukebox. Thus, between the farmer and the restaurant, price trends for food show a distinct change—from a decline at the first stage to a fairly strong upward movement at the last * * *.²⁵

The extensive use of packaging is familiar to all of us.²⁶ Pre-packaged fruits and vegetables, poultry, fish, and meats usually sell for higher prices. When poultry and meats are packaged there is less waste and the consumer may obtain the specific items (e.g., boneless meat, chicken breasts, etc.) that she desires. The extent to which retail prices of beef have been influenced by these added services is illustrated in the comparisons in table V-1.

TABLE V-1.—Price spreads for beef, selected dates, 1953 to 1963

[Cents per pound]

	1953	1958	1960	1963	Change 1953-63
Net farm value.....	42.2	50.9	48.2	46.6	+4.4
Farm-wholesale spread.....	10.0	9.4	10.5	9.5	-0.5
Wholesale-retail spread.....	16.9	20.7	22.3	24.9	+8.0
Retail price.....	69.1	81.0	81.0	81.0	+11.9

Source: J. Bruce Bullock and Duane Hacklander, "Price Spreads for Beef," U.S. Department of Agriculture, Miscellaneous Publication No. 992, February 1965, pp. 12-13.

Between 1953 and 1963, the retail price of beef increased by 11.9 cents from 69.1 cents to 81.0 cents a pound or by 17.2 percent as compared with the increase of 4.4 cents or 10.4 percent for the net farm value. The wholesale-retail spread increased from 16.9 cents to 24.9 cents a pound or by 47.3 percent in the same period. This larger spread has been attributed to "the increased services performed by the marketing system."²⁷

Similarly, the average retail price for beef was 81.0 cents a pound in 1958, 1960, and 1963. While the retail price remained unchanged, the net farm value declined and the wholesale-retail spread increased.

The added costs of marketing services usually are maintained so that once they rise, they rarely go down. Although the consumer generally appears to desire more processing and a variety of other services to which he has become accustomed, the growth in importance of the discount house and the supermarket indicates that he is willing to accept less direct sales and no deliveries in return for a lower price. However, on balance, the widening cost of distribution explains to a substantial extent the larger increases for retail prices than for wholesale prices in the period analyzed.

²⁵ "A New Look at Prices," Monthly Review, Federal Reserve Bank of Atlanta, Atlanta, Ga., December 1964, p. 2.

²⁶ See Harold Barger, *Distribution's Place in the American Economy Since 1869*, Princeton University Press, Princeton, N.J., 1955, pp. 31-32.

²⁷ Bullock and Hacklander, *op. cit.*, p. 12.

CHAPTER VI

WPI-CPI CYCLICAL RELATIONSHIPS

Historically the CPI has fluctuated less than the WPI. Table VI-1 and chart 10 show the changes in the CPI and the WPI in each half cycle from 1913 to 1964. The reference dates for the business cycle are those established by the National Bureau of Economic Research. However, the peaks and troughs for the two price indexes do not coincide with the turning points in the cycle in economic activity.¹ Nevertheless, by confining the periods to those set up by the NBER, the price indexes are related to the maximum pressures in either direction.

THE 1913-1957 PERIOD

Twenty half cycles are depicted for the 1913-57 period.

In six periods, the WPI declined more than the CPI during recessions and in seven periods it advanced more during periods of rising economic activity:

During three other recession periods, the WPI declined while the CPI increased (January 1913 to December 1914, August 1918 to March 1919, and May 1923 to July 1924); during one period of rising economic activity, the WPI rose and the CPI declined (July 1921 to May 1923); and in one period of "recession"—a few months around the end of World War II when inflationary pressures were substantial—both indexes rose with the WPI recording the smaller advance (February-October 1945).

TABLE VI-1.—Percent changes in the Wholesale Price and Consumer Price Indexes, by cycles, 1913-1964

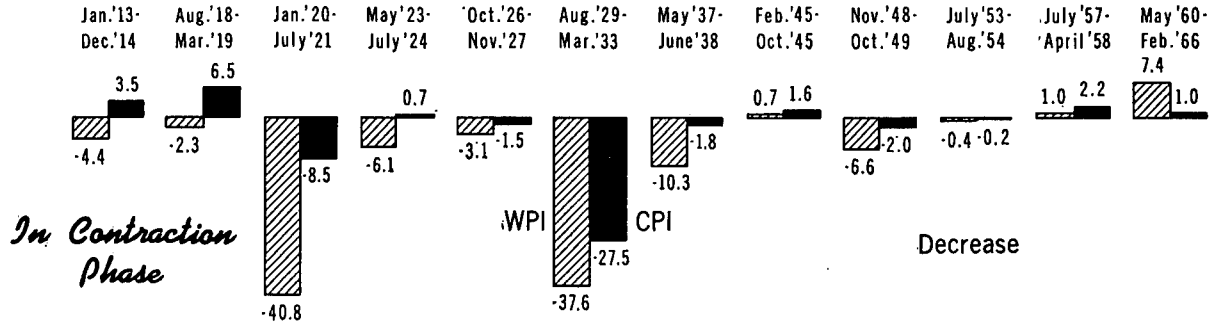
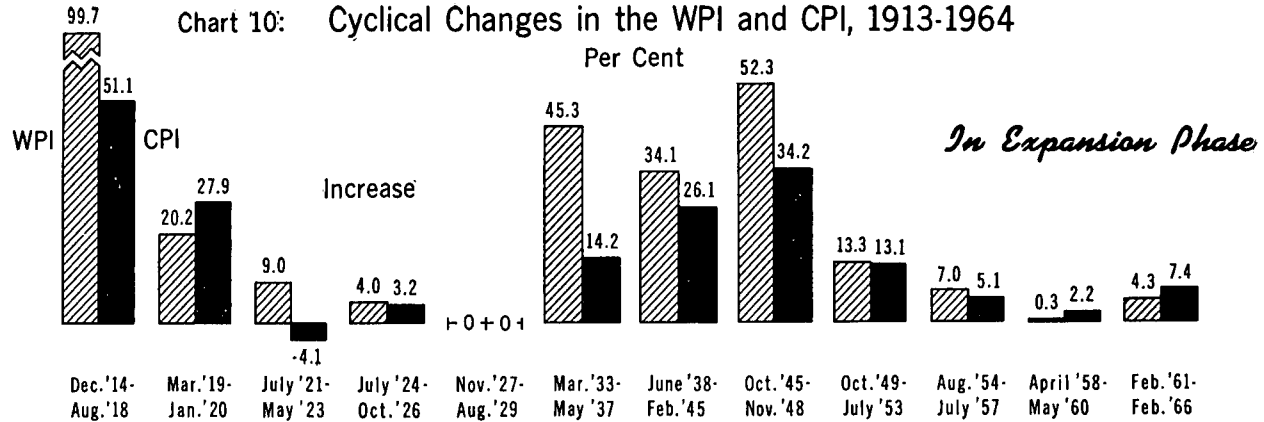
Period	Wholesale Price Index		Consumer Price Index	
	Trough to peak	Peak to trough	Trough to peak	Peak to trough
January 1913-December 1914.....		-4.4		3.5
December 1914-August 1918.....	99.7		51.1	
August 1918-March 1919.....		-2.3		6.5
March 1919-January 1920.....	20.2		27.9	
January 1920-July 1921.....		-40.8		-8.5
July 1921-May 1923.....	9.0		-4.1	
May 1923-July 1924.....		-6.1		0.7
July 1924-October 1926.....	4.0		3.2	
October 1926-November 1927.....		-3.1		-1.5
November 1927-August 1929.....	0		0	
August 1929-March 1933.....		-37.6		-27.5
March 1933-May 1937.....	45.3		14.2	
May 1937-June 1938.....		-10.3		-1.8
June 1938-February 1945.....	34.0		26.1	
February 1945-October 1945.....		0.7		1.6
October 1945-November 1948.....	52.3		34.2	
November 1948-October 1949.....		-6.6		-2.0
October 1949-July 1953.....	13.3		13.1	
July 1953-August 1954.....		-0.4		-0.2
August 1954-July 1957.....	7.0		5.1	
July 1957-April 1958.....		1.0		2.2
April 1958-May 1960.....	0.3		2.2	
May 1960-February 1961.....		0.2		1.0
February 1961-February 1966.....	4.3		7.4	

NOTE: Business cycle expansions and contractions as measured by the National Bureau of Economic Research. Indented periods show declining phase of the business cycle.

Source: U.S. Department of Labor, Bureau of Labor Statistics.

¹ U.S. Department of Commerce, Bureau of the Census, Business Cycle Developments, August 1965, p. 67.

Chart 10: Cyclical Changes in the WPI and CPI, 1913-1964



In one period both indexes remained unchanged (November 1927 to August 1929).

In one period of advancing economic activity, the CPI rose more than the WPI (March 1919 to January 1920). Actually, this was part of the immediate post-World War I inflation. If the entire World War I and early postwar period are considered together, the CPI rose 96.5 percent and the WPI 124.2 percent.

Thus, in 18 out of 20 periods, the WPI was more responsive to cyclical pressures than the CPI. It seems clear that up to the cyclical peak of July 1957, the CPI generally was considerably more sluggish than the WPI in response to underlying economic pressures.

Ewan Clague has summarized the reasons why the CPI fluctuated only modestly as follows:

In the first place, this index is a slow mover. Retail prices are the last to reflect the accumulation of costs (and value added), which have been incurred during the processes of production and distribution. They reflect the stability and the (usually) steady growth of consumer incomes and consumer spending . . .

In the second place, the comprehensiveness of the index practically insures that many of the price movements within it will counterbalance and offset each other . . .

In the third place, the major components of the index respond very differently to current business conditions.

. . . foods are responsible for many of the sharper fluctuations of the index, not only within the year, but also over a period of several years.²

In addition to the above factors, prices of services are:

Slow to change . . . They usually lag behind commodity prices, but they can move on upward after commodity prices have fallen. These service charges are not influenced directly or immediately by business fluctuations.

Not only are these governed largely by law and custom. . . but they also contain a large element of wages in the final service price. Unless the business decline goes so deep and lasts so long that wages begin to fall, there is no likelihood of a decline in the prices of the services.³

In contrast, the WPI contains several components that fluctuate very widely. Prices of farm products and industrial raw materials are among the most volatile in our economy. In addition, a number of intermediate products also fluctuate widely in price (e.g., those related to nonferrous metals). Finally, the WPI food index usually tended to fluctuate more than the CPI food index.

Thus, the difference in coverage helps to explain why the WPI fluctuated more than the CPI—the most sluggish prices are included in the CPI but not in the WPI—while for the most volatile prices the situation is reversed.

For specific products, wholesale prices also tended to fluctuate more than retail prices prior to 1958. As a product progresses through its cycle of production and distribution the fluctuations in its prices tend to become smaller.⁴ For some products, such as apparel, the practice of selling at designated price lines assures less fluctuation in the retail price than in the manufactured price or wholesale price.⁵

² Ewan Clague, "The Consumer Price Index in the Business Cycle," *Monthly Labor Review*, June 1958, pp. 616, 617. See also Ewan Clague, "Behavior of the CPI in Periods of Business Recovery," *Monthly Labor Review*, June 1959, pp. 642-45.

³ *Monthly Labor Review*, June 1958, pp. 617, 620.

⁴ For example, between December 1964 and January 1966, the wholesale prices of livestock increased 38.2 percent and meats 31 percent while retail meat prices rose 16.8 percent.

⁵ Stanley C. Hollander, "Retail Price Policies," *Compendium of Papers on the Relationship of Prices to Economic Stability and Growth*, 85th Cong., 2d sess., Washington, DC., 1958, p. 437.

Manufacturers and wholesalers also tend to be more responsive in their pricing to changing economic conditions than are retailers. Higher or lower prices for raw materials and supplies affect the manufacturer first. During the post-World War II years, labor costs have tended to rise earlier at the manufacturer's level because national wage patterns have been set in key manufacturing industries such as steel and automobiles and in general followed at a later date at the retail level.

Whether an attempt will be made to pass higher costs on to subsequent buyers depends upon many factors including competitive pressures, offsetting changes in other costs, price behavior of substitute products, trend of volume, strength of demand, and, in some instances, political pressures (e.g. aluminum, steel, and cigarettes in 1965-66). When retailers must pay a higher price, similar factors determine whether it is passed on to the consumer in whole or in part. As a result of these various forces, in the period through 1957, changes in retail prices lagged behind those in wholesale prices and tended to be smaller in magnitude.

THE RECORD SINCE 1957

Between July 1957 and February 1966 price relationships between the CPI and the WPI were markedly different from those which prevailed in the preceding four or more decades. Since July 1957, there have been two periods of declining economic activity and two periods of advance:

During both periods of declining economic activity, both indexes rose moderately with the CPI recording the larger increase each time.

During both periods of advancing economic activity, the WPI recorded smaller increases than the CPI.⁶

From July 1957 to February 1966, the WPI recorded a net rise of 5.8 percent as compared with the net increase of 13.3 percent in the CPI (services alone rose 23.7 percent).

July 1957 to December 1964.—The lag in the WPI between July 1957 and December 1964 reflected a number of basic pressures including relative stability in costs, intense competition from domestic companies and from abroad, and political considerations.

During this period, pressures upon finished goods prices from the cost side were minimal. The prices of crude materials declined by 7.8 percent during this period. Although hourly labor costs rose steadily, output per man-hour rose as rapidly so that unit labor costs recorded only minor changes in all manufacturing industries between 1957 and 1964. Unit labor costs for the entire corporate economy, on the other hand, rose about 1 percent annually. (See table VI-2.)

⁶ However, between December 1964 and February 1966, the WPI increased by 4.6 percent and the CPI by 2.6 percent.

TABLE VI-2.—Unit labor costs, 1957-1965

[1957-59=100]

	Labor cost per unit of output, manufacturing	Labor cost per dollar of real corporate GNP
1957.....	98.7	98.7
1958.....	102.2	100.8
1959.....	99.7	100.7
1960.....	100.7	103.2
1961.....	100.4	103.7
1962.....	100.4	103.3
1963.....	99.7	104.2
1964.....	99.7	105.1
1965.....	98.8	106.0

Source: U.S. Department of Commerce, Bureau of the Census, "Business Cycle Developments," February 1966, p. 30.

When the total volume of output rises sharply, unit overhead costs tend to decline. The Federal Reserve Board's industrial production index increased from 100.7 (1957-59=100) in 1957 to 132.3 in 1964 and total sales of manufacturing industries recorded a comparable increase. (See table VI-3.) With such increases in volume, unit overhead costs probably declined during this period.

The combination of relatively stable labor costs and relatively stable prices was accompanied by a small rise in before-tax margins. Most of this rise reflected the fact that these margins had been adversely affected by the recession in 1958. However, the before-tax margin was held down because the liberalization of depreciation allowances since 1958 has increased the proportion of the sales dollar used for this purpose.⁷ This increase in the relative importance of depreciation probably offset the decline in unit overhead costs.

Throughout the 1958-64 period, there was a considerable amount of idle capacity in American industry. The utilization rate (output as a percent of capacity) in manufacturing industries averaged between 82 and 88 percent in most of these years as compared with 92 percent preferred by managements.⁸ The availability of substantial excess capacity created pressure for price concessions and against price increases in many industries including aluminum, paper, chemical, nonferrous metals, and electrical machinery.⁹ When this excess capacity disappeared in industry after industry in 1965, wholesale prices began to move upward in a number of industries.

The competitive pressures generated by domestic surplus capacity were reinforced by the intensification of foreign competition in this country. Steel, chemicals, electrical equipment, radios, textiles, and many other products were subjected to severe competition as foreign countries recovered fully from the effects of World War II and added to their plant capacity.¹⁰

⁷ Corporate capital consumption allowances were increased from \$22 billion in 1958 to \$34 billion in 1964. During the same period, GNP increased from \$447.3 billion to \$628.7 billion. Corporate capital consumption allowances increased from 4.9 to 5.4 percent of GNP.

⁸ Economic Report of the President, January 1966, Washington, D.C., 1966, p. 249.

⁹ For a list of price increases that had to be reversed and price concessions see testimony of Jules Backman in Economic Concentration, Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate, 89th Cong., 1st sess., Washington, D.C., March 16, 1965, pt. 2, pp. 569-72, 890-98.

¹⁰ See, for example, "Steel Production, Inventories, and Consumption," Survey of Current Business, February 1964, p. 4; Jules Backman, Foreign Competition in Chemicals and Allied Products, Manufacturing Chemists' Association, Inc., Washington, D.C., January 1965, passim; Clifton B. Cox and Vernon W. Pherson, The Competitive Potential of the U.S. Cotton Industry, Harvard University Graduate School of Business Administration, Division of Research, Boston, Mass., 1959, pp. 18-23, 60-77; and Jules Backman, The Economics of the Electrical Machinery Industry, New York University Press, New York, 1962, chapter XI.

TABLE VI-3.—*Industrial production, manufacturing sales and income before taxes, 1957-1965*

	FRB total industrial production (1957-59=100)	Utilization rate-output as a percent of capacity in manufacturing	Total manufacturing sales (billions)	Income before taxes, as a percent of sales
1957.....	100.7	85	\$28.7	8.8
1958.....	93.7	76	27.3	7.4
1959.....	105.6	84	30.2	8.8
1960.....	108.7	83	30.8	8.0
1961.....	109.7	82	30.9	7.7
1962.....	118.3	86	33.3	8.2
1963.....	124.3	86	34.8	8.5
1964.....	132.3	88	37.1	8.9
1965.....	143.3	91	40.3	9.5

Sources: U.S. Department of Commerce, Federal Reserve Board, and Federal Trade Commission—Securities and Exchange Commission.

Finally, some leading industries were affected by the threat of government action if they raised their prices. The dramatic confrontation of the steel industry by President Kennedy in 1962 served notice on companies in other industries that they should be careful about increasing their prices. The political environment was not right for price increases in leading industries.

The forces discussed above affected the CPI less than the WPI between 1957 and 1964. Despite relative stability in the costs of goods bought, higher labor costs not fully offset by increases in output per man-hour and the proliferation of services created pressures for higher retail prices as was discussed earlier. These pressures developed against a background of steadily increasing consumer demand. Personal income after taxes increased from \$308.5 billion in 1957 to \$435.8 billion in 1964. The result was an increase of 5.2 percent in the retail prices of goods and of 16.2 percent in the prices of services.

1965 and 1966.—In 1965 and 1966, there were changes in some of the factors which had contributed to the stability of the WPI in the preceding years. Although unit labor costs continued to rise by only about 1 percent for the entire corporate economy, prices of raw materials reversed their previous decline. Between December 1964 and February 1966, the prices of industrial raw materials rose by 5.1 percent and farm products by 15.7 percent. The result was greater pressures on costs than had prevailed in the preceding years. Prices of processed foods, which were directly affected by higher farm product prices, rose by 10.8 percent.

At the same time, the continuing expansion of the economy resulted in increasing pressure on capacity. Utilization rates averaged 91 percent in 1965 and in some industries the supply position became quite tight. As price pressures developed, Government intervention developed in a number of instances. In 1965, for example, aluminum and copper price increases had to be rescinded after the Government threatened to sell those products from its stockpile. Price increases for structural steel and cigarettes had to be cut back in part as a result of vigorous criticism by Federal officials. However, as the experience in 1965 and early 1966 demonstrated, industries not in the political eye were able to raise prices as shown by the increase in wholesale

prices of industrial products by 2 percent between December 1964 and February 1966.

The forces operating in 1965-66 had a greater impact on the WPI than on the CPI. In the 14-month period from December 1964 to February 1966, the WPI rose by 4.6 percent due largely to the higher prices for farm products and foods while the CPI rose 2.6 percent.¹¹ Thus, the relationship which had prevailed historically between the WPI and CPI was once more in evidence.

¹¹ The higher rate of increase in the CPI than in the preceding 7 years was attributable largely to the rise of 6.5 percent in retail food prices.

CHAPTER VII

THE MEASUREMENT OF PRICE INFLATION

The preceding analysis has emphasized the coverage of the three major price indexes and how it affects the behavior of each index. We also have evaluated the criticisms made of each of these price indexes. Clearly, there is no price index which is perfect. Of course, the same general conclusion applies to practically all economic indicators.

The three price indexes alone do not tell the entire story of price inflation. Other measures, such as prices of land,¹ real estate, and common stocks may be even more revealing and significant in some periods. A complete analysis of price inflation, therefore, must review the experience in all of these areas.

Even more important, such an evaluation must be concerned with the basic causes of inflation, the demand-pull resulting from the fiscal and monetary policies of the Federal Government, and the cost-push created by excessive increases in labor costs.

There is urgent need for a more comprehensive set of indicators of prices and values if we are to have an effective "early warning system" to detect incipient inflation or even its actual development. All the data need not be compiled by a single Government agency. They should be compiled by the specialized agencies involved in a particular sector of the economy. This would be true, for example, for rail, truck, inland water and coastal transportation rates (Interstate Commerce Commission), air transportation rates (Civil Aeronautics Board), electric and gas rates (Federal Power Commission), and telephone rates (Federal Communications Commission).

An interagency committee should be established to facilitate the collection and coordination of the required data. Such a group, properly staffed, could determine the significant gaps in our price intelligence, determine what Government agency should fill them, and provide for a systematic publication of all price data.

For the time being, we must utilize the tools at hand while striving to extend further the improvements which have characterized the history of all three price indexes. The present study seeks to answer several questions dealing with price inflation by the use of price indexes. Does the given price index—CPI, WPI, IPI—reflect what is happening in the entire economy, in a major segment, or in only a small sector? How meaningful is the index as a measure of the overall magnitude of price inflation? Which index is most useful to determine when price inflation is starting and when it has been terminated?

We turn now to a brief review of each of the three price indexes and the role they play in measuring price inflation.

¹ Such data already are available for agriculture.

WHOLESALE PRICE INDEX

The WPI does not provide a satisfactory measure of the general level of prices because of its inadequate framework of reference, inadequacies in the data collected, and a failure to reflect fully all changes in quality. The index could be considerably improved by expanding its coverage to include construction, transportation, trade, services, and prices of products entering into international trade. Further research to determine the prices actually paid by buyers would indicate the extent to which sellers' prices now used to compile the index reflect the actual fluctuations in prices in our economy. By changing the WPI, so that its subindexes conform to the standard industrial classification, comparisons would be facilitated with other economic variables and it would be more useful as a deflator of the national accounts.

The WPI contains considerable duplication since it includes products at different stages of production. As a result, a change in the prices of a key item may have a significant impact on the entire index. For example, a decline in the supply of livestock in 1965 was reflected in major increases in the prices of farm products, in processed foods, and in hides and skins.

The WPI is mainly useful in connection with the timing of inflation. The fact that the WPI is reported weekly as well as monthly is important in this respect. The WPI reflects the price movements at earlier stages of the production-distribution process and hence often is a good indicator of future trends of finished goods prices at the retail level. However, changes in costs, in profit margins, in competitive pressures, and/or pricing policies at later stages of distribution may blunt or accentuate the impact of rising prices of raw materials, of intermediate products, or of many finished goods.

The WPI tends to be more directly responsive to economic pressures than either the IPI or CPI. The raw-materials component usually is more responsive than the entire WPI and hence is especially valuable as an indication of developing trends. However, these latter prices may have false starts (as during the Suez crisis in 1956) or may reflect special pressures (for example, sharply rising prices of fresh fruits and vegetables when supplies are short).

The National Bureau of Economic Research has classified the price index of basic commodities as a leading index, that is, one which tends to change direction before turning points in the business cycle; the index of wholesale prices of manufactured goods is classified as a coincident type series, one that moves in the same direction as the economic cycles with similar timing of turning points.² On the other hand, consumer price indexes "in general have conformed poorly to business cycles."³

During the years from 1945 to 1958, the total WPI led the CPI at several turning points but the timing has varied widely:

The WPI turned down in September 1948 and the CPI followed in October.

The WPI turned up in February 1950 while the CPI turned up one month later.

² Geoffrey H. Moore, editor, *Business Cycle Indicators*, vol. II, National Bureau of Economic Research, Princeton University Press, Princeton, N.J., 1961, pp. 67, 67.

³ Julius Shiskin, "Statistics for Short-Term Economic Forecasting," in "Business Cycle Indicators," vol. I, op. cit., p. 619.

The WPI reached a peak in March 1951, declined until the end of 1952 and then stabilized for more than 2 years. The CPI continued to move upward through 1951 and 1952 and reached its peak in October 1953. It then moved sideways until the spring of 1956.

The WPI began a new advance in May 1955. Although the CPI reached its low point in April 1955, it showed only minor changes until March 1956, after which it followed the rise in the WPI.

From the spring of 1958 through the end of 1964, the WPI recorded unimportant fluctuations while the CPI continued to advance a little more than 1 percent annually.

In 1965, the WPI once more advanced while the CPI continued to rise at a fractionally higher rate than in the preceding 6 years.

Although the timing of changes for the two indexes has shown no fixed pattern, there has been a tendency for the WPI to lead the CPI.

The extent to which the components of the WPI change in the same direction also may provide a useful guide to developing price trends. For example, the general stability of the WPI from 1958 to 1964 reflected offsetting increases and declines. In contrast, no major component of the WPI declined between December 1964 and December 1965. It was this rise in prices across the board—even though the increases for most groups were less than 1 percent—rather than the overall magnitude of the rise that caused considerable concern about further price inflation early in 1966.

The fact that the WPI covers prices at several stages of production makes it possible to trace price rises through successive stages from raw materials to finished fabrication. Thus, an analysis of the changes of the components of the WPI and the diffusion of price changes may provide a valuable early warning signal which reinforces the significance to be attached to turning points in the total WPI.

IMPLICIT PRICE INDEX

The coverage of the IPI is broader than that of the other two price indexes because it is derived from the comprehensive gross national product accounts. Although the Council of Economic Advisers has described the IPI as "our most comprehensive indicator of the price level,"⁴ it is affected by several significant weaknesses which limit its usefulness as a measure of the magnitude of price inflation.

Significant distortions are introduced into the IPI by the failure to allow for increases in output per man-hour in construction and in Government services. Moreover, many of the price deflators in the private sector are not strictly comparable to the dollar totals to which they are applied. As a result, the total IPI provides a very unsatisfactory measure of changes in the general level of prices in the United States. Improvement in the quality of these price indexes is necessary. A comprehensive price index covering the national accounts is vitally needed to improve our measures of real economic growth and output per man-hour. Hence every effort must be made to eliminate the defects of the present IPI.

⁴ Economic Report of the President, January 1966, Washington, D.C., 1966, p. 64.

Changes in the IPI overstate the magnitude of price inflation and result in an understatement of the increase in real gross national product. The measurement of the price changes for compensation of Government employees is particularly inadequate. Yet it is the changes incorporated for Government which account for most of the disparity between the changes recorded by the IPI and the CPI. For example, in the period 1958-1964, the rise in the total IPI was 8.9 percent. For the gross private product, after elimination of all Government services, the increase was 7.1 percent and for the CPI the rise was 7.3 percent. Thus, the breadth of coverage of the IPI is a disadvantage in determining the degree of price inflation because of the significant influence of the inadequately measured Government sector.

To the extent that this index is used, *there is much to be said for confining the measure of price inflation to the total IPI excluding compensation of Government employees (about 90 percent of the coverage)*. However, even this less comprehensive index tends to overstate the actual changes in the level of prices because of the inclusion of the inflated indexes for construction costs.

The IPI is published quarterly and hence has much less value as a measure of the timing of inflation than either the CPI published monthly or the WPI available weekly and monthly. Since the IPI is based in large part on the components of the CPI and WPI, (45.6 percent is derived from the CPI and 12.3 percent from the WPI), the mechanics of its compilation make it unavoidable that even the publication of the quarterly data will lag behind the other two indexes.

Because of its infirmities as a price index, the total IPI does not provide a good measure of general price inflation. There is vital need for a program to improve the quality of price data used to deflate the national accounts. A WPI based upon an input-output matrix, the development of indexes for products entering into international trade, and improvements in the price data for Government and construction are required. Until such improvements are achieved, the trends recorded by the IPI add little to the picture shown by the broad trends of the other two price indexes.

CONSUMER PRICE INDEX

The CPI is the index used most widely to measure the magnitude of price inflation.⁵ The CPI has broader coverage than the WPI because it includes a wide range of services (which account for about one-quarter of GNP) as well as excise taxes, sales taxes, and property taxes. On the other hand, the CPI coverage is significantly smaller than that of the IPI. However, the CPI does not have the infirmities noted earlier for the IPI and hence is a better measure of trends of prices.

To the extent that wholesale prices cover the same products (about one-third of the CPI), the CPI reflects the changes which are passed

⁵ See, for example, Arthur F. Burns, *Prosperity Without Inflation*, Fordham University Press, New York, 1957, p. 71. Employment, Growth, and Price Levels, Hearings before the Joint Economic Committee, Congress of the United States, 86th Cong., 1st sess., Washington, D.C., 1959, pt. 1, p. 59. See also statements by Prof. A. G. Hart, of Columbia University, *ibid.*, pt. 9A, p. 2864 and Prof. Robert A. Gordon, University of California, *ibid.*, pt. 9A, p. 2960. Defense Against Inflation, Committee for Economic Development, New York, May 1958, p. 19. William G. Bowen, *The Wage-Price Issue—A Theoretical Analysis*, Princeton University Press, Princeton, N.J., 1960, p. 16. For a dissent see William C. Freund, "We Are on Our Way Toward Attaining a Bright Future in 1966," *The Commercial and Financial Chronicle*, October 7, 1965, p. 18.

through to the final consumer. The CPI also provides the best measure of the degree of price inflation experienced by the final consumer, and hence, when used to adjust his income, indicates changes in the levels of living. However, the CPI does not measure the extent of price inflation affecting business concerns, because it does not cover raw materials and capital goods.⁶ Selected components of the WPI are far more useful in this connection, particularly as an early warning system.

The CPI gives major weight to items bought by city workers' families and single individuals. It does not attempt to measure price trends for rural areas⁷ (a sharply declining segment of the economy) or for higher income groups. Nevertheless, it is probable that the CPI does provide a rough indication of price trends for those areas and groups because of the geographic relationships among prices and the tendency for all groups to buy many of the items they require from the same types of outlets.

Despite the advantages as compared with the other two indexes, there are some limitations to be noted. The CPI usually tends to be more sluggish and to lag behind the WPI as was noted earlier. Thus, in the past, the CPI has been less useful as a measure of incipient price inflation than the WPI. However, between 1958 and 1964, the WPI was the lagging index. In 1965 and 1966, on the other hand, the WPI again played its historic role of leading the CPI.

Repeatedly, it is asserted that the CPI overstates the actual rise in prices, because of various imperfections in its compilation. These alleged imperfections are (a) a failure of the CPI to reflect fully quality improvements, (b) a failure to add new items and to subtract old items from the index rapidly enough, (c) delays in reflecting the effect of new methods of distribution at lower prices (discount house and supermarket), and (d) a built-in overstatement of price rises because the index is constructed by using fixed-base-period weights. It has been claimed that, if these defects were eliminated, the CPI might show no price inflation during much of the decade ending in 1964.

It is impossible to determine with any precision the net quantitative effect of these various criticisms. When allowance is made for the sectors of the index which are not affected and for those goods and services which appear to have experienced an offsetting deterioration in quality, the net effect upon the CPI appears to be very minor.

CONCLUSION

The CPI provides the best measure of the magnitude of price inflation. The coverage of the WPI is too limited for this purpose. The main value of the WPI, and particularly of the crude materials component, is to provide a warning signal that price inflation may be developing. The implicit price index (IPI) is the least useful of the three price indexes. However, the IPI, excluding compensation of Government employees, can be used to confirm, with some lag, the general magnitude of changes in the CPI.

Each of the indexes serves to provide some insight into the current and prospective course of prices. More can be learned through con-

⁶ To the extent that a company has a labor contract which contains a cost-of-living escalator clause, however, changes in the CPI directly affect the labor costs of the company. The automobile industry labor contracts have contained such clauses since 1948.

⁷ The U.S. Department of Agriculture collects such data for rural areas. (See appendix I.)

current observation of all three indexes of prices than by complete reliance upon any single measure. Although these indexes have been improved in recent years, they are still in need of further development to maximize their value as guides for anti-inflation policies.

APPENDIXES

APPENDIX A

THE CONSUMER PRICE INDEX (CPI)*

The Consumer Price Index (then known as a cost-of-living index) was published first shortly after World War I, and was based upon a study of expenditures by wage earners and clerical workers in the 1917-19 period. Periodically, BLS has recast completely the CPI as the required comprehensive studies of consumer expenditures could be made. Such expenditures studies were made as of 1934-36, 1950, and 1960-61. The pattern of spending determines the relative weights given to various items included in the index. As BLS has pointed out:

"At the time of periodic revisions in the index, when new value weights are introduced, the relative importance of each item is equivalent to its importance in average annual family expenditures in the year to which the new weighting structure relates. These basic value weights represent not only total family expenditures for the various items, but also the specific quantity and quality of each item at the unit price prevailing at the time of the expenditure study."¹

However, changes may also reflect new methods of imputing weights, the handling of product substitutions, and measures to eliminate any bias found in the index (e.g., elimination of rent bias in 1950).

The 1960-61 expenditures study provided the basis for the comprehensive revision of the index, starting in January 1964.² Prices are obtained monthly or quarterly for about 400 items in 33 standard metropolitan statistical areas and 17 smaller cities.³ Prices are obtained for the more important goods and services and, in addition, a sample is obtained for the many thousands of other items purchased by consumers in this group. Although substitutions of products sometimes are made between major revisions, BLS prices what is essentially a constant market basket. Price changes are weighted in terms of relationships derived from the survey of spending patterns.

BLS reports that:

"Prices are obtained by personal visit to a representative sample of about 16,500 retail stores and service establishments where wage and clerical workers buy goods and services, including among the establishments chain stores, independent grocery stores, department and specialty stores, restaurants, professional people, and repair and service shops. Rental rates are obtained from about 34,000 tenants. Reporters are located both in the city proper and in suburbs of each urban area * * *.

"To insure that the index reflects only changes in prices and not changes due to quantity or quality differences, the Bureau has prepared detailed specifications to describe the items of the market basket. Specially trained Bureau representatives examine merchandise in the stores to determine whether the goods and services for which they record prices conform to the specifications. Where the precisely specified item is not sold at a particular retail establishment, the Bureau's representative obtains a detailed technical description of the item on which prices are quoted, in order to insure that prices will be quoted on the same quality and quantity from time to time * * *.

"* * * The Bureau uses mail questionnaires to obtain data on streetcar and bus fares, public utility rates, newspaper prices, and prices of certain other items

*The original draft of this appendix was prepared by Marvin Levine, assisted by Martin Kwintner. We have benefited substantially from the extensive comments of the staff of the U.S. Bureau of Labor Statistics.

¹"Relative Importance of CPI Components, December 1953," *Monthly Labor Review*, July 1959, p. 776.

²The records for the 1960-61 expenditures study were furnished by 4,344 families with an average size of 3.7 persons and an average income of about \$8,230 after taxes, and by 517 single workers with an after-tax income of about \$3,560. U.S. Department of Labor, Bureau of Labor Statistics, *The Consumer Price Index* (revised January 1964), Washington, D.C., September 1964, pp. 1, 3.

³For a list of the areas and cities, and the pricing schedule, see *ibid.*, pp. 9-10. Effective January 1, 1966 the number of cities and standard metropolitan areas was increased to 56.

which do not require a personal visit by Bureau agents. For a number of items, e.g., home purchase, college tuition, used cars, magazines, etc., data collected by other Government agencies or private organizations are used."⁴

Separate indexes are reported monthly for 5 cities and quarterly for 18 other cities. Data are collected for additional cities for which no separate index is reported although the data are used in compiling the national consumer price index.

In the calculation of the CPI national index, price changes for the items in each area are averaged together with the weights that represent their importance in the spending of all wage earners and clerical workers. The city data are combined with weights based on their population in 1960.⁵

Consumer outlays are allocated to 1 of 52 expenditure classes. "BLS expects to maintain constant the relative base period weight relationships of the expenditure classes." However, it may select a new sample of items " * * * whenever there has been a significant shift in the composition of consumer expenditures within the category." This procedure will permit more readily the inclusion of new products.⁶

The index is usually published in the last week of the month for the preceding month.

THE EVOLVING CONSUMER PRICE INDEX

The major revisions of the CPI in 1939, 1952, and 1963 based on new expenditure studies reflected largely the changing composition of consumption and of goods and services available. Some products which are taken for granted today were of minor importance or nonexistent when the original CPI was compiled in 1919. In addition, changes have been made in the base periods in the size of the sample, and in methods of substituting products between major revisions.

1939 REVISIONS

Among the goods and services which increased in importance during the two decades between 1919 and 1939 were: Canned fruits and vegetables, dry cleaning, electricity, fuel oil, electrical appliances (washing machines, vacuum cleaners, electric refrigerators), light bulbs, radios, automobiles, gasoline, men's suits, beauty shops, razor blades, sanitary napkins, and face powder.

To compensate for the expenditures on items such as those mentioned above the following were given smaller relative weights in the index: Cereals and bakery products, children's clothing and footwear, anthracite coal, wood, gas, kerosene, sewing machines, wool rugs, stoves, streetcar fares, and medical care. Eliminated from the index in 1939 were: Boys' wool and cotton clothing, girls' cotton clothing, and shaves in barbershops.

In addition, there were many substitutions of new products including:

"The substitution of low shoes for high shoes * * *. Rayon slips replaced cotton corset covers and cotton petticoats * * *. Rayon dresses were gradually substituted for cotton or silk dresses. Pajamas replaced nightshirts. Living room furniture was bought in matched suites instead of the previously purchased single pieces."⁷

In terms of the broad groups of products included in the CPI, food and apparel declined sharply in relative importance between 1917 and 1919 and 1934 and 1936 and medical care fell moderately; all other groups increased in importance. These changes reflect the combination of price changes, which varied among the groups listed during the two periods, and changes in consumption patterns. The latter were more important in most instances.⁸

1950 REVISION

In 1950, the Bureau of Labor Statistics made an interim adjustment in the CPI. This was based on a 1949 survey of the average post-World War II expenditure pattern of families of wage earners and clerical workers with an income under \$10,000 in seven large cities. The commodity coverage was increased moderately. An important change at that time was an adjustment for "new unit bias" in rent.⁹

⁴ *Ibid.*, p. 4. Effective in January 1966, the number of reports was increased to 18,000 and the number of tenants to 40,000.

⁵ "The Consumer Price Index," *op. cit.*, pp. 5, 9, 10.

⁶ Sidney A. Jaffe, "The Statistical Structure of the Revised CPI," *Monthly Labor Review*, August 1964, pp. 918-19, 923.

⁷ U.S. Department of Labor, Bureau of Labor Statistics, "Changes in Cost of Living in Large Cities in the United States, 1913-41," *Bulletin No. 699*, Washington, D.C., 1941, p. 2.

⁸ *Ibid.*, pp. 24, 25.

⁹ U.S. Department of Labor, Bureau of Labor Statistics, "The Consumer Price Index: A Layman's Guide," *Bulletin No. 1140*, Washington, D.C., 1953, pp. 29-31.

During World War II and the early postwar years, the index did not reflect the difference between rents charged for new units entering the rental market and those of comparable units already in the market.¹⁰ The BLS studied in detail the housing situation in the 34 cities included in the CPI. It found that for the period from 1940 to 1950 the accumulated downward bias was 5.5 percent for the January 1950 rent index and 0.8 percent for the entire CPI.¹¹

1953 REVISION

In 1953 there was another comprehensive revision in the CPI. The index was related to the average 1952 expenditures of urban wage and clerical workers' families with an income of less than \$10,000. This was based on an expenditures survey in 97 cities in 1950 and adjusted to 1952.

The Bureau of Labor Statistics "selected about 300 items, which together can be used to estimate the average change in prices of all items in the 'market basket'."¹² In contrast, the old index had only about 200 items and the interim adjusted index about 225. The old series contained the following items that were not included in the revised series: salt pork, man's overcoat, horsehide man's jacket, uniform, mackinaw, girl's slip, quinine, iodine, kerosene, and laundry soap bar.

The revised series included many items that had not been priced in the old series: television sets, frozen foods, tea, cola drink, fresh peaches, fresh grapes, fresh strawberries, watermelon, canned luncheon meat, peanut butter, catsup, man's sport shirt, woman's sweater, woman's rayon suit, nylon slip, brassiere, handbag, girl's sweater, bedspread, tablecloth, broadloom rug, water heater, exterior house paint, porch flooring, multiple vitamin concentrates, shaving cream, shampoo, face cream, used cars, automatic laundry service, detergent, cleansing tissues, electric light bulbs, and blended whiskey.¹³ The index included for the first time a direct measure of the effect of price changes on the cost of homeownership and maintenance.

Table A-1 shows the relative importance of groups of items included in the CPI as of 1935-39, January 1950 after the adjustment, and December 1952 after the revision. There was a decline in the relative importance of food, apparel and personal care. The largest drops took place in food (from 35.4% in 1935-39 to 29.6% in December 1952) and apparel (from 11.0% in the earlier period to 9.2% at the end of 1952). On the other hand, transportation, medical care, reading and recreation, and other goods and services increased in importance. Thus, much of the rise was centered in services.

TABLE A-1.—Relative importance of groups of items included in Consumer Price Index, 1935-39, January 1950 (after adjustment) and December 1952 (after revision 1)

	1935-39	January 1950	December 1952
Food.....	35.4	33.3	29.6
Housing.....	33.7	25.1	132.5
Apparel.....	11.0	12.8	9.2
Transportation.....	8.2	11.4	11.3
Medical care.....	4.0	5.2	5.1
Personal care.....	2.4	2.4	2.0
Reading and recreation.....	2.9	5.8	5.3
Other goods and services.....	2.4	4.0	5.0
Total.....	100.0	100.0	100.0

¹ Includes home purchase not included in earlier figures.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Relative Importance of Consumer Price Index Components, December 1959 and December 1960, Including Selected Prior Periods for Major Groups, p. 1.

¹⁰ U.S. Department of Labor, Bureau of Labor Statistics, "Interim Adjustment of Consumers' Price Index," Bulletin No. 1039, Washington, D.C., 1951, p. 1.

¹¹ *Ibid.*, p. 2.

¹² U.S. Department of Labor, Bureau of Labor Statistics, The Consumer Price Index, A Short Description of the Index as Revised, 1953, Washington, D.C., January 1953, p. 3.

¹³ U.S. Department of Labor, Bureau of Labor Statistics, Comparative List of Items (Specifications) in the Consumer Price Indexes—Old Series, Adjusted Series and Revised Series, February 1953, pp. 1-12.

JANUARY 1964 REVISION

The CPI was revised again in January 1964. In this revision BLS developed a more comprehensive index, covering single workers living alone as well as families of clerical workers and wage earners. The new series is based on a consumer expenditures survey in 1960-61.¹⁴

The Bureau of Labor Statistics has pointed out that:

"The major difference between the old and the new series weights is a significant decline in the weight for food which is balanced by increased weights for housing, transportation, and health and recreation. Homeownership weights are up substantially, but the weights for furniture and appliances have declined. While the weights for automobile purchase and operation are significantly higher, the weight for public transportation is down. Services as a whole have increased weight in the new series; the weight for durable commodities also is higher; but the weight for nondurable commodities is reduced, primarily because of the lower food weight. However, a gain in the gasoline weight helped to minimize the decline for nondurables."¹⁵

The new series takes into account about 400 items which make up the "market basket." Thus, there has been a net increase of approximately 100 items over the 1953 revision. It has been noted that:

"Examples of a few items in the old basket that were not carried over to the new basket include lemons, women's nightgowns, men's pajamas, an appendectomy, and a sewing machine. Among the items added to the new basket are between-meal snacks, hotel and motel rooms, demountable air-conditioners, garbage disposal units, moving expenses, parking fees, taxicabs, airplane and inter-city bus fares, outboard motors, phonograph records, golf fees, college tuition and textbooks, music lessons, legal services and funeral services."¹⁶

Table A-2 shows the relative importance of components of the CPI in the old and new series. There was a marked drop in the relative importance of food. On the other hand, the housing component rose significantly with the rise centered in home purchase and financing and taxes and insurance. Similarly, the substantial rise in the transportation component basically reflected higher weights assigned to automobiles, gasoline, motor oil, and automobile services. Little change occurred with respect to apparel and upkeep. Medical care recorded a slight decline in the new series while other parts of the health and recreation component—personal care, reading and recreation, and other goods and services—showed a modest rise.¹⁷

TABLE A-2.—Relative importance of Consumer Price Index components, old and new series, December 1963

	Old series	New series
Food.....	28.18	22.43
Housing.....	30.71	33.23
Apparel and upkeep.....	10.58	10.63
Transportation.....	11.65	13.88
Health and recreation.....	18.03	19.45
Miscellaneous.....	.85	.38
Total.....	100.00	100.00

Source: U.S. Department of Labor, Bureau of Labor Statistics, Major Changes in the Consumer Price Index, Washington, D.C., March 1964, p. 7.

EFFECTS OF CHANGES IN INDEX

THE 1939 REVISION

BLS published new annual indexes for the CPI with the revised weights discussed earlier and on the old basis for the period 1930 to 1939. The changes are shown in table A-3.

¹⁴ "The Consumer Price Index," op. cit., pp. 1, 3.

¹⁵ U.S. Department of Labor, Bureau of Labor Statistics, Major Changes in the Consumer Price Index, Washington, D.C., March 1964, p. 2.

¹⁶ *Ibid.*, p. 3.

¹⁷ Between December 1963 and December 1964, the relative importance did not change by more than one tenth of one percentage point for any major group in the CPI. Gloria F. Green, "Relative Importance of CPI Items," Monthly Labor Review, November 1965, pp. 1346-49.

The revisions of the CPI based on the 1934-36 expenditures study for 1935-39 and the revised food index for 1930-35, resulted in a larger decline for the new index between 1930 and 1935 because of the greater decline recorded in the revised food index than in the previous index. Between 1935 and 1939, the effect of the comprehensive revision in weights was a somewhat smaller advance; namely, 1.4 percent as against 1.9 percent for the old index.

TABLE A-3.—*Consumer Price Index: Old index (1917-19 weights) and new index (1934-36 weights), 1930 to 1939*

[1923-25=100]

Year	Old index	New index
1930	97.0	96.9
1931	88.6	88.2
1932	79.8	79.2
1933	75.8	75.0
1934	78.6	77.0
1935	80.7	79.6
1936	81.6	80.4
1937	84.3	83.4
1938	83.0	81.8
1939	82.2	80.7
Percent change:		
1930-35	-16.8	-17.9
1935-39	1.9	1.4
1930-39	-15.3	-16.7

NOTE.—The new index was derived largely by reweighting the major groups for earlier years by the new weights.

Sources: U.S. Department of Labor, Bureau of Labor Statistics, "Changes in Cost of Living in the United States, December 15, 1939, and Year 1939," Monthly Labor Review, April 1940, p. 919; "Changes in Cost of Living in Large Cities in the United States, 1913-41," Bulletin No. 699, Washington, D.C., 1941, p. 44.

June 1930 to March 1935. In connection with the 1939 revision in the CPI, BLS reported that it "* * * reweighted the price indexes for main groups with the same set of revised weights (1934-36 expenditure survey data) to produce a new CPI series for the period June 1930 through March 1935."¹⁸ However, an examination of the old and the revised indexes shows that the food component also was revised.¹⁹ The changes in the major components of the CPI were as follows:

Consumer Price Index: Percent change, June 1930 to March 1935

	Old series	Revised series
Food	-21.1	-22.2
Clothing	-14.8	-14.9
Rent	-32.0	-32.0
Fuel and light	-6.9	-7.1
Housefurnishings	-14.4	-14.3
Miscellaneous	-6.7	-6.7
Total index	-17.5	-18.7
Total less food	-15.8	-15.7

Sources: Derived from U.S. Department of Labor, Bureau of Labor Statistics, "Changes in Cost of Living in the United States, December 15, 1939, and Year 1939," Monthly Labor Review, April 1940, p. 918; "Changes in Cost of Living in Large Cities in the United States, 1913-41," Bulletin No. 699, Washington, D.C., August 1941, p. 43.

The new index declined more than the old index largely because of the greater weight assigned to food (33.5 percent compared with 31.6 percent) and the larger declines recorded for food in the new index (22.2 percent compared with 21.1 percent).²⁰

¹⁸ "Hearings on Government Price Statistics," op. cit., pt. 2, p. 584, fn 6.

¹⁹ Starting in 1933, the food component was expanded to cover 42 additional foods. In 1935, the index included 84 foods as compared with only 42 prior to August 1933. U.S. Department of Labor, Bureau of Labor Statistics, Stella Stewart and Faith M. Williams, "Retail Prices of Food, 1923-36," Bulletin No. 635, October 1937, pp. 7-9.

²⁰ According to McAllister, "It appears reasonable to attribute this increased flexibility in the food component to the shift in weights away from cereals and baking products and to the increased emphasis upon fruits and vegetables as well as the effect of a smaller sample." Harry E. McAllister, "Statistical Factors Affecting the Stability of the Wholesale and Consumers' Price Indexes" in *The Price Statistics of the Federal Government*, National Bureau of Economic Research, Inc., New York, 1961, p. 381.

If the new weights (based on 1934-36 expenditures) are applied to the major components of the old index (weights based on average of 1917-19 and 1934-36 expenditures),²¹ the decline between June 1930 and March 1935 would have been about the same as reported for the old index. The larger decline reported for the revised index was due entirely to the change in the food component. This change added 0.4 percentage points to the overall decline. Clearly, the change in food products covered rather than the modernization of weights explains the larger decline reported for the revised index. On the basis of the new weights alone the decline would have been about the same.

March 1935 to December 1939. BLS also recalculated the index for the period March 1935 to December 1939 so that data are available both for the revised and the old indexes. The net changes in the two indexes were similar with the old index increasing 2.0 percent and the revised index increasing 1.8 percent. However, some of the major components showed much greater differences as is shown below:

Consumer Price Index: Percent change, March 1935 to December 1939

	Old series	Revised series
Food.....	-3.6	-4.8
Clothing.....	4.7	4.6
Rent.....	11.0	11.3
Fuel and light.....	-2.4	-2.2
Housefurnishings.....	11.3	9.0
Miscellaneous.....	1.5	2.9
Total.....	2.0	1.8

If the components of the revised indexes had been weighted by their relative importance in the old index, the result would have been similar to that reported (an increase of 1.9 percent instead of 1.8 percent) thus suggesting that for this period the changes in weights had practically no effect upon the overall change recorded.

Within the 1935-39 period, however, the revised index fluctuated more than the old index.

Consumer Price Index: Percent change, July 1935 to June 1939

	Old index	New index
July 1935 to September 1937.....	5.7	6.9
September 1937 to June 1939.....	-3.9	-5.5

On the basis of these changes, Prof. H. E. McAllister of Washington State University concluded: "One effective difference between the new index and the old one is its increased sensitivity."²²

January 1950 to December 1952. In connection with the 1953 revision of the CPI, data are available for the new series and the old series for the 3-year period January 1950 to December 1952. The old series rose by 14.4 percent and the new series by 13.4 percent during this period. (See table A-4.) (If the changes are measured between June 1950, when the Korean war started, and December 1952, the new series rose 12 percent or 0.2 percent less than the old index.) Thus, the extensive changes made in the revised index had only a minor dampening effect upon the rate of increase recorded.

²¹ Marsha Froeder and Carlyle P. Stallings, "Relative Importance of Items in the CPI," *Monthly Labor Review*, August 1954, p. 892. The estimates in the text are only approximate since the new and old weights are not applicable to the same time period. BLS has warned that in making such estimates " * * * the published relative importance data and the price data to be used in the computations must all relate to dates within a time interval during which a single weight pattern was used in the index calculation."

²² McAllister, *op. cit.*, p. 379

TABLE A-4.—Consumer Price Index, by months, old and new series, 1950-1952

[1935-39=100]

	Old series	New series		Old series	New series
<i>1950</i>			<i>1951</i>		
January.....	166.9	168.2	August.....	185.6	185.5
February.....	166.5	167.9	September.....	186.5	186.6
March.....	167.0	168.4	October.....	187.8	187.4
April.....	167.3	168.5	November.....	189.3	188.6
May.....	168.6	169.3	December.....	190.0	189.1
June.....	170.2	170.2	<i>1952</i>		
July.....	172.5	172.0	January.....	190.2	189.1
August.....	173.0	173.4	February.....	188.3	187.9
September.....	173.8	174.6	March.....	188.4	188.0
October.....	174.8	175.6	April.....	189.6	188.7
November.....	175.6	176.4	May.....	190.4	189.0
December.....	178.4	178.8	June.....	191.1	189.6
<i>1951</i>			July.....	192.4	190.8
January.....	181.6	181.5	August.....	192.3	191.1
February.....	184.2	183.8	September.....	191.4	190.8
March.....	184.5	184.5	October.....	191.5	190.9
April.....	184.5	184.6	November.....	191.6	191.1
May.....	185.4	185.4	December.....	191.0	190.7
June.....	185.5	185.2	Percent increase January		
July.....	185.8	185.5	1950 to December 1952..	14.44	13.38

Source: U.S. Department of Labor, Bureau of Labor Statistics.

January 1964 to June 1964. The revised CPI and the old CPI both were published for a 6-month period, January to June 1964. Table A-5 shows the changes in the major components of both indexes for that period. The new index increased by .28 percent or half as much as the rise of .56 percent for the old index. This smaller rise reflected the change in composition within the subgroups rather than changes in weights. Of the eight major subgroups, five recorded a smaller rise in the new index; these five groups accounted for 81.8 percent of the weight in the new index.

TABLE A-5.—Percent change in major groups of Consumer Price Index, new and old series, January-June 1964

[1957-59=100]

	New series			Old series		
	January	June	Percent change	January	June	Percent change
All items.....	107.7	108.0	0.28	107.6	108.2	0.56
Food.....	105.8	106.2	.38	105.7	106.5	.76
Housing.....	106.9	107.1	.19	106.9	107.3	.37
Apparel ¹	105.0	105.7	.67	104.3	104.7	.38
Transportation.....	109.4	109.2	-.18	108.9	109.0	.09
Medical care.....	118.2	119.3	.93	118.2	119.5	1.10
Personal care.....	108.5	109.1	.55	109.1	109.5	.37
Reading and recreation.....	113.1	114.0	.80	113.0	114.3	1.15
Other goods and services.....	108.3	108.7	.37	108.3	108.5	.18

¹ In new series called apparel and upkeep.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index for February 1964, pp. 3, 8; Consumer Price Index for April 1964, pp. 3, 8; Consumer Price Index for June 1964, pp. 3, 8.

APPENDIX B

WHOLESALE PRICE INDEX (WPI)*

The comprehensive Wholesale Price Index has been available continuously since 1890. According to the Bureau of Labor Statistics:

"'Wholesale' as used in the title of the index refers to sales in quantities, not to prices received by wholesalers, jobbers, or distributors. The index does not measure the price movements of retail transactions, transactions for services (except gas and electricity), construction, real estate, transportation, or securities * * *. The prices used in constructing the index are those which apply as nearly as possible to the first significant commercial transaction in the United States. Later transactions for the same item at other stages in the distribution cycle are not included. However, as raw materials are transformed into semi-finished and finished goods, the resulting products are represented according to their importance in primary markets.

"Most prices are obtained by mail from the manufacturer or other producer; a few are reported by trade associations, and some are taken from trade publications or from Government agencies which collect price quotations as part of their regular work.

"Prices obtained from manufacturers or other producers are subject to the applicable trade and quantity discounts. Cash and seasonal discounts are deducted from the price when it is determined that most buyers avail themselves of the reduced prices. Excise taxes are excluded from the price. Closeout sales prices are normally not used. Free deals or allowances are reflected when possible in arriving at the net price to be included in the index calculation. Nominal prices are used when they are indicative of the market situation and no other price is available."¹

The coverage of the index has been expanded periodically. For the year 1890, the WPI originally included 99 price relatives but the number has since been increased to 199 for that year. By the late 1920's the number of commodities had been increased to 784, in 1947 it was increased to 1,819, and in December 1960 to 2,161.² New items are now introduced in January of each year.

In addition to the comprehensive index, BLS publishes indexes for 15 major industry groups of products such as chemicals and allied products (two digit) and 87 subgroups such as industrial chemicals (three digit). Special indexes also are published by economic groupings such as crude materials, intermediate materials, supplies and components, and finished goods (consumers and producers).

The comprehensive index is published monthly and an index covering a smaller sample of commodities is published weekly—usually with a lag of less than 1 week.

The index is weighted by the total sales value of commodities traded in primary markets. Further, "each commodity price series in the index is representative of a class of prices and is assigned its own weight (the shipment value of the commodity) plus the weights of other commodities not directly priced but whose prices are known or assumed to move similarly." Changes are made in the weights when industrial censuses become available—now every 5 years. However, the relative importance of specific products also changes when their prices rise or fall more or less than the average for all prices. New products are not included in the index "until they become established both technologically and in the market."³

*The original draft of this Appendix was prepared by Marvin Levine. Here, too, we have benefitted much from the helpful comments of the staff of the U.S. Bureau of Labor Statistics.

¹ U.S. Department of Labor, Bureau of Labor Statistics, "Wholesale Prices and Price Indexes, 1962," Bulletin No. 1411, Washington, D.C., June 1965, pp. 7, 8.

² Allan D. Searle, "Weight Revisions in the Wholesale Price Index, 1890-1960," Monthly Labor Review, February 1962, p. 181.

³ U.S. Department of Labor, Bureau of Labor Statistics, Wholesale Prices and Price Indexes, January 1965 Final and February 1965 Preliminary, Washington, D.C., 1965, p. 4.

Historically, the coverage of the index has been increased and the relative weights assigned to individual products, subgroups, and major groups have been changed. Thus, it must be kept in mind that the long term trend of the index reflects varying rather than constant weights.

Comparisons of weights over time also are significantly affected by the changes in method of weighting. There was a major change in the method of weighting in 1952 and it was applied to the index starting in 1947. Prior to 1947 " * * * items in the index were assigned weights equal to their own value in the market without imputation of values for similar unpriced items." ⁴ Under the revised approach "value weights, based on the 1947 industrial censuses, replaced quantity weights * * * [a] system of imputation was introduced, wherein each commodity series in the index represents a class of items whose prices are presumed to move similarly." ⁵

This was an important change because under the previous method, the inclusion of a larger number of products in a group would give it a larger weight. An effort was made to overcome this infirmity by including products in proportion to the importance of the group. Under the weighting system introduced in 1952, this problem was avoided and the weights assigned to specific products and groups of products reflect more accurately their relative importance in the sectors of the economy measured by the Wholesale Price Index. Despite the inadequacies of the earlier weighting system, in broad terms the index did reflect the growing industrialization of the economy as the new products included in the index were largely from the industrial sector.

Table B-1 shows the changing weights for commodity groups used in the wholesale price index since 1890. In 1947, the number of major commodity groups was increased from 10 to 15 thus making it impossible to trace the changes in weights assigned to every group for the 70-year period. However, for several groups comparisons can be made. The table also shows the marked increase in the number of products for which prices are obtained.

During the 70-year period, 1890 to 1960, the weights assigned to farm products and foods declined sharply as is shown below:

Weights in Wholesale Price Index, 1890 and 1960

	Percent		Change in percentage points
	1890	1960	
Farm products.....	29.04	10.59	-18.45
Processed foods.....	25.54	14.04	-11.50
Nonfarm, nonfood (industrial).....	45.42	75.37	+29.95
Total.....	100.00	100.00	

⁴ Searle, op. cit., p. 182.

⁵ Ibid., p. 180.

TABLE B-1.—Relative importance of commodities in the Wholesale Price Index and number of commodities as of dates of major weight changes, 1890 to December 1960

Commodity group	1890	December 1913	December 1918	December 1920
	1909 weights	1914 and 1919 average weights	1919 and 1921 average weights	1921 and 1923 average weights
All commodities.....	100.00	100.00	100.00	100.00
Farm products ¹	29.04	24.91	27.11	19.49
Foods.....	25.54	25.06	25.80	21.92
Hides and leather products.....	4.24	5.23	4.80	5.28
Textile products.....	7.32	7.92	9.06	8.11
Fuel and lighting materials.....	11.19	9.46	10.47	16.33
Metals and metal products.....	7.84	11.88	9.72	12.48
Building materials.....	5.40	4.38	3.34	4.83
Chemicals and allied products ²	1.35	2.42	2.12	2.01
Housefurnishing goods.....	1.08	1.81	1.41	2.27
Miscellaneous.....	7.00	6.93	6.17	7.28
Number of commodities ³	199	531	534	536

Commodity group	December 1922	December 1929	December 1931	December 1933
	1923 and 1925 average weights	1925 and 1927 average weights	1927 and 1929 average weights	1929 and 1931 average weights
All commodities.....	100.00	100.00	100.00	100.00
Farm products ¹	20.88	19.01	14.15	13.98
Foods.....	20.93	18.36	17.14	16.31
Hides and leather products.....	4.15	3.40	3.44	3.58
Textile products.....	9.13	9.18	8.00	9.72
Fuel and lighting materials.....	16.45	13.69	15.97	18.19
Metals and metal products.....	13.45	16.15	19.05	16.52
Building materials.....	5.47	6.54	6.72	6.23
Chemicals and allied products ²	1.78	1.74	2.08	1.98
Housefurnishing goods.....	2.12	3.11	3.31	3.01
Miscellaneous.....	6.64	8.82	10.14	10.48
Number of commodities ³	544	784	784	784

TABLE B-1.—Relative importance of commodities in the Wholesale Price Index and number of commodities as of dates of major weight changes, 1890 to December 1960—Continued

	January 1947		December 1954	December 1957	December 1960
	1929 and 1931 average weights ¹	1947 weights	1952 and 1953 average weights	1954 weights	1958 weights
All commodities.....	100.00	100.00	100.00	100.00	100.00
Farm products ¹	22.52	14.59	10.84	10.69	10.59
Processed foods.....	20.14	15.87	13.75	12.73	14.04
Textile products and apparel.....	8.49	10.37	8.30	7.45	7.75
Hides, skins, leather, and leather products ⁴	3.48	2.17	1.41	1.35	1.43
Fuel, power, and lighting materials ⁶	12.60	7.75	9.02	7.72	7.87
Chemicals and allied products ²	3.99	5.83	6.54	5.85	6.04
Rubber and rubber products.....	2.21	1.75	1.75	1.61	1.43
Lumber and wood products.....	3.35	2.43	2.66	2.97	2.60
Pulp, paper, and allied products.....	1.99	3.57	3.73	5.17	4.86
Metals and metal products.....	7.86	11.18	13.56	13.53	12.83
Machinery and motive products.....	6.07	13.75	17.07	19.27	17.57
Furniture and other household durables.....	2.23	3.94	4.14	4.23	4.00
Nonmetallic minerals—structural.....	1.96	1.35	2.07	2.63	2.87
Tobacco products and bottled beverages ⁷	2.33	2.49	2.40	2.42	2.47
Miscellaneous products.....	.78	2.96	2.76	2.38	3.05
Number of commodities ³	888	1,819	1,868	1,870	2,161

¹ These relative importance figures for 1890 through January 1947 refer to the indicated weight-base reference periods for all major groups except farm products. For farm products, the following are the weight-base reference periods:

Weight data for	Indexes for	Weight data for	Indexes for
1909	1890-1912	1921-23	1921-22
1913-15	1913-14	1923-25	1923-29
1915-17	1915-16	1925-27	1930-31
1917-19	1917-18	1927-29	1932-33
1919-21	1919-20	1929-31	1934-January 1947

From January 1947 through 1960, the weights for farm products have the same reference date as other components.

² Before 1940, titled "Chemicals and drugs."

³ Commodities included in more than one major group are counted only once.

⁴ The 1929-31 weight-base index was calculated through 1951; the 1947 weight-base index was calculated retroactively to 1947. The data based on 1929 and 1931 weights have been reclassified into the 15 major groups used in the 1947 weight-base index.

⁵ Before 1947, titled "Hides and leather products."

⁶ Before 1947, titled "Fuel and lighting materials."

⁷ Before 1960, titled "Tobacco manufactures and bottled beverages."

NOTE.—For comparability with earlier data, figures for 1947 and later periods have been rounded to 2 decimals.

Source: Allan D. Searle, "Weight Revisions in the Wholesale Price Index, 1890-1960," Monthly Labor Review, February 1962, p. 181.

From a combined weight of about 55 percent, farm products and processed foods declined to less than 25 percent, while the relative importance of industrial prices increased from about 45 percent to slightly more than 75 percent. (Within this period, farm products temporarily increased in importance during each of the two World Wars, because of their greater-than-average rise in prices.) Within the industrial price group, some groups declined in relative importance despite the sharply higher weight assigned to the entire category. Thus, the weight for hides, skins, and leather fell from more than 4 percent in 1890 to 1.4 percent in 1960, and fuel, power, and lighting materials declined from 11.2 percent to 7.9 percent. In contrast, metals and metal products had a weight of 7.8 percent in 1890, while metals and metal products plus machinery and motive products had a combined weight of 30.4 percent in 1960; chemicals and allied products

increased from 1.4 percent to 6.6 percent; and furniture and other household durables increased from 1.1 percent to 4 percent.⁶

Table B-2 shows the changes between 1947 and 1960, the period for which comparable commodity groups are available. The largest declines in relative importance occurred for farm products, processed foods, and textile products and apparel, while the largest increases in weights took place for machinery and motive power, metals, structural nonmetallic minerals, and pulp, paper, and allied products. This pattern was similar to that shown for the period between 1800 and 1889.⁷

TABLE B-2.—*Relative importance of major commodity groups in Wholesale Price Index, 1947 and 1960*

[In percent]

	1947	1960	Change
Farm products.....	14.59	10.59	-4.00
Processed foods.....	15.87	14.04	-1.83
Textile products and apparel.....	10.37	7.75	-2.62
Hides, skins, leathers, and leather products.....	2.17	1.43	-.74
Fuel, power, and lighting materials.....	7.75	7.87	+.12
Chemicals and allied products.....	5.83	6.64	+.81
Rubber and rubber products.....	1.75	1.43	-.32
Lumber and wood products.....	2.43	2.60	+.17
Pulp, paper, and allied products.....	3.57	4.86	+1.29
Metals and metal products.....	11.18	12.83	+1.65
Machinery and motive products.....	13.75	17.57	+3.82
Furniture and other household durables.....	3.94	4.00	+.06
Nonmetallic minerals—structural.....	1.35	2.87	+1.52
Tobacco products and bottled beverages.....	2.49	2.47	-.02
Miscellaneous products.....	2.96	3.05	+.09
Total.....	100.00	100.00	-----

Source: See table B-1.

EFFECT OF CHANGING WEIGHTS AND COVERAGE

The changes in coverage of the WPI have tended to make the index more stable. The items added to the index have been largely industrial prices which tend to fluctuate less widely⁸ than prices of farm products and processed foods.

Because of the increase in relative importance of industrial prices, which rose less than farm products and processed foods, the rise in the Wholesale Price Index during World War II and the early postwar period was smaller than would have been recorded in the First World War and the Civil War. From 1939 to August 1948, prices of farm products and processed foods rose considerably more than industrial prices as is shown below:

Wholesale prices: Percent increase, 1939 to August 1948

Farm products.....	190.8
Processed foods.....	165.5
Industrial.....	88.6
Total index.....	119.8

If the weights for farm products and processed foods had been as large as in earlier years, the increase in the total WPI would have been greater than reported. For example, if the 1939 price indexes for farm products, processed foods, and industrial products had been weighted by the December 1913 weights, the total WPI would have increased by 135.3 percent instead of 119.8 percent as shown for the reported index.

⁶ Each of these categories is not fully comparable for 1890 and 1960 because of changes in classification and because of the different products available in both years. Nevertheless, the data do indicate the broad changes in weights which have developed for these sectors of the economy.

⁷ The index prepared by Warren and Pearson assigned a weight of 62 percent to farm products and foods as of January 1800, and 50 percent as of January 1889. For metals and metal products, the weight increased from 4 percent to 10 percent in the same period; the same weight changes were assigned to fuel and lighting. George F. Warren and Frank Pearson, "Wholesale Prices for 213 Years, 1720 to 1932," Cornell University, Ithaca, N.Y., 1932, pt. I, p. 164.

⁸ It has been pointed out that there has been " * * * rigidity and resistance to reductions of prices for semiprocessed and highly processed goods." Pearl C. Ravner, "Price Trends and the Business Cycle in Postwar Years," Monthly Labor Review, March 1962, p. 246.

The WPI for the Civil War had the following weights, as compared with those in 1939: ⁹

Weights in WPI, 1860 and 1939

[In percent]

	1860	1939
Farm products.....	28.2	11.8
Processed foods.....	25.7	14.9
Industrial.....	46.1	73.3
Total.....	100.0	100.0

If the Civil War weights for the three groups are applied to the increases between 1939 and August 1948, the rise in the total index would have been 137.1 percent instead of 119.8 percent as reported. Similarly, the decline in the total index between August 1948 and December 1949 would have been greater than reported because farm products (-19.4 percent) and processed foods (-16.7 percent) declined considerably more than industrial prices (-5.2 percent). The overall decline using the earlier weights would have been 12.2 percent as compared with the reported decline of 10.8 percent.

It must be emphasized that this exercise in weighting is very rough and is intended to illustrate in general terms how changes in weights may affect the index rather than to provide an exact or even approximate measure of the differences. The latter cannot be determined because of the significant changes in the products for which prices are reported and because of the varying coverage of the indexes.

Different patterns of price behavior for major commodity groups reflect changes in coverage and changes in the products for which prices are obtained. For example, during the Civil War (1860-64), the wholesale prices of fuel and lighting increased by 101 percent while from 1939 to 1948 the rise was only 73.3 percent. In the Civil War index 6.8 percent out of a total weight of 8.1 percent was for coal (the balance of the index was candles, whale oil, and matches).¹⁰

In 1939, coal accounted for only 5.77 percent out of the total weight of 16.63 percent assigned to fuel, power, and lighting. The changes in the components of the fuel, power, and lighting materials index were as follows:

Fuel, power and lighting index, 1939 and 1948

	Weight in 1939	Indexes (1947-49=100)		Percent change
		1939	1948	
Coke.....	1.12	53.3	104.3	+95.7
Coal.....	5.77	52.8	106.2	+101.1
Electricity.....	2.58	119.4	99.2	-16.9
Gas.....	1.05	100.2	102.4	+2.2
Petroleum and products.....	6.11	51.2	111.7	+118.2
Total.....	16.63	61.8	107.1	+73.3

If the 1939 index had had the same coverage as the Civil War index, the magnitude of the rise would have been similar since coal alone rose by 101 percent in the latter conflict. Prices of petroleum and products also rose by more than 100 percent between 1939 and 1948 while prices of electricity fell by 16.9 percent and gas prices increased only nominally. Clearly, the inclusion of the latter two items during World War II and the postwar years acted to dampen down considerably the overall rise reported for this index.

In connection with several revisions of the WPI, the Bureau of Labor Statistics has made available revised indexes for earlier years so that comparisons could be made between the changes recorded by the new and old indexes.

⁹ 1939 weights estimated by adjusting 1929-31 weights by the changes in each of these components between the average price for 1929 and 1931 and 1939. Civil War weights as reported by Warren and Pearson, op. cit., p. 164.

¹⁰ Warren and Pearson, op. cit., p. 123.

1913-1926: When the WPI was revised in 1927, the new indexes were carried back to 1913, thus making possible comparisons for a 13-year period (1913 to 1926). The main fluctuations in the new and old indexes in terms of annual data may be summarized as follows:¹¹

Percent changes in Wholesale Price Indexes, selected periods, 1913-1926

Periods	Old index (404 items)	New index (550 items)
1913-20.....	+126.2	+121.2
1920-21.....	-35.1	-36.8
1921-23.....	+4.6	+3.1
1923-24.....	-2.6	-2.5
1924-25.....	+6.0	+5.5
1925-26.....	-4.9	-3.4
1913-26.....	+51.0	+43.3

Except for the decline from 1920 to 1921, the new index fluctuated less than did the old one in each of the periods shown. For the entire 13-year period, the new index rose only 43.3 percent as compared with the rise of 51 percent for the old index.

1926-31: In 1931, the number of commodities included in the WPI was increased from 550 to 784. The price series added were almost all manufactured products. The changes recorded by the new index were smaller than those shown by the old index:

Percent changes in Wholesale Price Indexes, selected periods, 1926-1931

	Old index (550 items)	New index (784 items)
January 1926-June 1927.....	-9.5	-8.8
June 1927-September 1928.....	+6.7	+4.8
September 1928-December 1931.....	-33.8	-30.4
January 1926-December 1931.....	-36.0	-33.5

After a detailed study of the trends of the two indexes for the 1926-31 period, Prof. Harry E. McAllister concluded:

"* * * the effects of increased coverage are more important than the change in economic structure in accounting for the reduced fluctuation in the [wholesale price] index * * *. Increasing the size of sample and increasing the proportion of the more stable finished goods and semifinished goods prices both contributed to minimizing its fluctuations."¹²

1947-57: BLS has computed the WPI for the 1947-57 period both in terms of 1947 weights and of 1954 weights.¹³ The annual fluctuations in the two indexes are shown below:

Percent changes in Wholesale Price Index, selected periods, 1947-1957

	1947 weights	1954 weights
1947-48.....	+8.1	+7.0
1948-49.....	-4.9	-5.7
1949-51.....	+15.6	+14.9
1951-54.....	-3.8	-4.2
1954-57.....	+7.1	+6.6
1947-57.....	+22.4	+18.4

¹¹ The old index was based on 404 commodities while the new index was based on 550 commodities, U.S. Department of Labor, "Wholesale Prices, 1890 to 1926," BLS Bulletin No. 440, July 1927, p. 4, and "Wholesale Prices, 1913 to 1927," Bulletin No. 473, January 1929, p. 5.

¹² Harry E. McAllister, "Statistical Factors Affecting the Stability of the Wholesale and Consumers' Price Indexes," Staff Paper 8 in "The Price Statistics of the Federal Government," op. cit., pp. 373-78.

¹³ Ewan Clague referred to these calculations in testimony before a congressional committee in 1961. See Government Price Statistics, Hearings before the Subcommittee on Economic Statistics of the Joint Economic Committee, 87th Cong., 1st sess., May 2, 1961, pt. 2, pp. 568-69, 585. BLS has made these unpublished estimates available to the writers.

For the entire period, the WPI based on 1954 weights rose only 18.4 percent as compared with the increase of 22.4 percent based on 1947 weights. However, in each of the periods of decline the index based on 1954 weights fell fractionally more while in periods of advance it rose less than the 1947 weighted index. However, if the measurement is between monthly lows and highs of the two indexes, the revised index declined less and rose less than the old index.¹⁴ Between 1947 and 1954, there was a decline of more than 2 percentage points in the weights of farm products, processed foods, and textile products and apparel while the weights were increased by more than 2 percentage points for metals and machinery and motive products. (See table B-1.)

SUMMARY

On balance, these data show that as the WPI has been revised to incorporate an expanding number of products and to reflect the changing structure of the economy, the new indexes tend to show a smaller long-term rise. The full extent of these tendencies cannot be determined because that would necessitate estimating what the changes would have been in the current index for earlier years for which comparable data cannot be obtained. In any event, even if the data were available the changes in such an index would not be very meaningful in light of the enormous changes which have taken place in our dynamic economy.¹⁵

¹⁴ McAllister, *op. cit.*, p. 374.

¹⁵ "Strict comparability in the items priced and the weights assigned to commodities can be achieved only at the cost of making an index number increasingly obsolete." "The Price Statistics of the Federal Government," *op. cit.*, p. 25.

APPENDIX C
IMPLICIT PRICE INDEX (IPI)*

I. GENERAL

The implicit price index is derived as a byproduct of the efforts of the Office of Business Economics, U.S. Department of Commerce, to determine real (constant dollar) GNP. Increases in current-dollar GNP can come about from increases in the physical volume of production of goods and services or from price increases. To determine the real growth in output the effect of price change is removed through deflation. This is achieved by dividing each component of GNP by an appropriate price index and summing these deflated components to yield real GNP.

The ratio of the current-dollar to constant-dollar output yields an implicit price index; implicit in the sense that the various price data used in deflation are brought together into a composite price index according to some implicit weighting scheme.

The Office of Business Economics has carried out these computations since 1951 when the first provisional estimates of constant dollar GNP were made for the period beginning in 1929.¹

Initially the base year was 1939, later 1947 and 1954. Today, along with the major revisions of the national accounts, the base has been shifted to 1958. The selection of these years was a matter of convenience rather than of normality of the base year. At the time of selection they were the most recent year for which complete census information, upon which the weights for the price deflators depend, was available.

The most authoritative description of the nature and properties of the implicit price index was released in 1954² followed by a briefer but more up-to-date description contained in a paper in 1958 by a staff member of the Office of Business Economics.³ Beyond this no further studies have been made detailing the quantitative and methodological aspects of the deflation process. The extent to which both public and private price statistics are used and their effect on movements in the Implicit Price Index are not known with any precision. The Conference Board through special arrangements with the Office of Business Economics conducted a detailed analysis of the implicit price deflators. The topics to be discussed in this analysis are as follows:

1. A brief discussion of the procedures followed in the deflation of gross national product.
2. A discussion and classification of the classes of price, wage, and cost indexes used in deflation.
3. The methodology of deflation.
4. The relative importance of the various classes of price deflators.
5. A tabular summary of the deflation of GNP by detailed component.
6. The development and construction of a new price index constructed by reweighting the components of the IPI with base-year weights.
7. An analysis of the contribution of each of the classes of price deflators incorporated in the Implicit Price Index.
8. A comparison of components of the CPI, WPI, and base year weighted Implicit Price Index which are similar in their coverage of expenditures.
9. A discussion of the mathematical properties of the Implicit Price Index.

*Gregory Kipnis prepared this appendix after long and fruitful sessions with the staff of the Office of Business Economics. Their help has been invaluable.

¹ Office of Business Economics, U.S. Department of Commerce, "National Income and Product of the United States, 1929-50," Washington, U.S. Government Printing Office, 1951, pp. 141-46.

² Office of Business Economics, U.S. Department of Commerce, "National Income, 1954 edition," Washington, U.S. Government Printing Office, 1954, pp. 153-58.

³ George M. Cobren, "The Deflation of the Gross National Product by the Department of Commerce," Proceedings of the Business and Economic Statistics Section, American Statistical Association, 1958, pp. 312-19.

II. DEFLATION PROCEDURES

There are two general techniques employed by the OBE to arrive at deflated values for the components of GNP: (1) Deflating current-dollar expenditures through the use of price and wage data; and (2) deriving a constant-dollar series by extrapolating base-year values with a quantity index. The procedures outlined below, though they do not exhaust all the variations, are representative and are special cases of either of the two general techniques mentioned above:

1. Use of price and wage data:

A. Dividing an expenditure component by a price relative.

Example: Expenditures for automobile repairs are divided by the CPI for automobile repairs.

Equation:

$$Y' = \frac{p_i q_i}{p_o} = p_o q_i$$

where: Y' = Deflated expenditures.

i = Current year.

o = Base year.

$p_i q_i$ = current-dollar expenditures.

$\frac{p_i}{p_o}$ = price relative.

$p_o q_i$ = constant-dollar expenditures.

B. A base year weighted price index (Laspeyres index) is divided into an expenditure component.

Example: Expenditures for barbershops and beauty parlors are divided by a weighted combination of the CPI for men's haircuts and the CPI for beauty shops.

Equation:

Given: ω_o^a, ω_o^b = base year expenditure weights

$$Y' = \frac{p_j q_i}{\omega_o^a \frac{p_{a_i}}{p_{a_o}} + \omega_o^b \frac{p_{b_i}}{p_{b_o}}} = \frac{p_j q_i}{\sum_j \frac{p_{j_i} q_{j_o}}{\sum_j p_{j_o} q_{j_o}}} \quad \text{where: } j = a, b$$

C. A base year weighted combination of price and wage data are divided into an expenditure component.

Example: Expenditures for moving and warehousing are deflated by three indexes: the CPI for transportation gasoline, the WPI for motor trucks and an index of average annual earnings in the highway freight transportation and warehousing industry.

Equation:

$$Y' = \frac{p_i q_i}{\omega_o^a \frac{p_{a_i}}{p_{a_o}} + \omega_o^b \frac{p_{b_i}}{p_{b_o}} + \omega_o^c \frac{E_i}{E_o}}$$

where: $\frac{E_i}{E_o}$ = Index of average annual earnings.

$$\omega_o^a + \omega_o^b + \omega_o^c = 1.00$$

2. Extrapolation of base year values:

A. Extrapolation of base year values by use of a quantity index.

Example: Deflated expenditures for baseball games are derived by taking the base year expenditures and extrapolating yearly data by an index of yearly attendance.

Equation:

$$Y' = p_o q_o \left(\frac{q_i}{q_o} \right) = p_o q_i$$

B. Extrapolation of base year values by use of an index of deflated values for a related item.

Example: Deflated values for rental value of farmhouses are derived by extrapolating base year rental values by an index of deflated values of farm dwellings.

Equation:

$$Y' = p_{ao}q_{ao} \left(\frac{p_{bo}q_{bi}}{p_{bo}q_{bo}} \right)$$

where: a refers to rental values.
 b refers to value of dwelling.

However, if it can be assumed that rental values are some proportion of the real market value of farm dwellings:

$$p_{ao}q_{ai} = K(p_{bo}q_{bi}) \quad \text{where: } K = \text{constant}$$

Then:

$$Y' = p_{ao}q_{ao} \left(\frac{1/K p_{ao}q_{ai}}{1/K p_{ao}q_{ao}} \right) = p_{ao}q_{ai}$$

III. DATA USED IN DEFLATION

Current dollar gross national product is adjusted for price change through the use of six classes of price and wage data. They are—

- (1) Components of the Consumer Price Index.
- (2) Components of the Wholesale Price Index.
- (3) Components of indexes of prices paid and prices received by farmers.
- (4) Various "other" price series from Government agencies and private organizations.
- (5) Implicit prices.
- (6) Average annual earnings.

For the purpose of exposition these six classes of data are referred to as price deflators, not to be confused with the GNP implicit price deflators discussed earlier in this study.

In some cases the titles of these deflators are self-explanatory. Classes 1, 2, and 3 simply refer to components of these three official indexes. In a few cases the entire index is used rather than a component. Item 4, "other" prices, includes price data supplied by such governmental agencies as the Department of Interior, Bureau of the Census, Bureau of Public Roads, and various private organizations. As an example of the latter, nearly all of the deflators for construction originate with private organizations such as American Appraisal Co. and the Turner Construction Co. Implicit prices, item 5, as their name implies, are not actual existing published price data; rather they are arrived at indirectly. For example, in some instances a constant dollar series can be computed without the direct use of price data.⁴ Dividing these constant dollar values into current dollar values will implicitly yield a price index. Item 6 refers to earnings data derived by the OBE from Bureau of Labor Statistics data and to implicit earnings indexes derived for the Government sector.

IV. METHODOLOGY OF DEFLATION

At the finest level of detail, each current dollar component of GNP is deflated by one or an explicitly weighted combination of price deflators. The latter procedure is necessary when the expenditure data to be deflated are more global than any single available price deflator. Often a component includes expenditures for a whole array of individual items and cannot be conveniently or accurately broken down into each of these items. On the other hand, there may be price data for each of these "individual items" or at least approximately similar items. When this is the case, the OBE weights them together. These explicit weights usually represent approximate market shares in a benchmark year. For example, although expenditures for major appliances are not available in detail, 24 price indexes, each representing a different model or type of appliance, are available. These indexes are weighted together according to approximate market shares in a given year.

⁴ One way to arrive at constant dollar series without price data is to extrapolate base year values with a quantity index. See examples 2 A and B, sec. II above.

Periodically the deflators and, in those cases where a weighted combination of deflators is used, the "explicit" weights⁵ are changed. These changes occur whenever new data and information from census and consumer expenditures studies and revisions in the major price indexes permit. The last such change incorporated data from the 1958 census and, to some extent, the 1960-61 survey of consumer expenditures.

Some of the changes which have been incorporated resulted in an upgrading in the quality of the price deflators used and a better reflection of the changing importance of the "individual items" in the deflated components. Examples of upgrading include the use of price data for a more appropriate market and the introduction of new and previously unavailable data. For example, prior to 1964 several *wholesale* price indexes were used to deflate expenditures for jewelry and watches. In 1964 these were replaced by a *retail* price index which previously had been unavailable.

The correction for appropriate market level most often takes the form of substituting a Bureau of Labor Statistics consumer price series for a wholesale price series as shown above. The previous use of a wholesale price series resulted in a bias (in the statistical sense) in the deflated values as the market level of the expenditures that were deflated (final purchases) differed from the market level of the available price data (wholesale purchases). As pointed out in chapter VI, movement of wholesale and retail prices for related items are divergent over the course of the business cycle.⁶

The second type of periodic improvement—better reflection of the changing importance of the "individual items"—occurs when the explicit weights of the price deflators are changed. The changes may be of two types: to reflect shifts in the distribution of expenditures among economic sectors for a given item; and to reflect changes in the relative expenditures among the "individual items."⁷

The distribution of expenditures among economic sectors is sometimes reflected by the use of weighted agricultural and BLS consumer prices for a given item. The weights represent the relative expenditures between farm and non-farm areas. Over long periods of time these weights have been changed. In recent years, where such a weighting scheme was used, the agricultural price index usually received a weight of about 30 percent.

The second change can be best understood through the use of an example: Consumer expenditures for barbershops and beauty parlors are deflated by two price series from the Consumer Price Index—men's haircuts and beauty shop services. The weights reflect the distribution of expenditures between haircuts and beauty shop services. Periodically, as the proportions change, the weights are also changed.

V. RELATIVE IMPORTANCE OF THE DEFLATORS IN THE IPI

Determining the actual weight a price deflator receives in the Implicit Price Index is a considerably more complicated question in all years except the base year.⁷ In the base year, in addition to the weight a price deflator receives in the composite price deflator (explicit weight), each price deflator is further weighted by the relative importance of the expenditure component it deflates. Thus, the base year weight for each price deflator is the cross product of its explicit and relative weights. For example, if in the base year the CPI for men's haircuts had an explicit weight of 40 percent and expenditures for barbershops and beauty parlors accounted for 0.5 percent of gross national product, then the effective weight for the CPI-men's haircuts would be 0.2 percent.

Table C-1 presents the results of this type of computation for each component of GNP in 1958. In terms of the base year weights, BLS consumer prices were the single most important class of deflators for GNP, accounting for 45.6 percent of the total weights. In order of importance, "other" prices followed receiving 13.5 percent, earnings indexes 12.5 percent, wholesale prices 12.3 percent, implicit prices 9.3 percent, and agricultural prices 6.8 percent.⁸

⁵ Explicit weights refer to weights actually assigned to a price index. An example is given in the previous paragraph where it is mentioned that each index is assigned a weight approximating its market share. When these weighted combinations of deflators for subaggregates are brought together into the Implicit Price Index, they receive an indirect or implicit weight which is equal to the importance of the subaggregate.

⁶ Divergency in movement between wholesale and retail prices for related items reflects demand elasticities, market structure, changes in retail margins, and changes in productivity.

⁷ In nonbase years the weighting scheme is far more complex as there is a greater degree of interaction among the deflators. In addition, the sum of the actual weights will not equal 100 due to level adjustments when new deflators are linked on, adjustments for margins and excise taxes, etc.

⁸ A detailed listing of the components of GNP and which deflators are used to deflate it are summarized in table C-2, below.

TABLE C-1.—Composition of the implicit price deflators for gross national product in terms of base year weights, 1958

	Dollar value (billions of dollars)	Implicit price deflator	Percent importance in terms of base year weights of— ¹					
			BLS		Agricultural prices	Other ² prices	Implicit prices	Earnings indexes ³
			Consumer prices	Wholesale prices				
Gross national product.....	447.3	100.0	45.6	12.3	6.8	13.5	9.3	12.5
Personal consumption expenditures.....	290.1	100.0	67.3	4.5	10.1	2.4	10.9	4.9
Goods.....	178.0	100.0	67.5	3.8	16.5	2.2	10.0	
Services.....	112.0	100.0	07.0	5.5	(⁴)	2.7	12.3	12.4
Gross private domestic investment.....	60.9	100.0	3.1	29.8	1.4	60.9	4.8	
Fixed investment.....	62.4	100.0	3.0	32.6	(⁴)	59.6	4.7	
Nonresidential.....	41.6	100.0	4.5	48.9	(⁴)	40.4	6.1	
Structures.....	16.6	100.0				86.1	13.9	
Producers' durable equipment.....	25.0	100.0	7.5	81.4	(⁴)	10.1	1.0	
Residential structures.....	20.8	100.0				98.2	1.8	
Nonfarm.....	20.1	100.0				98.5	1.5	
Farm.....	0.6	100.0				91.2	8.8	
Net change in business inventory.....	-1.5	100.0		148.3	⁵ -57.0	8.7		
Net exports of goods and services.....	2.2	100.0	37.4			⁶ -64.0	126.6	
Exports.....	23.1	100.0	3.6			72.4	24.0	
Imports.....	20.9	100.0				56.9	13.1	
Government purchases of goods and services.....	94.2	100.0	6.5	25.2		19.1	4.5	44.7
Federal.....	53.6	100.0	6.5	37.0		10.4	7.7	38.4
State and local.....	40.6	100.0	6.4	9.8		30.5	0.3	53.1

¹ Detail may not add to totals due to rounding.² Other prices refer to price data collected by Government agencies other than the BLS and Department of Agriculture and by private organizations.³ Includes implicit earnings indexes for Government compensation.⁴ Less than one-tenth of 1 percent.⁵ A rising price index will have a negative effect on the composite deflator if it is used to deflate a negative component.

The importance of the various price series differs greatly from sector to sector. For example, the weights for consumer prices are concentrated mainly in the goods and service components of personal consumption expenditures, accounting for 67.3 percent of the weights in that sector. On the other hand, earnings indexes are most extensively used in the deflation of government compensation which accounts for 44.7 percent of total government purchases of goods and services.

Constant dollar government compensation is derived by extrapolating base year compensation by an index of full-time equivalent employment. Dividing current by constant dollar compensation yields an implicit earnings index. This price deflator is in effect a weighted average of annual earnings. However, a direct estimate of this earnings index is not available.

Wholesale prices are extensively used in the deflation of (a) producer's durable equipment, accounting for 81.4 percent and (b) Federal Government, 37.0 percent of the weights, respectively.

VI. DETAILS OF DEFLATION

A detailed listing of the components of gross national product and the price deflators used in deflating them are found in table C-2. Each "X" entry indicates the particular class of price deflators which finds its way into the implicit price index. An "X" entry should not be taken as an indication of the *number* of such price deflators used. For example, "Appliances" listed under personal consumption expenditures for goods is deflated by three classes of deflators; components of the CPI, components of the WPI, and components of prices paid and prices received by farmers. In fact, 25 agricultural, 6 consumer, and 1 wholesale price indexes are used.

In addition, it should also be noted that this listing applies only to the base year 1958. The distribution in the usage of the various classes of price deflators has shifted significantly over time particularly toward the greater use of consumer prices in more recent years, with less reliance on wholesale prices.

TABLE C-2.—Detailed summarization of deflation, procedures, 1958

	Deflated by—					
	BLS		Agricul- tural prices	Other prices	Implicit prices	Earnings indexes ¹
	Con- sumer prices	Whole- sale prices				
Personal consumption expenditures:						
Goods:						
Food purchased for off-premises consumption excluding alco- holic beverages.....	X		X			
Purchased meals and beverages excluding alcoholic beverages...	X					
Alcoholic beverages.....					X	
Food furnished military employ- ees.....					X	
Food furnished Government and commercial employees.....	X					
Food produced and consumed on farms.....			X			
Cigarettes.....					X	
Cigars.....	X					
Other tobacco products.....					X	
Shoes and other footwear.....	X		X			
Women's and children's clothing excluding luggage.....	X		X			
Men's and boys' clothing exclud- ing luggage.....	X		X			
Luggage.....		X				
Standard clothing issued to mili- tary personnel.....		X				
Jewelry and watches.....		X		X		
Toilet articles and preparations.....	X					
Furniture including mattress and bedding.....	X		X			
Appliances.....	X	X	X			
China, glassware, table utensils...	X	X	X	X		
Other durable housefurnishings...	X	X	X			
Floor coverings.....	X		X			
Writing equipment.....		X				

¹ Includes implicit earnings indexes for government compensation.

TABLE C-2.—Detailed summarization of deflation, procedures, 1958—Continued

	Deflated by—					Earnings indexes ¹
	BLS		Agricultural prices	Other prices	Implicit prices	
	Consumer prices	Wholesale prices				
Personal consumption expenditures—Con. Goods—Continued						
Tools.....		X				
Semidurable housefurnishings.....	X	X	X			
Cleaning preparations.....	X					
Lighting supplies.....	X	X				
Household paper products.....	X	X				
Stationery and writing supplies.....		X				
Other fuel and ice, farm home consumption.....			X			
Other fuel—purchased.....	X					
Drug preparations and sundries.....	X					
Ophthalmic and orthopedic appliances.....	X					
New domestic cars.....	X					
Used cars and dealer margins.....					X	
New foreign cars.....					X	
Trailers.....					X	
Tires and tubes.....	X		X			
Accessories and parts.....		X	X		X	
Gasoline and oil.....	X		X			
Books and maps.....	X		X			
Nondurable toys and sport supplies.....	X	X				
Wheel goods, durable toys, and sports equipment.....	X	X				
Radio and TV receivers, records, etc.....	X	X	X			
Flowers, seeds, and potted plants.....			X			
Less: Remittances-in-kind.....	X		X			
Expenditures abroad by United States.....				X		
Services:						
Shoe cleaning and repair.....	X					
Cleaning, dyeing and pressing, alterations, etc.....	X					
Laundering in establishments.....	X					
Watch, clock, and jewelry repair.....	X	X		X		X
Miscellaneous personal services and costume rental.....	X					
Barbershops, beauty parlors, and baths.....	X					
Owner-occupied nonfarm dwellings.....	X					
Tenant-occupied nonfarm dwellings.....	X					
Rental value of farm houses.....					X	
Clubs, schools, and institutions.....	X					
Hotels, motels, and tourist camps.....				X		
Electricity.....	X					
Gas.....	X					
Water.....	X					
Telephone and telegraph.....	X					
Domestic service.....	X					
Postage.....	X					
Moving and warehousing.....	X	X				X
Electrical repairs.....		X				X
Upholstery and furniture repairs.....	X		X			X
Miscellaneous household operations.....		X				X
Fire and theft insurance.....					X	
Rug, drapery, and mattress cleaning and repair.....	X					
Physicians.....	X					
Dentists.....	X					
Other professional services.....	X					
Nonprofit private controlled hospitals.....		X				X
Profit-private controlled hospitals.....	X					
Medical care and hospitalization insurance.....					X	
Brokerage charges and investment consulting.....					X	
Bank service charges.....					X	
Services furnished without payment.....					X	

¹ Includes implicit earnings indexes for government compensation.

TABLE C-2.—Detailed summarization of deflation, procedures, 1958—Continued

	Deflated by—					
	BLS		Agricul- tural prices	Other prices	Implicit prices	Earnings indexes ¹
	Con- sumer prices	Whole- sale prices				
Personal consumption expenditures—Con. Services—Continued						
Expenses of handling insurance.....		X				X
Legal services.....					X	X
Funeral and burial expenses.....					X	
Crematory and cemetery expenses.....					X	
Monuments and tombstones.....				X		
Net payments to unions.....		X				X
Other personal business.....	X					
Automobile repairs.....	X					
Bridge, tunnel, ferry, and toll roads.....				X		
Automobile insurance premiums less claims.....					X	
Street and electric railway and local bus.....	X					
Taxi cabs.....						X
Railway commutation.....					X	
Railway excluding commutation.....					X	
Intercity bus.....					X	
Airline.....					X	
Other transportation.....					X	
Radio and television repair.....	X					
Motion picture theaters.....	X					
Legitimate theaters and opera, etc.....	X					
Spectator sports.....					X	
Clubs and fraternal organizations.....		X				X
Commercial participant amuse- ments.....						X
Parimutuel net receipts.....					X	
Photographic studios and devel- oping.....						X
Commercial amusements.....						X
Other recreation.....	X					
Higher education.....		X				X
Elementary and secondary schools.....		X				X
Foundation expenditures for edu- cation, etc.....		X				X
Correspondence schools.....		X				X
Commercial and trade school.....		X				X
Other institutions.....		X				X
Religious organizations.....		X				X
Social welfare.....		X				X
Museums and libraries.....		X				X
U.S. passenger fare payments.....					X	
U.S. travel expenditures.....				X		
Less:						
Travel expenditures of for- eigners.....	X					
Wages and salaries to foreign nations.....						X
Mexican and West Indian net expenditures.....	X					
Nonresidential structures:						
Petroleum.....					X	
Commissions on sales.....					X	
Less:						
Net transfers.....					X	
All other structures.....				X		
Residential structures:						
Nonfarm buildings.....				X		
Farm buildings.....				X		
Commissions.....					X	
Less: Net transfers.....					X	
Producers' durable equipment:						
Milking machines.....			X			
Electronic computing machinery.....				X		
Radio, telephone and telegraph, and transmission equipment.....				X		
Magnetic tapes.....				X		

¹Includes implicit earnings indexes for government compensation.

TABLE C-2.—Detailed summarization of deflation, procedures, 1958—Continued

	Deflated by—					
	BLS		Agricul- tural prices	Other prices	Implicit prices	Earnings indexes ¹
	Con- sumer prices	Whole- sale prices				
Passenger cars:						
New	X					
Used						
Foreign					X	
Barges				X		
Subsidized ships				X		
Railroad equipment				X		
Telephone and telegraph apparatus			X	X		
All other producer's durable equip- ment				X		
Less: Sale of nonauto equipment scrap		X				
X		X				
Inventory:						
Durable, manufacturing		X				
Nondurables, manufacturing		X				
Durables, wholesale		X				
Nondurables, wholesale		X				
Durables, retail		X				
Nondurables, retail		X				
All other durables, nonfarm		X				
Agricultural			X			
Tobacco			X			
Transportation			X			
Exports:						
Merchandise				X		
Passenger fares				X		
Other transportation					X	
Freight					X	
Travel	X				X	
Miscellaneous services					X	
Income on investments					X	
Imports:						
Merchandise				X		
Passenger fares					X	
Freight					X	
Other transportation					X	
Travel				X		
Miscellaneous private services					X	
Income on investments					X	
Federal Government:						
Military compensation						X
Civilian compensation						X
Construction				X		
Less:						
Force account					X	
Purchase of existing structures					X	
Military equipment		X		X		
Enterprise equipment		X			X	
Stockpiling and defense production		X				
Other equipment		X				
Ammunition		X				
Fuel		X				
CCC inventory change					X	
Printing and reproduction		X				
Less: Domestic sales		X				
Travel	X					
Transportation of things				X		
Communication services	X					
Rents and utility services	X					
Other contractual services	X					
Net purchases from abroad	X				X	
State and local government:						
School compensation						X
Nonschool compensation						X
Construction				X		
Less:						
Force account					X	
Purchase of existing structures					X	
Durables		X				
Nondurables		X				
Services	X			X		

Includes implicit earnings indexes for government compensation.

VII. COMPUTATION OF A BASE YEAR WEIGHTED IMPLICIT PRICE INDEX

In order to analyze the implicit price index we have constructed a new price index utilizing all the price, wage, and cost indexes incorporated in the implicit price index. The new index employs a fixed weighting scheme in accord with the Laspeyres price index formula, whereas the implicit price index uses changing weights. To accomplish this end it is necessary to ascertain, at the finest level of detail, the weights associated with each of these indexes in some base year.

In section V above, the relative importance of each of the classes of price indexes used in the deflation of GNP, which in turn make up the implicit price index, was determined for the year 1958. In table C-1 the results were summarized for each class of deflator by major component of GNP. Further, it was noted that the weights for each price index differed for each year; they were easiest to compute for the base year, 1958, however.

The construction of a base year weighted implicit price index⁹ serves several useful purposes. First, it provides a price index which weights together the various component price series according to their relative importance, in terms of expenditures, in a base year. A reading of this index tells us what the current prices of the Nation's output of goods and services would be if the distribution among these final goods and services had remained the same in all years. This provides the advantage of being able to make year-to-year comparisons among identical market baskets. Second, the base year weighted index, in conjunction with the current year weighted index, will provide an indication of the possible magnitude of the downward statistical bias *believed* to exist in the Implicit Price Index due to the use of a current year weighting scheme. Third, movements in the index will be more directly comparable to the existing Consumer and Wholesale Price Indexes as they will all be similar mathematical constructs with similar base years. Lastly, it will be possible to determine the separate effect of each of the classes of deflators on the total movement of the base year weighted implicit price index. From this the effects on the actual Implicit Price Index can be generalized.

In table C-3A and C-3B the base year weighted implicit price indexes are presented for each major component of GNP and for each of the six classes of deflators by major component of GNP. Though data were collected for the entire 1954-64 period, computations were only made for the years 1954, 1958, and 1964.

TABLE C-3A.—*Base year weighted GNP price deflators, by sector, 1954, 1958, and 1964*

[1958=100]

	All components		
	1954	1958	1964
Gross national product.....	88.5	100.0	108.0
Personal consumption expenditures.....	90.2	100.0	105.8
Goods.....	89.9	100.0	101.3
Services.....	90.5	100.0	113.0
Gross private domestic investment.....	87.2	100.0	106.5
Nonresidential structures.....	85.9	100.0	111.3
Producers' durable equipment.....	84.4	100.0	100.7
Residential structures.....	90.5	100.0	112.2
Inventory change.....	72.0	100.0	143.8
Net exports of goods and services.....	46.3	100.0	101.9
Exports.....	95.7	100.0	102.2
Imports.....	101.0	100.0	102.2
Government purchases of goods and services.....	85.4	100.0	116.1
Federal.....	85.3	100.0	112.8
State and local.....	85.5	100.0	120.3

Source: The Conference Board.

⁹ Throughout the remainder of the text, the new index will be referred to as the base year weighted Implicit Price Index. This designation is not precise, however, and is used only for ease of description. More precisely, the new index is a reconstruction of the IPI in which the price, cost and wage data are recombined by use of the Laspeyres price index formulation with 1958 as the base year.

TABLE C-3B.—Components of base year weighted GNP deflators, by sector, 1954, 1958, 1964

[1958=100]

	Consumer price components			Wholesale price components			Agricultural price components			Other price components			Implicit price components			Earnings index components		
	1954	1958	1964	1954	1958	1964	1954	1958	1964	1954	1958	1964	1954	1958	1964	1954	1958	1964
Gross national product.....	88.1	100.0	107.3	87.7	100.0	100.1	101.4	100.0	97.2	87.2	100.0	105.4	95.0	100.0	107.6	80.8	100.0	127.8
Personal consumption expenditures.....	88.0	100.0	107.1	94.0	100.0	92.5	101.1	100.0	96.9	100.0	100.0	64.9	92.4	100.0	111.1	84.2	100.0	128.0
Goods.....	85.7	100.0	104.7	96.1	100.0	85.2	101.2	100.0	96.9	106.5	100.0	32.0	94.1	100.0	107.0	-----	-----	-----
Services.....	91.7	100.0	110.9	91.7	100.0	100.6	92.2	100.0	103.3	93.0	100.0	107.6	90.2	100.0	116.4	84.2	100.0	128.0
Gross private domestic investment.....	88.8	100.0	101.6	83.2	100.0	99.8	111.1	100.0	110.0	88.4	100.0	110.1	88.6	100.0	103.4	-----	-----	-----
Nonresidential structures.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	85.2	100.0	112.8	90.7	100.0	101.8	-----	-----	-----
Producers' durable equipment.....	88.8	100.0	101.6	83.5	100.0	103.5	90.0	100.0	106.7	90.5	100.0	77.6	64.3	100.0	104.3	-----	-----	-----
Residential structures.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	90.4	100.0	112.2	91.3	100.0	112.7	-----	-----	-----
Inventory change.....	-----	-----	-----	86.1	100.0	133.4	111.5	100.0	110.5	89.6	100.0	100.0	-----	-----	-----	-----	-----	-----
Net exports of goods and services.....	96.6	100.0	115.0	-----	-----	-----	-----	-----	-----	189.5	100.0	77.6	104.2	100.0	85.7	-----	-----	-----
Exports.....	96.6	100.0	115.0	-----	-----	-----	-----	-----	-----	94.3	100.0	103.0	100.0	100.0	97.8	-----	-----	-----
Imports.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	101.0	100.0	101.0	95.6	100.0	101.2	-----	-----	-----
Government purchases of goods and services.....	91.3	100.0	113.4	87.7	100.0	104.3	-----	-----	-----	87.6	100.0	109.1	112.2	100.0	98.7	79.7	100.0	127.7
Federal.....	91.2	100.0	112.7	86.5	100.0	104.8	-----	-----	-----	88.0	100.0	105.0	112.8	100.0	98.1	77.0	100.0	125.6
State and local.....	91.5	100.0	114.3	93.6	100.0	102.3	-----	-----	-----	87.4	100.0	110.0	92.5	100.0	118.8	82.3	100.0	129.8

Source: The Conference Board.

From table C-3A we see that the base year weighted Implicit Price Index for GNP rose to 108 in 1964. This compares with 108.9 for the actual Implicit Price Index (see table C-4). By shifting to constant weights the rise in the Implicit Price Index is cut 10 percent. There are, however, four exceptions to the pattern of current year weighted indexes exceeding base year weighted indexes in 1964. The base year weighted index for personal consumption expenditures for services was 24 percent greater, residential structures 17 percent greater, and State and local government purchases 5 percent greater than the current year weighted index. While at first these results may appear to contradict any assertion of statistical bias further analysis demonstrates that economic rather than statistical factors cause these dichotomous results.

A multisector price index which uses current year weights, i.e., prices weighted together on the basis of their importance in each year, will increase more rapidly than an index using base year weights when those sectors increasing in relative importance (importance being measured in real expenditures) also are experiencing the greatest increase in prices. If the relative expenditures remained constant over the period of observation then both indexes would yield identical results.

Our postwar experience conforms to the former of these two conditions, that is, there has been generally a positive correlation between rates of increase in prices and expenditures by sector. Two sectors have expanded more rapidly than the aggregate while at the same time undergoing above average inflation in prices. They are expenditures for services and purchases of State and local government.

However, as was noted above, greater advances in the current year weighted index than in the base year weighted index are not found for all sectors of GNP. In the case of personal consumption expenditures for services, State and local government purchases, and construction of residential structures, the reverse is true. This divergence can only occur if there is an inverse correlation between rates of change in expenditures and prices for items within a given sector. This is not so severe a restriction as might appear at first.

By way of example, consider expenditures for services. In the aggregate, expenditures and prices increased at an above average rate. At the same time, however, the pattern of expenditures may have shifted from more expensively to less expensively priced services. This shift need only manifest itself in relative terms for an inverse correlation between changes in prices and expenditures for different categories of services to occur. Unfortunately, no published data are available which can be used to confirm these relationships, as the Department of Commerce has not made available constant dollar expenditures for services in detail; however, these relationships must exist in order that the above results be obtained.

TABLE C-4.—GNP implicit price deflators, by sector, 1954, 1958, 1964

[1958=100]

	1954	1958	1964
Gross national product.....	89.6	100.0	108.9
Personal consumption expenditures.....	92.5	100.0	107.2
Goods.....	93.9	100.0	103.9
Services.....	90.0	100.0	112.7
Gross private domestic investment.....			
Nonresidential structures.....	86.0	100.0	111.8
Producers' durable equipment.....	84.0	100.0	103.1
Residential structures.....	90.4	100.0	112.0
Inventory change.....			
Net exports of goods and services.....			
Exports.....	94.3	100.0	101.5
Imports.....	100.8	100.0	101.8
Government purchases of goods and services.....	84.1	100.0	116.0
Federal.....	83.5	100.0	112.9
State and local.....	85.3	100.0	119.3

Source: U.S. Department of Commerce.

VIII. EFFECT OF EACH OF THE DEFLATORS ON THE IMPLICIT PRICE INDEX

In the aggregate, the most rapidly rising of the price deflators were indexes of earnings, increasing 28 percent since 1958 and 58 percent since 1954. As noted in table C-1, earnings indexes accounted for 12.5 percent of the total weights in the base year. The effect of changes in the earnings indexes over the period 1954-64 on the total base year weighted implicit price index is presented in table C-5. There it is shown that between 1958 and 1964, 43.2 percent of the 8 percentage point increase in the IPI is accounted for by increases in the earnings indexes. In the Government sector alone, where implicit earnings indexes are used for employee compensation, they accounted for 77.3 percent of the 16.1 percentage point increase. This finding is interesting in light of the fact that slightly less than 45 percent of the Government sector was deflated by use of implicit earnings indexes (see table C-1).

TABLE C-5.—Proportion of increase of GNP deflators (base year weighted) contributed by the various price and earnings components, 1954-58, 1958-64

	Total percentage point increase		Proportion accounted for by increases in—											
			BLS				Agricultural prices		Other prices		Implicit prices		Earnings indexes	
			Consumer prices		Wholesale prices									
	1954-58	1958-64	1954-58	1958-64	1954-58	1958-64	1954-58	1958-64	1954-58	1958-64	1954-58	1958-64	1954-58	1958-64
Gross national product.....	11.45	8.04	47.4	41.2	13.2	0.1	-0.8	-2.3	15.1	9.1	4.1	8.8	21.0	43.2
Personal consumption expenditures.....	9.83	5.83	82.5	81.9	2.7	-5.8	-1.2	-5.4	-0.2	-14.4	8.4	20.8	7.7	22.9
Goods.....	10.06	1.30	96.0	244.4	1.5	-43.5	-1.9	-39.7	-1.4	-115.1	5.8	-53.9		
Services.....	9.47	13.04	59.7	56.1	4.8	0.2	(1)	(1)	2.0	1.6	12.8	15.5	20.7	26.6
Gross private domestic investment.....	12.83	6.48	2.8	0.8	39.1	-0.8	-1.2	2.2	55.0	95.4	4.3	2.5		
Nonresidential structures.....	14.09	11.28							90.8	97.8	9.2	2.2		
Producers' durable equipment.....	15.64	0.73	5.6	16.3	86.0	386.1	(1)	0.5	6.2	-308.5	2.2	5.6		
Residential structures.....	9.54	12.24							98.4	98.2	1.6	1.8		
Inventory change.....	27.99	43.80			73.9	113.0	23.2	-13.0	3.1	0				
Net exports of goods and services.....	53.73	1.87	2.4	300.0					107.4	773.9	-9.8	-973.9		
Exports.....	4.27	2.17	2.9	24.6										
Imports.....	-0.96	2.21												
Government purchases of goods and services.....	14.59	16.05	3.9	5.4	21.3	6.8			16.3	10.8	-3.8	-0.4	62.4	77.3
Federal.....	14.69	12.81	3.9	6.4	34.0	13.7			8.5	4.1	-6.7	-1.1	60.3	76.9
State and local.....	14.46	20.33	3.8	4.5	4.4	1.1			26.6	16.4	0.1	0.2	65.1	77.7

Source: The Conference Board.

¹ Less than 1/10 of 1 percent.

The second most rapidly rising price deflator, and indeed only second in importance to consumer prices, were implicit prices. They increased 24 percent since 1954 and 8 percent since 1958. In terms of their total effect on the base year weighted Implicit Price Index they were responsible for only 8.8 percent of the 8 percentage point rise.

The third most rapidly rising, but in terms of their total effect, the second most important, were components of the Consumer Price Index. They were responsible for 41.2 percent of the rise in the base year weighted Implicit Price Index and yet they only rose by 7.3 percent since 1958. The reason why they exerted such an important influence on the Implicit Price Index is because 45.6 percent of GNP was deflated by Consumer Price Indexes in 1958.

In passing it is interesting to note that earnings indexes and components of the Consumer Price Index were almost equal in terms of their effect on the base year weighted Implicit Price Index and that, in total, accounted for 84.4 percent of the total increase. Yet, the magnitude of the movements in these two classes of price deflators are quite different, earnings indexes have moved nearly 4 times as fast. The explanation for this, of course, lies in the fact that components of the Consumer Price Index received nearly 4 times the weight of earnings indexes.

The use of agricultural prices in the deflation of GNP on balance served to reduce the level of the Implicit Price Index as the agricultural prices used fell 4.1 percent over the 1954-64 period and received positive weights.

In considering the data in table C-3B, it should be noted that although the sum of the weights in each of the years are equal, the sum of the weights for a given class of price deflators may change from year to year. This will occur whenever a linkage or substitution of one index with another is made. Whenever this operation occurs the weights are shifted to the newly introduced price index. Consequently, whenever a linkage or substitution takes place between two different classes of price deflators, there is a transfer of weights from one class to another class of price deflators.

A good example of this can be seen in the movement of the index for the "Other price components" for personal consumption expenditures for goods which fell to 32 in 1964 from 100 in 1958. The reason for this is that of the original six indexes used in 1954 only two remained by 1964, the sum of the weights having fallen from 0.01347 in 1954 to 0.00280 in 1964. An index based on those items remaining throughout the period would be 95.4 in 1954, 100 in 1958 and 100 in 1964.

IX. COMPARISON OF THE BASE YEAR WEIGHTED IPI AND COMPONENTS OF THE WPI AND CPI

Comparisons between classes of price deflators made up of components of the CPI and WPI and actual components of the CPI and WPI for similar items are possible once certain refinements have been made (see footnote 1, table C-6).

Thus, for example, the aggregate price deflator for GNP, composed of consumer price indexes, is comparable to the CPI-all items. The consumer price deflator for personal consumption expenditures for goods is comparable to the CPI-commodities and the consumer price deflator for personal consumption expenditures for services is comparable to the CPI-services.

In addition, the GNP deflator composed of components of the wholesale price index is comparable to the WPI-all commodities other than farm and food, the wholesale price deflator for personal consumption expenditures for commodities is comparable to the WPI-consumer commodities excluding food, and the wholesale price deflator for producers' durable equipment is comparable to the WPI-producers' finished goods.

The data for each of these components (converted to a 1958-equals-100 base) of the Consumer and Wholesale Price Indexes are found in table C-6. Each of the comparisons for the Consumer Price Index reveals similar movements over the entire period except in the case of services. The CPI-services increased by 14.9 percentage points from 1958 to 1964 whereas the consumer price deflator only moved up 10.9 percentage points.

TABLE C-6.—Comparison of components of the CPI and WPI and related components of the base year weighted IPI,¹ 1954-64

[1958=100]

	1954	1958	1964
Consumer Price Index:			
All items.....	92.8	100.0	107.3
Commodities.....	94.7	100.0	104.5
Services.....	89.5	100.0	114.9
Consumer price components of the Implicit Price Index:			
GNP.....	90.6	100.0	106.1
PCE—Goods.....	89.9	100.0	102.7
PCE—Services.....	91.6	100.0	110.7
Wholesale Price Index:			
All commodities excluding food and farm.....	90.9	100.0	101.7
Consumer commodities excluding food.....	94.4	100.0	101.4
Producer's finished goods.....	82.9	100.0	103.9
Wholesale price components of the implicit price indexes:			
GNP.....	88.0	100.0	102.2
PCE—Commodities.....	104.0	100.0	114.2
Producer's durable equipment.....	83.5	100.0	100.6

Source: U.S. Department of Commerce; The Conference Board.

¹ The components of the base year weighted Implicit Price Index as listed here are different from those shown in table C-3b. Whereas in the previous table there were shifts in the weights among classes of price deflators, in this table special indexes have been computed which preserve constant weights over the period by only using those price indexes for which no linkages or substitutions were made.

Comparisons of the Wholesale Price Index and the wholesale price deflators do not reveal as much conformity, with the exception of the WPI—all commodities excluding food and farm and the wholesale price deflator for GNP. The wholesale price deflator for PCE-commodities, rose 14.2 percent while the WPI-consumer commodities, excluding food rose only 1.4 percent from 1958 to 1964.

As a general explanation of the reasons why the indexes compared will not move in the same way, it may be observed that (1) all the price series which make up the CPI and WPI are not used as deflators, and (2) the relative weights assigned to each of the component series of the deflators are not the same as the actual weights they receive in the CPI and WPI.

X. MATHEMATICAL PROPERTIES OF THE IMPLICIT PRICE INDEX

As indicated earlier, the Implicit Price Index approximates a Paasche price index because the various composite price, cost, and earnings deflators receive current year weights. This generalization is correct only insofar as the weighting scheme is concerned. Divergence from a pure Paasche price index arises from the nature of the deflators used.

In symbolic form a Paasche price index (P_{ii}) is constructed in the following way:

$$(1) \quad P_{ii} = \frac{\sum_j p_{ij} q_{ij}}{\sum_j p_{io} q_{ij}} \quad \text{where: } \begin{matrix} j=1, 2, 3, \dots, n \\ i = \dots, -2, -1, 0, 1, 2, \dots \end{matrix}$$

Thus, a value for the Paasche price index in year i equals the sum, over j components, of current year prices weighted by current year quantities, divided by the sum, over j components, of base year prices weighted by current year quantities.

Conceptually, the implicit price index (IPI_i) achieves the general form of a Paasche price index because the sum of current year values for j components (Y_{ii})

$$(2) \quad Y_{ii} = \sum_j p_{ij} q_{ij}$$

is divided by deflated (constant dollar) GNP (Y'_{ii}), where the latter is derived by dividing each of the j components by an appropriate price relative.

Thus deflated GNP (Y'_{ii}) equals:

$$(3) \quad Y'_{ii} = \sum_j \frac{Y_{ij}}{p_{io}} = \sum_j \frac{p_{ij} q_{ij}}{p_{io}} = \sum_j p_{io} q_{ij}$$

And the implicit price index (IPI_i) would appear as:

$$(4) \quad IPI_i = \frac{Y_{ii}}{Y'_{ii}} = \frac{\sum_j p_{ii} q_{ii}}{\sum_j p_{i0} q_{ii}} = P_{ii} \quad (\text{see (1) above})$$

This is equivalent to a Paasche price index. The same result could be obtained if each of the composite price deflators were in the form of Paasche price indexes themselves rather than price relatives.

$$(5) \quad IPI_i = \frac{Y_{ii}}{Y'_{ii}} = \frac{\sum_j p_{ii} q_{ii}}{\frac{\sum_j p_{ii} q_{ii}}{\frac{\sum_j p_{i0} q_{ii}}{\sum_j p_{i0} q_{ii}}}} = P_{ii}$$

However, the actual deflation of each of the components of GNP involves the use of deflators which are in a form other than price relatives or Paasche price indexes. For example, in many cases, either Laspeyres or Laspeyres-type price indexes are used. A Laspeyres price index has the following form:

$$(6) \quad L_{ii} = \frac{\sum_k p_{ik} q_{ik}}{\sum_k p_{i0} q_{i0}} = \frac{p_{ii} q_{i0}}{p_{i0} q_{i0}} \quad \text{where: } k(=1, 2, \dots, m) \text{ represents individual prices, costs or wages in subgroup } j.$$

At one extreme, where there is only one component to GNP and it is deflated by a Laspeyres price index, the IPI would also be a Laspeyres price index.

$$(7) \quad IPI_i = \frac{Y_i}{Y'_i} = \frac{p_i q_i}{\frac{p_i q_i}{\frac{p_{i0} q_{i0}}{p_{i0} q_{i0}}}} = L_i \quad (\text{see (6) above}).$$

And, at the other extreme, where there are many components, each deflated by a Laspeyres index, the IPI would be a weighted average of Laspeyres price indexes.

$$(8) \quad IPI_i = \frac{Y_{ii}}{Y'_{ii}} = \frac{\sum_j p_{ii} q_{ii}}{\sum_j \frac{p_{ii} q_{ii}}{L_{ii}}}$$

Dividing the numerator and denominator by: $\sum_j p_{ii} q_{ii}$

and defining

$$\omega_{ii} = \frac{p_{ii} q_{ii}}{\sum_j p_{ii} q_{ii}} \quad \text{where } j=1, 2, 3, \dots, n$$

we have,

$$(9) \quad IPI_i = \frac{1}{\sum_j \frac{\omega_{ii}}{L_{ii}}}$$

This is equivalent to saying that the IPI is the inverse of current year weighted reciprocals of Laspeyres price indexes.

Since the deflation of GNP involves the use of price relatives, Laspeyres and Laspeyres-type price indexes, and indexes of costs and wages, the implicit price index is a weighted average, of the form described in (9) above, of these deflators.

APPENDIX D*

AGRICULTURAL PRICE INDEXES

The set of price indexes developed for the farm community provides indicators of price change for this relatively small but important sector of the economy. Nevertheless, their distinctive features deserve examination in this study because of their importance in the public eye and because of their practical value to the professional analyst and in the administrative process.

The indexes prepared by the Statistical Reporting Service (formerly part of the Agricultural Marketing Service) of the U.S. Department of Agriculture are widely used summary measures of the economic position of farmers. They are the most comprehensive attempt made to define shifts in the buying and selling relations of a single majority group of producers. In addition, they have served, since the passage of the Agricultural Adjustment Act of 1933, as the foundation of the agricultural support policies of the Federal Government. Their current construction and use are determined, in part, by congressional action.

This set of indexes consists of: (1) an index of prices received by farmers for the products they sell; (2) a corresponding index, on the input side, of prices paid by farmers for items used in production; (3) an index of prices farmers pay for items used in family living (similar to the CPI for urban workers) and (4) a "parity index" based upon the two indexes of prices paid for goods and services (series 2 and 3 in this list) to which are added, by congressional order, measures of changes in interest or indebtedness secured by farm mortgages, taxes on farm real estate, and wages paid to hired farm labor.

From the index of prices received (No. 1 above) and the parity index (No. 4) is derived the *parity ratio* which measures changes in the average purchasing power of farm products. These indexes are used in computing parity prices of farm products, and parity prices, in turn, are used in determining support levels for price support programs, in administering market agreements and orders, and as criteria for price ceilings during national emergencies.

Since both the prices received and the parity indexes enter into the computation of the parity ratio and parity prices, the two indexes are designed to be essentially similar in concept and construction. Both are published monthly, relate to prices at midmonth (with some minor exceptions) and are available in a continuous series since 1910.¹ The base, or reference period, taken as 100 for purposes of comparison, is the same—the 5 years beginning January 1910 through December 1914 as provided by the Agricultural Adjustment Act of 1938, as amended in 1948 and 1949.

These companion indexes are both of the aggregate type—the Laspeyres formula²—with modification to permit changes in weights and in the number of commodities. Both indexes are constructed with weights representing the same period. For the 25 years from 1910 to February 1935, both indexes use weights from the period 1924–29; from March 1935 through August 1952 both use weights representing 1937–41; and from September 1952 forward, the prices paid series has 1955 weights and the Prices Received Index has a slightly broader weight base—average cash receipts in 1953–57. The indexes for each period with its own weighting pattern are linked together—namely in March 1935 and September 1952—to provide a continuous series since 1910.

*The original draft of this Appendix was prepared by Gertrude Deutsch who received valuable assistance from the staff of the U.S. Department of Agriculture.

¹ Monthly estimates of prices received by farmers are published for all years since 1910. The index of prices paid, including interest, taxes, and wage rates, is available on a monthly basis only since January 1937, on a quarterly basis for the years 1923–35, and annually for 1910–22.

² See fn. 7, chapter 2 for algebraic notation of this formula.

PRICES RECEIVED BY FARMERS

The prices received index measures changes over time in the average price farmers receive for their products at points of first sale—local markets or other centers to which farmers deliver their crops. It is a close approximation to a measure of the price component of receipts by farmers from the sale of farm products. The present index for all farm products combined is based on prices of 55 commodities whose aggregate sales value in 1953–57 represented about 93 percent of cash receipts from total marketings. These prices are gathered monthly from various sources but chiefly by means of mail questionnaires filled out by a group of voluntary respondents most of whom are buyers of, or dealers in, farm products at country shipping points (e.g., operators of country mills and elevators, managers of cooperative marketing organizations, managers of creameries, and milk receiving stations). In recent years, returns have been received from about 9,000 regular price reporters each month.

The price of a product as used in this index represents the average received by farmers for all grades and qualities, without the specifications that define grades in the usual wholesale trade channels. These farm prices, therefore, cannot be compared directly with the prices for goods of specified grades that enter into the BLS wholesale price index. This concept of an "average" means that movements in the index of prices received by farmers reflect shifts in the average quality of products marketed as well as price changes proper. In such an index, even though prices for each grade may remain the same over a given period, the average for a commodity may decrease if lower grades account for a larger proportion of total sales than previously. The reasons for using this all-inclusive price concept has been summarized by the Department of Agriculture as follows:

"The complexities involved in the marketing of farm products, the wide variations as to grades, kinds, and qualities of a given product, the lack of a uniform system of selling by grade, the sharp variation from area to area in the grades used, and the relatively large quantities of most products sold ungraded complicate the attempts to measure comprehensive price behavior by using prices for special grades. Accordingly, the term 'prices received by farmers' has come to apply to the concept of an all-inclusive price—a price for what the farmer sells where he sells it, which reflects the impact of supply and demand relationships upon a commodity in total—in short, the average price for all grades and classes being sold by farmers at a given time.

"This concept of an average is closely connected with cash income, and it is income rather than price that pays the farmers' bills. Thus, the average price received by farmers multiplied by the total quantity sold give the total cash receipts from the marketing of a commodity. This is the kind of price that is represented in the index of prices received by farmers."³

The prices received by farmers is used in computing the receipts from sale of farm products. Such receipts are an important component of farm income which, in turn, is a building block in estimating the national income accounts. This use has been a major factor in determining the definition of prices received by farmers.

Weights based on average quantities sold during 1953–57 have been used since September 1952 to combine the U.S. average prices for individual items into subgroup indexes. In combining these subgroup indexes into groups and into the all-commodities indexes, the index numbers are weighted by the percentages that cash receipts from marketing for the particular commodity subgroups bear to total cash receipts for the same period—1953–57. For the official index, the subgroups, group, and total indexes are then converted from the 1953–57 to the 1910–14=100 base prescribed by law, by linking them to the 1910–14 index in September 1952. (Appendix table D-1 shows the percent weights for important categories in the three weight-base periods used in constructing the index over its long timespan.)

³ "Agricultural Prices and Parity," Major Statistical Series of the U.S. Department of Agriculture, Agricultural Handbook No. 118, August 1957, vol. I, p. 4.

TABLE D-1.—*Relative group weights for index of prices received by farmers*
 [In percent]

Commodity group	Weight-base period		
	1924-29	1937-41	1953-57
All farm products.....	100.0	100.0	100.0
Crops.....	48.0	42.2	45.2
Food grains.....	8.9	7.0	7.9
Feed grains and hay.....	7.5	6.7	9.1
Cotton.....	13.9	8.3	8.4
Tobacco.....	2.6	3.7	4.1
Oil-bearing crops.....	2.3	3.1	4.9
Fruit.....	6.0	5.8	4.7
Commercial vegetables.....	3.5	4.8	4.2
Potatoes, sweetpotatoes, and dry edible beans.....	3.3	2.8	1.9
Livestock and products.....	52.0	57.8	54.8
Meat animals.....	26.1	28.6	29.1
Dairy products.....	15.1	17.7	14.6
Poultry and eggs.....	9.9	10.2	10.7
Wool.....	.9	1.3	.4

Source: U.S. Department of Agriculture, "Agricultural Economics Research," April-July 1959, p. 74.

INDEX OF PRICES RECEIVED AND WPI FARM PRODUCTS INDEX

The index of prices received by farmers differs materially in concept and construction from the farm-product component of the BLS wholesale price index. It was noted earlier that the prices received index measures changes in average prices of all grades of a given commodity (all wheat, for instance); the WPI, on the other hand, measures prices of specific grades or quantities. A second major difference is that the prices received index refers to prices at the level of sale by farmers and is based on the average price throughout the country; in contrast, the WPI is based on prices in selected central markets—the price of apples of a specific grade at the New York auction market, for example.

The number and selection of commodities for which prices are included in the indexes also differ somewhat. Finally, the weights and base periods used are different in the two indexes. Prices received by farmers is currently compiled with a 1953-57 weight and a 1910-14 base period while the WPI uses the weighting pattern of 1958 and has a 1957-59 reference base. The prices received index is currently published also on a 1957-59 reference base to facilitate comparisons with other indexes.

PRICES PAID BY FARMERS

The parity index measures the average change over time in the prices of a selected list of commodities and services which farmers commonly buy. The parity index has five major components. (1) The most important, in terms of postwar farm expenditures, is the index of prices paid for commodities used in farm production. Such items accounted for about 51 percent of total farm outlays in 1955. (2) Second in importance, with a weight of nearly 40 percent of the 1955 expenditure total is the index of prices paid for items used in family living. (3) Taxes payable per acre on farm real estate, (4) interest payable per acre on farm mortgage debt, and (5) farm wage rates for hired labor. The last three components together made up almost 10 percent of farmers' spending in 1955. (Appendix table D-2 shows the percent of total weight accounted for by the principal components of the parity index in the three weight-base periods). The inclusion of taxes and interest has been criticized as not belonging in a price index.⁴

⁴ The inclusion of interest and taxes " . . . are prescribed by statute but no statute can make an index of expenditures into an index of prices." "The Price Statistics of the Federal Government," op. cit., pp. 76-77.

TABLE D-2.—*Relative group weights for the parity index*

[In percent]

Item	Weight base period		
	1924-29	1937-41	1955
Commodities, interest, taxes and cash wage rates.....	100.0	100.0	100.00
Living.....	41.2	44.0	39.50
Food (including tobacco).....	14.8	16.7	13.40
Clothing.....	12.5	8.6	6.34
Autos and auto supplies.....	4.5	6.9	5.63
Household operations.....	3.9	5.9	5.77
Household furnishings.....	2.4	4.0	3.99
Building materials, house.....	3.1	1.9	4.37
Production.....	36.4	41.2	50.90
Feed.....	10.1	10.2	12.80
Livestock.....	4.4	5.3	4.60
Motor supplies.....	3.9	5.2	8.39
Motor vehicles.....	3.9	5.2	4.38
Farm machinery.....	3.4	4.5	5.21
Building and fencing materials.....	3.7	2.7	5.20
Fertilizer and lime.....	2.7	3.1	4.11
Equipment and supplies.....	3.3	3.3	3.66
Seeds.....	1.0	1.7	2.55
Total commodities.....	77.6	85.2	90.40
Taxes.....	5.7	3.8	2.04
Interest.....	6.5	3.0	.96
Cash wage rates.....	10.2	8.0	6.60

Source: U.S. Department of Agriculture, "Agricultural Economics Research," April-July 1959, p. 37.

As of June 15, 1964, 447 different commodity price series, in addition to interest, taxes and farm wage rates, were used in computing the parity index. They were distributed about equally between commodities bought for use in family living and those used in farm production.⁵ The 447 items were selected by the Department of Agriculture as representative of the 2,500 commodities purchased by farmers in 1955 as reported in the nationwide survey of farm expenditures.⁶

The basic price quotations for the individual items covered by the family-living and farm-production indexes are collected monthly largely by mail from a total of about 35,000 independent and chainstores in rural areas, small towns, and shopping sections selling to farmers.⁷ Information on average costs of electricity and telephone service is obtained in an annual mail survey of about 20,000 farmers.

Items to be priced are described in general terms with no brand specification or other identification. Respondents are asked to report the average price paid for those kinds or qualities of each item purchased in the greatest volume by farmers on the day of the quotation. Of course, the "volume-sellers" may change from one date to another in response to (1) changes in the quality or types of commodities stocked by merchants or (2) changing level of farm income. If there is a shift over a given period toward higher quality, for example, the price reported for the item would be higher too, even if the prices of the various qualities were the same on the two dates. Because of this concept of "average price," which is analogous to that used in the prices received series, movement in the index of prices paid over time, can be a reflection of either changes in the quality

⁵ The farm-production component included 247 separate price series and the family-living component covered 242 items—making a total of 489. But prices for 42 of these items are common to both indexes, leaving a net of 447 series.

⁶ The coverage of the parity index, which has been expanded periodically over its 55-year span, was increased 23 percent in the past nine years. In 1955, 389 items were covered as compared with the 447 in 1964.

⁷ For certain types of farm expenditures, such as spending for medical care, insurance, custom work, and marketing charges, resources have not been available to collect the price data necessary to have these costs represented directly in the index. Such items amounted to about 15 percent of total farm-living expenditures in 1955 and to about the same percent of all production outlays. Because of this lack, an imputation is made for the items not priced by adjusting the weighting scheme. In the family-living index, the importance of such spending is spread over the available six subgroup indexes so that their effect is reflected in the distribution of weights among the major component indexes. For the farm-production index it was imputed to the production group as a whole and allocated on a pro rata basis in determining the percentage weights.

⁸ Since March 1953, price information has been collected monthly from chainstores and quarterly from independent stores. Price changes for independent stores in interquarterly months are estimated largely from changes in chainstore prices.

of goods purchased, or of changes in prices proper, or of changes in both of these factors.⁸

From the price reports of the merchants, statewide averages are calculated for each item. They, in turn, are combined into national averages by weighting each State price estimate by the estimated quantities of that commodity purchased by farmers in that State.⁹ From these national averages, subgroup indexes are computed for 15 types of expenditures, using as weights the estimated quantities of the individual commodities purchased by farmers in 1955. Six of these subgroups are combined (again weighted on the basis of relative expenditures in 1955) into the index of prices paid for items used in family living. The remaining nine subgroups are combined (weighted in a like manner) for items used in farm production.¹⁰

The parity index covers three elements of farm expenditures—interest, taxes, and wage rates—in addition to the goods and services bought for family living and farm production. The series used to measure “interest on indebtedness secured by farm mortgages” and “taxes on farm real estate” are those relating to such costs per acre of farm real estate. The interest charges are developed annually from data on farm mortgage loans and interest rate charged for those loans, which are obtained from special surveys and lending agencies. The tax index, also compiled annually, is based on the Census of Agriculture and, for intercensal years on data from local governmental records. The index of farm wage rates is obtained from a quarterly mail survey of farmers.

INDEX OF PRICES PAID BY FARMERS AND CPI.

Although the index of prices paid by farmers for family living items and the Consumer Price Index prepared by the Bureau of Labor Statistics are basically parallel in purpose, and both relate to retail prices, there are important differences between them which on occasion give rise to differences in the movement of the two indexes.

One major difference is that the lists of commodities included are not identical and different weights are used for individual commodities since the two indexes relate to different population groups. The CPI is based on the purchasing habits of urban families. The farm-family-living index is based on a survey of farm-family expenditures. City workers, for example, use much more transportation than do farmers; they also buy some food items which farmers either produce themselves, or buy in smaller quantities. The farm index also does not give adequate coverage to medical services.

Another difference is that although both indexes are composed of a fixed list of items for any successive dates, the CPI measures price change over the period for specified descriptions of the items whereas the farm family-living index measures average price changes for the best-selling products of each item. However, the quality purchased in the greatest volume by farmers may shift, and such upgrading (or downgrading) would be reflected in the farm price index. Such upgrading may well be of more importance during wartime shortages with price controls than at other times.

Some differences may exist between these rural and urban indexes because of the different methods used in collecting the data. The prices used in compiling the farm family-living index are collected mainly by mail questionnaire (a technique known to have numerous weaknesses but necessary because of cost considerations) while much of the price information for the CPI is collected by the more expensive procedure of using trained enumerators.

Finally, there are differences between the two indexes in the dates of the weights and of the base period. The Index of Prices Paid by Farmers for family living is currently compiled with 1955 weights and linked to a 1910-14 reference base as required by law. However, for convenience in comparing with other indexes, it is also published currently with a 1957-59 reference base. The CPI now uses a 1960-61 weighting pattern and a 1957-59 reference base.

⁸ For criticism of this approach, see Zvi Griliches, “Notes on the Measurement of Price and Quality Changes” in *Models of Income Determination, Studies in Income and Wealth*, vol. 28, National Bureau of Economic Research, Princeton University Press, Princeton, N.J., 1964, pp. 383-385.

⁹ These estimates of purchases are based upon the distribution of farm population, farm income, farm expenditures, and other available information.

¹⁰ The major commodity groups in the family-living index are: (1) food and tobacco, (2) clothing, (3) household operations, (4) household furnishings, (5) building materials, and (6) autos and auto supplies. For the production index, the subgroups are: (1) feed, (2) feeder livestock, (3) motor supplies, (4) motor vehicles, (5) farm machinery, (6) farm supplies, (7) fencing materials, (8) fertilizer, and (9) seed.

APPENDIX E—STATISTICAL TABLES

TABLE E-1.—Implicit Price Index, Consumer Price Index, and Wholesale Price Index, annually 1939-1965

[1957-59=100]

	IPI	CPI	WPI
1939	43.3	48.4	42.2
1940	44.0	48.8	43.0
1941	47.3	51.3	47.8
1942	53.2	56.8	54.0
1943	57.0	60.3	56.5
1944	58.4	61.3	56.9
1945	59.9	62.7	57.9
1946	66.9	68.0	66.1
1947	74.8	77.8	81.2
1948	79.8	83.8	87.9
1949	79.3	83.0	83.5
1950	80.4	83.8	86.8
1951	85.9	90.5	96.7
1952	87.8	92.5	94.0
1953	88.6	93.2	92.7
1954	89.9	93.6	92.9
1955	91.2	93.3	93.2
1956	94.3	94.7	96.2
1957	97.8	98.0	99.0
1958	100.3	100.7	100.4
1959	101.9	101.5	100.6
1960	103.6	103.1	100.7
1961	104.9	104.2	100.3
1962	106.0	105.4	100.6
1963	107.4	106.7	100.3
1964	109.2	108.1	100.5
1965	111.2	109.9	102.5

TABLE E-2.—Consumer Price Index, major groups, December 1964 and December 1965

[1957-59=100]

	December 1964	December 1965
All items	108.8	111.0
Health and recreation	114.3	116.6
Medical care	120.3	123.7
Reading and recreation	114.9	115.4
Personal care	110.0	110.0
Other goods and services	109.2	113.4
Transportation	110.5	111.6
Public	120.3	122.0
Private	109.0	110.1
Housing	107.8	109.4
Shelter	109.5	111.8
Fuel and utilities	107.9	108.1
Household furnishings and operation	102.9	103.6
Food	106.9	110.6
Food away from home	116.0	119.9
Food at home	105.1	108.9
Apparel and upkeep	106.6	108.1
Footwear	111.7	115.6
Men's and boys'	107.1	109.3
Women's and girls'	103.3	104.3

Source: Derived from U.S. Department of Labor, Bureau of Labor Statistics, the Consumer Price Index, December 1965, p. 3.

TABLE E-3.—Wholesale Price Index for major groups and subgroups, December 1964 and December 1965

[1957-59=100]

	December 1964	December 1965
All commodities.....	100.7	104.1
Miscellaneous products.....	110.7	112.5
Manufactured animal feeds.....	116.4	118.6
Jewelry, watches, and photographic equipment.....	103.9	105.1
Other miscellaneous products.....	103.0	104.9
Toys, sporting goods, small arms, etc.....	101.0	103.1
Notions and accessories.....	99.1	99.1
Tobacco products and bottled beverage.....	107.5	107.9
Nonalcoholic beverages.....	128.1	128.5
Tobacco products.....	106.1	106.0
Alcoholic beverages.....	100.5	101.3
Hides, skins, leather, and leather products.....	105.4	114.4
Footwear.....	109.0	113.8
Other leather products.....	104.0	109.7
Leather.....	103.9	114.2
Hides and skins.....	90.2	132.3
Metals and metal products.....	104.7	106.6
Nonferrous metals.....	113.4	117.2
Fabricated nonstructural metal products.....	108.3	109.7
Metal containers.....	105.6	109.8
Hardware.....	104.8	107.2
Plumbing fixtures and brass fittings.....	104.1	106.7
Iron and steel.....	101.1	101.7
Fabricated structural metal products.....	100.0	102.0
Heating equipment.....	92.2	91.6
Machinery and motive products.....	103.1	104.2
Agricultural machinery and equipment.....	114.2	117.0
Metalworking machinery and equipment.....	114.2	118.9
Construction machinery and equipment.....	113.7	116.5
Special industry machinery and equipment.....	106.6	109.0
General purpose machinery and equipment.....	105.0	106.8
Miscellaneous machinery.....	104.1	105.4
Motor vehicles.....	100.8	100.5
Electrical machinery and equipment.....	96.3	96.6
Nonmetallic mineral products.....	101.6	101.6
Gypsum products.....	106.6	97.4
Structural clay products.....	105.0	105.6
Concrete ingredients.....	102.9	103.4
Flat glass.....	102.1	99.9
Other nonmetallic minerals.....	101.2	100.9
Concrete products.....	101.1	101.8
Asphalt roofing ²	91.2	94.6
Textile products and apparel.....	101.5	102.0
Miscellaneous textile products.....	117.8	130.0
Silk products.....	117.4	143.6
Apparel.....	103.1	104.3
Wool products.....	102.8	105.4
Cotton products.....	99.4	101.2
Manmade fiber textile products.....	96.8	91.9
Processed foods.....	100.8	109.4
Miscellaneous processed foods.....	111.2	114.1
Dairy products and ice cream.....	108.9	111.3
Cereal and bakery products.....	108.2	111.2
Sugar and confectionery.....	107.1	108.8
Canned and frozen fruits and vegetables.....	101.9	105.1
Packaged beverage materials.....	98.2	93.4
Meats, poultry, and fish.....	88.8	110.5
Lumber and wood products.....	99.4	101.9
Millwork.....	109.0	107.9
Lumber.....	99.1	103.4
Plywood.....	90.3	92.1

TABLE E-3.—*Wholesale Price Index for major groups and subgroups, December 1964 and December 1965—Continued*

[1957-59=100]

	December 1964	December 1965
Pulp, paper, and allied products	98.9	100.9
Paper	103.7	104.9
Converted paper and paperboard products	97.9	100.4
Woodpulp	96.8	98.1
Paperboard	96.4	96.5
Wastepaper	95.9	104.6
Building paper and board	93.3	92.7
Furniture and other household durables	98.4	98.1
Household furniture	105.7	106.7
Other household durables	104.4	106.2
Commercial furniture	103.3	104.0
Floor coverings	99.0	97.5
Household appliances	90.8	88.8
Television, radio receivers, and phonographs	86.6	84.5
Fuels and related products, and power	98.1	100.6
Gas fuels	³ 124.0	128.6
Coke	107.3	107.3
Electric power	³ 101.3	100.7
Coal	98.2	97.6
Petroleum products, refined	94.0	98.4
Chemicals and allied products	97.2	97.6
Fats and oils, inedible	116.8	110.1
Mixed fertilizer	100.7	105.5
Fertilizer materials	100.7	103.8
Other chemicals and allied products	99.6	99.8
Drugs and pharmaceuticals	94.7	94.6
Industrial chemicals	94.2	95.5
Farm products	92.7	103.0
Hay, hayseeds, and oilseeds	116.7	110.8
Fluid milk	105.0	108.0
Fresh and dried fruits and vegetables	98.9	92.2
Plant and animal fibers	92.6	89.6
Grains	90.1	90.1
Eggs	85.3	118.2
Livestock and live poultry	83.1	109.0
Other farm products	98.3	103.5
Rubber and rubber products	92.2	93.5
Miscellaneous rubber products	96.4	97.7
Crude rubber	90.3	89.6
Tires and tubes	88.8	91.1

¹ January 1961 equals 100.² Formerly prepared asphalt roofing.³ January 1958 equals 100.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Wholesale Prices and Price Indexes, December 1964 final and January 1965 preliminary, pp. 4-19 and December 1965 final and January 1966 preliminary, pp. 4-19.

TABLE E-4.—Indexes of wholesale prices by stage of processing and all commodities, by years, 1947-65

[1957-59=100]

	Crude materials for further processing	Intermediate materials, supplies, and components	Finished goods	All commodities
1947.....	100.8	76.5	80.1	81.2
1948.....	110.5	82.7	86.4	87.9
1949.....	95.6	79.4	84.0	83.5
1950.....	104.2	83.0	85.5	86.8
1951.....	119.6	93.0	93.6	96.7
1952.....	109.9	90.3	93.0	94.0
1953.....	101.5	90.8	92.1	92.7
1954.....	100.6	91.3	92.3	92.9
1955.....	96.7	93.0	92.5	93.2
1956.....	97.2	97.1	95.1	96.2
1957.....	99.4	99.4	98.6	99.0
1958.....	101.6	99.6	100.8	100.4
1959.....	99.0	101.0	100.6	100.6
1960.....	96.6	101.0	101.4	100.7
1961.....	96.1	100.3	101.4	100.3
1962.....	97.1	100.2	101.7	100.6
1963.....	95.0	100.5	101.4	100.3
1964.....	94.1	100.9	101.8	100.5
1965.....	98.9	102.2	103.6	102.5

Source: U.S. Department of Labor, Bureau of Labor Statistics.

TABLE E-5.—State sales taxes, Jan. 1, 1957, Sept. 1, 1964, and Dec. 1, 1965

State	Jan. 1, 1957	Sept. 1, 1964	Dec. 1, 1965
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Alabama.....	13.0	14	14
Arizona.....	2.0	13	13
Arkansas.....	2.0	3	3.00
California.....	13.0	13	13
Colorado.....	2.0	12	13
Connecticut.....	3.0	3.5	3.5
Florida.....	3.0	3	3
Georgia.....	3.0	3	3
Hawaii ²	(³)	3.5	4
Idaho.....	0	0	3
Illinois.....	12.5	13.5	13.5
Indiana.....	0	2	2
Iowa.....	2.5	2	2
Kansas.....	2.0	2.5	3
Kentucky.....	0	3	3
Louisiana.....	12.0	12	12
Maine.....	2.0	4	4
Maryland.....	2.0	3	3
Michigan.....	3.0	4	4
Mississippi ²	13.0	13.5	13.5
Missouri.....	2.0	3	3
Nevada.....	2.0	2	2
New Mexico ²	2.0	13	13
New York.....	0	0	12
North Carolina.....	3.0	3	3
North Dakota.....	0	2.25	2.25
Ohio.....	3.0	3	3
Oklahoma.....	2.0	2	2
Pennsylvania.....	3.0	5	5
Rhode Island.....	2.0	3.5	4
South Carolina.....	3.0	3	3
South Dakota.....	2.0	2	3
Tennessee.....	3.0	13	13
Texas.....	0	2	2
Utah.....	2.0	13	13
Washington.....	3.3	4	4.2
West Virginia.....	2.0	42	3
Wisconsin ²	0	3	3
Wyoming.....	2.0	2	2.5

¹ Plus local sales taxes.² Gross receipts tax.³ Not available.⁴ Also includes a temporary additional tax, which expired June 30, 1965, 1 cent per dollar on proceeds in excess of \$1.

Sources: John F. Due, "Sales Taxation," University of Illinois Press, Urbana, Ill., 1957, p. 294 and Tax Foundation, Facts and Figures on Government Finance, 1964-65, pp. 188-236. James C. Daugherty, "Effect of Taxes on the CPI," Monthly Labor Review, February 1966, p. 183.

TABLE E-6.—*Cities in CPI in standard metropolitan statistical areas with a population of at least 250,000 in 1960*

Standard metropolitan statistical areas	Population weight	State sales tax	Rate	
			1957	1964
Chicago (includes northwestern Indiana) ¹	5.552	Yes ²	2.5	23.5
Detroit ¹	2.895	Yes.....	3.0	4.0
Los Angeles-Long Beach ¹	5.017	Yes ²	23.0	23.0
New York ¹ (includes northeastern New Jersey).....	12.577	No.....	(3)	(3)
Philadelphia ¹	2.703	Yes.....	3.0	5.0
Boston ¹	1.930	No.....	0	0
Pittsburgh ¹	1.565	Yes.....	3.0	5.0
Wichita.....	2.210	Yes.....	2.0	2.5
Buffalo.....	2.347	No.....	(3)	(3)
Nashville.....	3.266	Yes.....	3.0	23.0
Cleveland ¹	1.325	Yes.....	3.0	3.0
Dallas.....	3.267	Yes ⁴	-----	2.0
Dayton.....	2.210	Yes.....	3.0	3.0
Seattle.....	2.173	Yes.....	3.3	4.0
Washington, D.C. ¹	1.255	-----	-----	-----
Hartford.....	2.348	Yes.....	3.0	3.5
Atlanta.....	3.267	Yes.....	3.0	3.0
Denver.....	2.174	Yes.....	2.0	22.0
Baltimore ¹	1.402	Yes.....	2.0	3.0
Honolulu.....	.354	Yes ⁵	(6)	3.5
Indianapolis.....	2.209	Yes.....	0	2.0
St. Louis ¹	1.428	Yes.....	2.0	3.0
San Francisco-Oakland ¹	2.372	Yes ²	23.0	23.0

¹ One of the 12 largest standard metropolitan statistical areas (SMSA).

² Plus local sales tax. As of Sept. 1, 1964, rate was 0.5 percent in Illinois, 1 percent in California, from 1 to 2 percent in Colorado, 1 percent in Tennessee.

³ In New York State no statewide sales tax in effect but in 1964 rate ranged between 1 and 4 percent; New York City had a 4 percent rate.

⁴ No sales tax in 1957.

⁵ Data not available for 1957.

⁶ Not available.

NOTE.—The 12 largest SMSA set forth in the 1960 census of population represent only themselves in the population weight patterns. The others in addition to carrying their own population weights bear pro rata shares of the population weights of all cities in their region in the same population class.

Sources: U.S. Department of Labor, Bureau of Labor Statistics, the Consumer Price Index (revised January 1964), A Short Description, Washington, D.C., September 1964, pp. 9-10 and State sales tax table.

TABLE E-7.—State gasoline tax rates, Sept. 1, 1956, Sept. 1, 1964, and Dec. 1, 1965

[In cents per gallon]

State	Sept. 1, 1956	Sept. 1, 1964	Dec. 1, 1965	Increase, Sept. 1, 1956-Dec. 1, 1965
Alabama.....	7	7	7	0
Alaska.....	(¹)	8	8	(¹)
Arizona.....	5	6	7	2
Arkansas.....	6.5	6.5	7.5	1
California.....	6	7	7	1
Colorado.....	6	6	7	1
Connecticut.....	6	6	6	0
Delaware.....	5	6	7	2
Florida.....	7	7	7	0
Georgia.....	6.5	6.5	6.5	0
Hawaii.....	(¹)	(²)	(²)	(¹)
Idaho.....	6	6	6	0
Illinois.....	5	5	5	0
Indiana.....	4	6	6	2
Iowa.....	6	6	7	1
Kansas.....	5	5	5	0
Kentucky.....	7	7	7	0
Louisiana.....	7	7	7	0
Maine.....	7	7	7	0
Maryland.....	6	7	7	1
Massachusetts.....	5	5.5	6.5	1.5
Michigan.....	6	6	6	0
Minnesota.....	5	6	6	1
Mississippi.....	7	7	7	0
Missouri.....	3	5	5	2
Montana.....	7	6	6	-1
Nebraska.....	6	7	7.5	1.5
Nevada.....	6	6	6	0
New Hampshire.....	5	7	7	2
New Jersey.....	4	6	6	2
New Mexico.....	6	6	6	0
New York.....	4	6	6	2
North Carolina.....	7	7	7	0
North Dakota.....	6	6	6	0
Ohio.....	5	7	7	2
Oklahoma.....	6.58	6.58	6.58	0
Oregon.....	6	6	6	0
Pennsylvania.....	6	7	7	1
Rhode Island.....	4	7	7	3
South Carolina.....	7	7	7	0
South Dakota.....	5	6	6	1
Tennessee.....	7	7	7	0
Texas.....	5	5	5	0
Utah.....	5	6	6	1
Vermont.....	5.5	6.5	6.5	1
Virginia.....	6	7	7	1
Washington.....	6.5	7.5	7.5	1
West Virginia.....	6	7	7	1
Wisconsin.....	6	6	6	0
Wyoming.....	5	5	5	0

¹ Not available.² Rate varies because State tax differs from county to county and separate county taxes set by the county in which fuel is used.

Sources: The Tax Foundation, Facts and Figures on Government Finance, 9th edition, 1956-57, New York, 1956, p. 147 and 13th edition, 1964-65, New York, 1965, p. 190. James C. Daugherty, "Effect of Taxes on the CPI," Monthly Labor Review, February 1966, p. 183.

TABLE E-S.—State cigarette tax rates, Sept. 1, 1956, Sept. 1, 1964, and Dec. 1, 1965

[In cents per package of 20]

State	Sept. 1, 1956	Sept. 1, 1964	Dec. 1, 1965	Increase, Sept. 1, 1956- Dec. 1, 1965
Alabama.....	4	6	7	3
Alaska.....	(¹)	8	8	(¹)
Arizona.....	2	2	6½ ²	4½
Arkansas.....	6	6	8	2
California.....	0	3	3	3
Colorado.....	0	3	5	5
Connecticut.....	4	6	8	4
Delaware.....	3	5	7	4
Florida.....	5	8	8	3
Georgia.....	5	8	8	3
Hawaii.....	(¹)	(²)	(¹)	(¹)
Idaho.....	3	7	7	4
Illinois.....	3	4	7	4
Indiana.....	3	4	6	3
Iowa.....	3	6	8	5
Kansas.....	3	6	8	5
Kentucky.....	3	2½ ²	2½ ²	-½
Louisiana.....	8	8	8	0
Maine.....	5	6	8	3
Maryland.....	0	6	6	6
Massachusetts.....	5	6	8	3
Michigan.....	3	7	7	4
Minnesota.....	4	8	8	4
Mississippi.....	5	9	9	4
Missouri.....	2	4	4	2
Montana.....	4	8	8	4
Nebraska.....	3	6	8	5
Nevada.....	3	7	7	4
New Hampshire.....	3	(³)	(⁴)	(¹)
New Jersey.....	5	8	8	3
New Mexico.....	5	8	8	3
New York.....	3	5	10	7
North Carolina.....	0	0	0	0
North Dakota.....	6	7	8	2
Ohio.....	3	5	5	2
Oklahoma.....	5	7	8	3
Oregon.....	0	0	0	0
Pennsylvania.....	5	8	8	3
Rhode Island.....	3	8	8	5
South Carolina.....	3	5	5	2
South Dakota.....	3¼ ⁴	6	8	4¾
Tennessee.....	5	7	7	2
Texas.....	5	8	11	6
Utah.....	4	8	8	4
Vermont.....	4	8	10	6
Virginia.....	0	3	3	3
Washington.....	5	7	11	6
West Virginia.....	5	6	6	1
Wisconsin.....	4	8	10	6
Wyoming.....	2	4	4	2

¹ Not available.² 20 percent of wholesale price.³ 15 percent of retail price.⁴ 40 percent of wholesale price.⁵ 21 percent of retail price.

Source: The Tax Foundation, "Facts and Figures on Government Finance," 9th edition, 1956-57, New York, 1956, p. 160 and 13th edition, 1964-65, New York 1965, p. 196. James C. Daugherty, "Effect of Taxes on the CPI," Monthly Labor Review, February 1966, p. 183.

TABLE E-9.—WPI Commodity groups: Relative proportion of goods bought by final consumers, December 1960 (1958 weights)

Code	Commodity	Bought by final consumer, percent in total WPI		Percent in CPI, December 1963 new series
		No	Yes	
01	Farm products.....	8.749	1.840	2.340
01-11	Fresh fruits.....	.159	.372	.760
01-12	Dried fruits.....	.020	.060	.....
01-13	Fresh and dried vegetables.....	.129	.389	.940
01-2	Grains.....	1.479	.....	.....
01-3	Livestock and poultry.....	3.741	.....	.....
01-4	Plant and animal fibers.....	.686	.....	.....
01-5	Milk for fluid use.....	.408	.480	.....
01-52	Milk for manufacturing use.....	.626	.....	.....
01-6	Eggs.....	.080	.539	.640
01-7	Hay, hayseeds, etc.....	.631	.....	.....
01-81	Green coffee, tea, etc.....	.352	.....	.....
01-82	Leaf tobacco.....	.438	.....	.....
02	Processed foods.....	2.495	11.543	15.350
02-11	Bread and other bakery products.....	.....	1.380	1.650
02-12	Flour.....	.311	.255	.200
02-13	Cereal preparations.....	.....	.227	.800
02-14	Rice.....	.019	.059	.200
02-21	Meats.....	.213	3.331	4.450
02-22	Processed poultry.....	.033	.642	.730
02-23	Unprocessed fin fish.....	.042	.062	.....
02-24	Fresh processed fish.....	.....	.081	.230
02-25	Frozen processed fish.....	.....	.084	.....
02-26	Canned fish.....	.....	.155	.220
02-3	Dairy products and ice cream.....	.388	2.200	2.800
02-41	Canned fruits and juices.....	.....	.344	.400
02-42	Frozen fruits and juices.....	.049	.057	.260
02-43	Canned vegetables and soups.....	.....	.632	1.110
02-44	Frozen vegetables.....	.....	.111	.420
02-5	Sugar and confectionery.....	.802	.534	.480
02-6	Packaged beverage material.....	.....	.625	.700
02-71	Animal fats and oils.....	.031	.072	.....
02-72	Crude vegetable oils.....	.139	.....	.....
02-73	Refined vegetable oils.....	.091	.010	.....
02-74	Vegetable oil end products.....	.071	.282	.400
02-81	Jams, jellies, preserves.....	.013	.052	.160
02-82	Pickles and pickle products.....	.....	.085	.140
02-83	Processed eggs.....	.050	.....	.....
02-84	Miscellaneous processed foods.....	.241	.563	.....
03	Textile products and apparel.....	3.141	4.613	7.416
03-11	Cotton yarns.....	.229	.....	.....
03-12	Cotton broadwoven goods.....	1.002	.235	.....
03-13	Cotton narrow fabrics.....	.056	.....	.....
03-14	Cotton thread.....	.032	.019	.....
03-15	Cotton housefurnishings.....	.....	.421	.610
03-21	Wool tops.....	.031	.....	.....
03-22	Wool yarns.....	.095	.....	.....
03-23	Wool blankets.....	.....	.009	.....
03-24	Wool broadwoven goods.....	.272	.014	.....
03-25	Knit outerwear fabrics.....	.010	.001	.....
03-31	Filament yarns and fabrics.....	.468	.....	.....
03-32	Spun rayon.....	.069	.....	.....
03-33	Manmade fiber broadwoven.....	.578	.135	.....
03-34	Knit goods.....	.082	.....	.....
03-35	Narrow fabrics.....	.042	.....	.....
03-36	Manmade fiber blankets (not in index December 1960).....	.....	.....	.....
03-4	Silk products.....	.019	.....	.....
03-5	Apparel.....	.....	3.758	6.806
03-61	Burlap.....	.085	.....	.....
03-62	Other products.....	.071	.....	.....
03-7	Plastic housefurnishings.....	.....	.021	.....
04	Hides, skins, leather, and leather products.....	.443	.989	1.630
04-1	Hides and skins.....	.110	.....	.....
04-2	Leather.....	.234	.....	.....
04-3	Footwear.....	.....	.769	1.510
04-41	Luggage and small goods.....	.....	.198	.....
04-42	Gloves.....	.....	.022	.120
04-43	Industrial belting.....	.028	.....	.....
04-44	Cut soles.....	.071	.....	.....

TABLE E-9.—WPI Commodity groups: Relative proportion of goods bought by final consumers, December 1960 (1958 weights)—Continued

Code	Commodity	Bought by final consumer, percent in total WPI		Percent in CPI, De- cember 1963 new series
		No	Yes	
05	Fuels and related products and power.....	4.609	3.261	5.820
05-11	Anthracite.....	.024	.035	.060
05-12	Bituminous coal.....	.392	.098	
05-2	Coke.....	.069		
05-3	Gas fuels.....	.353	.354	1.300
05-4	Electric power.....	1.065	.574	1.410
05-61	Crude petroleum.....	.778		
05-71	Gasoline.....	1.121	1.371	3.050
05-72	Light distillate.....	.063	.140	
05-73	Middle distillate.....		.678	
05-74	Residual fuels.....	.405		
05-75	Lubricating oil materials.....	.309		
05-77	Petroleum wax.....	.030	.011	
06	Chemicals and allied products.....	4.929	1.714	3.970
06-11	Inorganic chemicals.....	.869		
06-12	Organic chemicals.....	1.412	.074	
06-13	Essential oils.....	.024		
06-21	Prepared paint.....	.291	.015	.330
06-22	Paint materials.....	.564		
06-31	Drug and pharmaceutical materials.....	.123		
06-35	Pharmaceutical preparations, ethical.....		.540	.640
06-36	Pharmaceutical preparations, proprietary.....		.235	.500
06-4	Fats and oils, inedible.....	.122		
06-5	Mixed fertilizer.....	.218	.011	
06-6	Fertilizer materials.....	.256		
06-71	Soap and synthetic detergents.....	.169	.396	.800
06-72	Explosives.....	.065		
06-73	Plastic materials.....	.678		
06-74	Photographic materials.....	.138	.092	.180
06-75	Cosmetics, etc.....		.351	1.520
07	Rubber and rubber products.....	1.089	.341	.720
07-11	Natural rubber.....	.079		
07-12	Synthetic rubber.....	.142		
07-13	Reclaimed rubber.....	.015		
07-21	Tires.....	.337	.181	.720
07-22	Tubes.....	.021	.011	
07-31	Footwear.....		.077	.014
07-32	Rubber heels and soles.....	.042		
07-33	Rubber belts and belting.....	.046		
07-34	Other rubber products.....	.407	.072	
08	Lumber and wood products.....	2.562	.035	
08-1	Lumber.....	1.493		
08-2	Millwork.....	.662	.035	
08-3	Plywood.....	.407		
09	Pulp, paper, and allied products.....	4.555	.305	.480
09-1	Woodpulp.....	.229		
09-2	Wastepaper.....	.090		
09-3	Paper, except newsprint.....	1.276		
09-4	Paperboard.....	.445		
09-51	Sanitary papers, etc.....	.081	.242	.300
09-52	Paper bags and sacks.....	.422		
09-53	Paper boxes, etc.....	1.451		
09-54	Packaging accessories.....	.135		
09-55	Games, toys, etc.....		.063	.180
09-56	Office supplies.....	.252		
09-58	Composite cans (not in index 12/60).....			
09-6	Building paper and board.....	.174		
10	Metals and metal products.....	12.674	.152	
10-11	Iron ore.....	.057		
10-12	Iron and steel scrap.....	.217		
10-13	Semifinished steel.....	.202		
10-14	Finished steel.....	3.268		
10-15	Foundry and forge shop products.....	.789		
10-16	Pig iron and ferroalloys.....	.195		
10-22	Primary metal shapes.....	.747		
10-23	Nonferrous scrap.....	.219		
10-24	Secondary metal.....	.308		

TABLE E-9.—WPI Commodity groups: Relative proportion of goods bought by final consumers, December 1960 (1958 weights)—Continued

Code	Commodity	Bought by final consumer, percent in total WPI		Percent in CPI, De- cember 1963 new series
		No	Yes	
10	Metals and metal products—Continued			
10-25	Mill shapes.....	.921		
10-26	Wire and cable.....	.598		
10-3	Metal containers.....	.618		
10-41	Hardware, n.e.c.....	.354	.037	
10-42	Hand tools.....	.121	.030	
10-51	Enameled iron fixtures.....	.039		
10-52	Vitreous china fixtures.....	.043		
10-53	Enameled steel fixtures.....	.023		
10-54	Brass fittings.....	.070	.018	
10-6	Heating equipment.....	.308		
10-71	Metal doors, sash, and trim.....	.274		
10-72	Metal tanks.....	.500		
10-73	Sheet metal products.....	.320	.010	
10-74	Structural metal products.....	.829		
10-81	Bolts, nuts, screws.....	.336		
10-82	Miscellaneous fabricated metal products.....	1.093	.057	
10-83	Lighting fixtures.....	.245		
11	Machinery and motive products.....	14.329	3.244	2.550
11-11	Farm and garden tractors.....	.274	.014	
11-12	Agricultural machinery, except tractors.....	.417	.036	
11-13	Agricultural equipment.....	.088		
11-21	Power cranes, etc.....	.131		
11-22	Construction machinery for mounting.....	.115		
11-23	Specialized construction machinery.....	.112		
11-24	Portable air compressors.....	.028		
11-25	Scrapers and graders.....	.058		
11-27	Mixers, pavers, etc.....	.054		
11-28	Tractors, other than farm.....	.296		
11-29	Off highway vehicles.....	.020		
11-31	Machine tools.....	.352		
11-32	Machine tools, home.....		.008	
11-33	Metalworking presses.....	.199		
11-34	Power driven hand tools.....	.109	.019	
11-35	Other metalworking machinery.....	.174		
11-36	Small cutting tools.....	.276		
11-37	Precision measuring tools.....	.040		
11-41	Pumps, compressors.....	.261		
11-42	Elevators and escalators.....	.066		
11-43	Industrial process furnaces.....	.088		
11-44	Industrial material handling equipment.....	.311		
11-45	Mechanical power transmission equipment.....	.226		
11-46	Industrial scales.....	.018		
11-47	Fans and blowers.....	.102		
11-48	Abrasive products.....	.184		
11-49	Valves and fittings.....	.719		
11-51	Oil field machinery.....	.196		
11-52	Mining machinery.....	.127		
11-53	Office and store machines.....	.624		
11-54	Internal combustion engines.....	.388		
11-6	Special industry machinery.....	1.390		
11-71	Wiring devices.....	.453		
11-72	Integrating and measuring instruments.....	.340		
11-73	Motors and generators.....	.952		
11-74	Transformers and regulators.....	.425		
11-75	Switchgear.....	.717		
11-76	Electric welding machines.....	.130		
11-77	Electric lamps.....	.182	.122	
11-78	Batteries.....	.068	.204	
11-79	Miscellaneous electrical machinery.....	.991	.098	
11-81	Passenger cars.....	.970	2.263	2.550
11-82	Motor trucks.....	.710		
11-83	Motor coaches.....	.053		
11-84	Auto parts.....	.563	.480	
11-97	Transportation equipment.....	.332		
12	Furniture and other household durables.....	1.012	2.989	6.540
12-11	Metal household furniture.....	.051	.062	
12-12	Wood household furniture.....	.066	.266	.890
12-13	Upholstered household furniture.....	.030	.267	.330
12-14	Bedding.....	.008	.144	.110
12-15	Porch and lawn furniture.....	.018	.023	.110
12-21	Wood commercial furniture.....	.119		
12-22	Metal commercial furniture.....	.276		
12-31	Soft surface floor covering.....	.048	.190	.340

TABLE E-9.—WPI Commodity groups: Relative proportion of goods bought by final consumers, December 1960 (1958 weights)—Continued

Code	Commodity	Bought by final consumer, percent in total WPI		Percent in CPI, De- cember 1963 new series
		No	Yes	
12	Furniture and other household durables—Con.			
12-32	Hard surface floor covering.....	.036	.109	.140
12-4	Household appliances.....		.978	1.360
12-5	Television, radio, and phonographs.....		.487	2.960
12-61	Dinnerware.....		.124	.100
12-62	Household glassware.....		.064	
12-63	Glass containers.....	.292		
12-64	Silverware and plated ware.....	.007	.065	.100
12-65	Mirrors.....		.033	
12-66	Lawnmowers.....		.076	.100
12-67	Cutlery.....	.013	.052	
12-68	Metal household containers.....	.048	.049	
13	Nonmetallic mineral products.....	2.865	0	
13-1	Flat glass.....	.244		
13-2	Concrete ingredients.....	.719		
13-3	Concrete products.....	.908		
13-4	Structural clay products.....	.343		
13-5	Gypsum products.....	.126		
13-6	Prepared asphalt roofing.....	.136		
13-7	Other nonmetallic minerals.....	.389		
14	Tobacco manufacturers and bottled beverages.....	0	2.473	4.840
14-1	Tobacco products.....		.955	1.890
14-4	Alcoholic beverages.....		1.038	2.640
14-5	Nonalcoholic beverages.....		.480	.310
15	Miscellaneous products.....	1.577	1.472	1.360
15-11	Toys.....		.212	.180
15-12	Sporting and athletic goods.....	.060	.140	.180
15-13	Small arms and ammunition.....	.006	.052	
15-21	Grain byproduct feeds.....	.529		
15-23	Vegetable cake and meal feeds.....	.506		
15-24	Formula foods (not in index December 1960)			
15-25	Miscellaneous foodstuffs.....	.284	.284	
15-31	Buttons and button blanks.....	.025	.004	
15-32	Pins, fasteners, etc.....	.065	.011	
15-41	Jewelry.....		.245	.120
15-42	Pens and pencils.....		.066	
15-43	Watches and clocks.....		.126	.240
15-44	Photographic equipment.....	.068	.069	.180
15-51	Caskets.....		.069	.280
15-52	Matches.....		.019	
15-53	Musical instruments.....	.008	.074	
15-54	Brushes.....	.013	.054	
15-55	Phonograph records.....		.047	.180
15-56	Fire extinguishers.....	.013		
	Grand total.....	65.029	34.971	53.030

Source: U.S. Department of Labor, Bureau of Labor Statistics, Washington, D.C., September 1965.

TABLE 10.—Weights and December 1964 and year 1964 price indexes for goods in common in the Wholesale and Consumer Price Indexes

	Weights (percent of total)		December 1964 (1957-59=100)		1964 (1957-59=100)	
	WPI	CPI	WPI	CPI	WPI	CPI
All foods.....	^a 15.786	22.430	^a 100.1	106.9	^a 100.8	106.4
Fruits and vegetables.....	^b 2.222	3.020	^b 100.4	114.5	^b 104.1	115.3
Fresh and dried fruits.....	^c .611	.760	^c 90.1	N.A.	^c 107.3	N.A.
Apples.....	.139	.170	96.3	100.9	101.3	116.8
Bananas.....	.078	.150	^d 72.7	^d 98.6	^d 98.1	^d 103.7
Grapefruit, Florida.....	.022	.050	119.6	131.7	133.9	150.7
Oranges.....	^e .114	.200	^e 101.5	134.4	^e 123.7	134.2
Grapes.....	.028	.050	87.0	N.A.	99.0	125.2
Strawberries.....	.029	.050	N.A.	N.A.	91.1	122.7
In common.....	.410	.670	^f 99.1	^f 120.5	^f 110.0	^f 128.1
Fresh and dried vegetables.....	.518	.940	108.9	N.A.	99.9	N.A.
Cabbage.....	.018	.050	127.2	126.1	101.1	124.8
Carrots.....	.034	.050	113.7	104.4	94.0	101.3
Celery.....	.020	.050	84.5	104.1	106.2	105.3
Lettuce.....	.062	.160	115.4	136.1	105.5	114.4
Onions.....	.023	.050	96.1	107.5	88.3	109.4
Potatoes.....	.142	.240	^g 168.2	^g 130.1	^g 134.9	^g 122.1
Tomatoes.....	.077	.140	84.5	140.0	96.2	109.3
In common.....	.376	.740	^h 101.3	^h 127.0	^h 99.0	^h 111.3
Canned and frozen fruits and vegetables.....	1.093	1.320	101.9	108.5		
Fruit cocktail.....	.038	.130	88.1	99.2		
Orange juice concentrate.....	.079	.130	133.1	128.1		
Canned peas.....	.051	.130	115.7	109.1		
Tomatoes.....	.042	.130	96.3	102.3		
In common.....	.210	.520	113.0	109.7		
Cereal and bakery products.....	2.251	2.450	108.2	111.0		
Bread.....	.977	.600	108.8	115.1		
Cookies.....	.264	.200	99.7	100.1		
Flour.....	.566	.200	113.4	108.9		
Cornflakes.....	.040	.200	N.A.	119.4		
Rice.....	.078	.200	95.1	106.5		
In common.....	1.925	1.400	ⁱ 108.3	ⁱ 110.1		
Processed poultry.....	.577	.730	84.9	87.9		
Broilers or fryers.....	.388	.510	82.2	88.3		
In common.....	.388	.510	82.2	88.3		
Dairy products.....	2.588	2.800	108.9	105.6	107.8	104.7
Milk.....	1.304	1.530	111.7	105.3	111.2	104.5
Butter.....	^j .266	.250	^j 99.9	104.3	^j 100.3	102.0
Ice cream.....	^k .404	.250	^k 101.1	95.2	^k 101.6	96.2
Milk (whole—evaporated).....	.117	.250	101.3	104.5	98.2	102.9
In common.....	2.091	2.280	107.6	104.0	107.2	101.3
Packaged beverages.....	.525	1.010	98.2	^l 103.4		
Coffee.....	.351	.400	98.4	96.2		
Tea bags.....	.020	.150	102.2	102.0		
Coffee, instant.....	.105	.150	^m 126.2	^m 115.8		
In common.....	.476	.700	ⁿ 98.6	ⁿ 97.8		
Meats.....	3.544	4.450	86.7	99.0	89.0	99.4
Beef.....	^o 1.520	^o 2.210	^o 86.6	^o 102.9	^o 88.8	^o 101.9
Bacon.....	.180	.300	75.9	94.1	78.0	93.6
Frankfurters.....	.231	.160	^p 92.5	^p 102.8	^p 93.6	^p 102.5
Veal, choice.....	.133		108.6		109.0	
Veal cutlets.....		.170		116.0		116.5
Pork loins, fresh.....	.618			^q 103.5		^q 104.7
Loin roast.....		.160	^r 93.7		^r 104.8	
In common.....	2.682	3.000	^r 87.1	102.7	^s 91.4	101.9

See footnotes at end of table, pp. 126 and 127.

TABLE 10.—Weights and December 1964 and year 1964 price indexes for goods in common in the Wholesale and Consumer Price Indexes—Continued

	Weights (percent of total)		December 1964 (1957-59=100)		1964 (1957-59=100)	
	WPI	CPI	WPI	CPI	WPI	CPI
Fish.....	.424	.450	108.4	108.7	106.8	107.4
Canned tuna fish.....	.059	.110	102.6	102.9	102.7	101.7
Fish, fresh or frozen.....	.047	.110	99.0	114.6	94.4	114.7
In common.....	.106	.220	101.0	108.7	99.0	108.2
Sugar and confectionery.....	1.336	.640	107.1	113.4		
Sugar.....	.716	.160	105.2	106.6		
Candy bar.....	.105	.160	101.3	105.5		
In common.....	.821	.320	104.6	106.0		
Other foods:						
Eggs.....	.619	.640	86.2	94.9		
Margarine.....	.103	.150	101.3	97.2		
Jelly.....	.022	.160	108.9	115.4		
In common.....	.744	.950	89.0	106.0		
Total food in common.....	10.229	11.310				

	Weights (percent of total)		December 1964 (1957-59=100)	
	WPI	CPI	WPI	CPI
Fuel and utilities.....	7.870	5.260	99.1	107.9
Anthracite.....	.059	.060	99.8	(u)
Natural gas.....	.608	1.300	133.4	114.6
Fuel oil.....	.358	.670	89.7	103.2
Electric power.....	.781	1.410	99.7	102.8
In common.....	1.808	3.440		
Textile housefurnishings.....	.421	.610	102.8	102.4
Sheets.....	.082	.100	105.3	105.5
Bedspread.....	.068	.100	97.4	105.1
In common.....	2.228	.200	101.7	105.3
Floor coverings.....	.383	.480	99.0	102.1
Soft surface floor coverings.....	.238	.340	96.8	101.4
Household furniture:				
Sofa bed.....	.054	.110	102.8	102.1
Bed, dresser, chest.....	.180	.280	109.0	99.3
In common.....	.234	.390	107.6	100.0
Household appliances.....	1.003	1.360	90.6	89.4
Ranges.....	.104	.150	102.7	94.8
Washing machine (automatic).....	.148	.150	92.5	87.6
Vacuum cleaner.....	.049	.150	84.8	81.0
Refrigerator.....	.090	.280	85.1	88.1
In common.....	.391	.730	92.5	87.9
Other housefurnishings: Dish sets.....	.124	.100	103.5	114.6
Housekeeping supplies.....		1.550		
Soaps and detergents.....	.335	.260	99.2	100.9
Paper napkins.....	.024	.260	102.9	106.7
Toilet tissue.....	.124	.260	101.9	102.6
In common.....	.533	.780	100.0	103.4

See footnotes at end of table, pp. 126 and 127.

TABLE 10.—Weights and December 1964 and year 1964 price indexes for goods in common in the Wholesale and Consumer Price Indexes—Continued

	Weights (percent of total)		December 1964 (1957-59=100)	
	WPI	CPI	WPI	CPI
Men's and boys' apparel.....	bb 1.420	2.860	bb 107.5	107.1
Suit (better, medium, and popular).....	.163	.360	113.4	116.8
Topcoat.....	.053	.154	104.4	117.2
Trousers (men's wool or blend).....	.049	.154	103.8	105.1
Trousers (men's rayons).....	.068	.154	96.5	94.6
Shirts (men's branded and unbranded).....	.074	.154	104.0	109.2
Shirts, sport.....	.099	.154	106.5	N.A.
Work trousers.....	.074	.154	102.4	102.6
Work shirt.....	.031	.154	102.9	107.2
Dungarees (boys').....	.038	.160	107.0	104.9
Cotton hose (or cotton argyle).....	.060	.154	N.A.	101.2
T-shirt (men's).....	.025	.154	104.3	107.3
In common.....	.734	1.906	105.7	108.4
Women's and girls' apparel.....	cc 2.281	4.080	cc 101.8	103.3
Dress, rayon.....	.496	.500	100.0	105.8
Housedress, cotton.....	.059	.121	101.4	106.2
Coat, untrimmed.....	.145	.280	108.5	107.7
Girdle.....	.080	.121	100.0	103.0
Blouse, cotton.....	.127	.121	dd 100.0	102.4
Anklet.....	.014	.121	99.0	100.4
Nylon hosiery.....	.072	.390	ee 96.1	ee 99.1
Slip, nylon.....	.086	.121	93.3	102.6
Dress, popular girls.....	.136	.094	99.7	120.6
Coat, girl's.....	.083	.094	101.5	99.7
In common.....	1.298	1.863	100.4	104.3
Men's and boys' footwear.....	.278	.400	110.8	-----
Oxford.....	ff 204	.260	ff 110.6	110.6
Work shoes.....	.061	.140	109.8	107.6
In common.....	.265	.400	110.6	109.5
Women's, misses' footwear.....	.491	-----	-----	-----
Pump.....	gg 277	.260	gg 108.5	114.7
Children's shoes.....	.055	.140	105.2	107.1
In common.....	.332	.400	107.9	112.0
Transportation:	-----	-----	-----	-----
Autos, passenger cars.....	3.233	2.550	98.5	101.6
Tires, passenger cars.....	.283	.360	86.4	97.6
Gasoline.....	2.492	3.050	92.7	102.4
Motor oil.....	hh 309	.230	hh 113.6	116.6
In common.....	6.317	6.190	96.4	102.3
Toilet goods.....	ii 438	ii 1.520	ii 107.3	ii 103.0
Toothpaste.....	.079	.190	102.9	99.4
Toilet soap.....	.087	.190	114.6	110.4
Shaving cream.....	.022	.190	102.2	99.4
Face powder.....	.038	.190	117.0	114.2
In common.....	.226	.760	109.7	105.8
Television, radio receivers, and phonographs.....	.487	-----	86.6	-----
Radio.....	.071	.180	74.5	87.5
Television.....	.259	.630	90.0	89.5
In common.....	.330	.810	86.7	89.0
Tobacco products.....	.955	1.890	ii 104.4	ii 115.2
Cigarettes.....	.751	1.740	ii 104.1	ii 116.1
Cigars.....	.129	.150	ii 99.8	ii 101.2
In common.....	.880	1.890	ii 103.5	ii 114.9

See footnotes at end of table, pp. 126 and 127.

TABLE 10.—Weights and December 1964 and year 1964 price indexes for goods in common in the Wholesale and Consumer Price Indexes—Continued

	Weight (percent of total)		December 1964 (1957-59=100)	
	WPI	CPI	WPI	CPI
Nonalcoholic beverage.....	.480	1.010	123.1	125.3
Cola drink.....	.427	.150	129.6	125.3
Alcoholic beverage.....	1.038	2.640	100.5	104.9
Beer.....	.674	1.060	100.8	104.8
Whiskey.....	.268	1.780	97.2	104.9
In common.....	.942	1.840	99.8	104.8
Total, in common.....	25.534	33.499		

- N.A. =Not available.
- * Represents a weighted average of processed foods, fresh and dried fruits and vegetables, and eggs.
 - † Fruits and vegetables consist of fresh and dried fruits and vegetables and canned and frozen foods in the Wholesale Price Index. Annual average and December 1964 figures represent a weighted average.
 - ‡ Fresh and dried fruits represent a weighted average.
 - § December 1962=100.
 - ¶ Weighted average in Wholesale Price Index.
 - // Represents a weighted average for December 1964 and year 1964. Complete data were not available for bananas and strawberries; consequently, these figures were excluded in constructing a weighted average for December 1964. However, an annual average for strawberries was available so that the weighted average for the year 1964 excluded only bananas in the Consumer Price Index. The weighted average for December 1964 consisted of apples, grapefruits, and oranges. Bananas, grapes, and strawberries were not available for December 1964.
 - 1 January 1931=100.
 - 2 Weighted average. Excludes potatoes for both Consumer Price Index and Wholesale Price Index.
 - 3 Represents a weighted average excluding cornflakes.
 - 4 Butter in Wholesale Price Index is a weighted average, consisting of butter grade A and AA, New York; butter grade A and AA, Chicago; butter grade A and AA, San Francisco.
 - 5 Ice cream in Wholesale Price Index is a weighted average figure consisting of ice cream bulk and ice cream pint package.
 - 6 Represents the price in Consumer Price Index for nonalcoholic beverages which was matched with packaged beverage materials in Wholesale Price Index.
 - 7 July 1961=100.
 - 8 Represents weighted averages figure excluding instant coffee in Consumer Price Index and Wholesale Price Index.
 - 9 Beef prices in the Wholesale Price Index represent a weighted average figure consisting of beef Prime, beef Choice, beef Utility, beef Standard, beef Good which correspondingly match steak round, steak sirloin, rib roast, chuck roast, and hamburger in the Consumer Price Index.
 - 10 January 1960=100.
 - 11 April 1960=100.
 - 12 Weighted average. Excludes frankfurters and loin roast.
 - 13 Includes unprocessed fin fish, fresh processed fish, frozen processed fish, canned fish; December and annual figures are weighted averages.
 - 14 Fish, fresh or frozen consists of weighted average of fresh haddock and frozen flounder, haddock and ocean perch for December 1964 and year 1964.
 - 15 No specific index in the Consumers Price Index that shows anthracite coal separately.
 - 16 March 1958=100.
 - 17 Fuel oil includes New York No. 2 and Gulf Coast No. 2 middle distillate.
 - 18 Electricity in the Consumer Price Index is compared to commercial power in the Wholesale Price Index. The base is March 1953=100.
 - 19 In the Wholesale Price Index sheet type 180 is available on January 1960=100 base and is therefore excluded.
 - 20 Represents a weighted average consisting of a bed, dresser, and chest in the Wholesale Price Index which is matched to bedroom suite in the Consumer Price Index.
 - 21 Represents a weighted average consisting of laundry bars white, detergent, heavy duty, powdered or granulated and detergent, light duty, powdered or granulated and detergent, light duty, liquid.
 - 22 Includes men's and boys' apparel. Hosiery (hose, men's cotton argyle, unbranded, stretch nylon and half hose, men's cotton), underwear and nightwear (union suit, men's; undershirt, men's; T-shirt, men's; shorts, men's knit, shirts, men's woven), knit outerwear (polo shirts, men's and boys).
 - 23 Includes women's, misses, and juniors apparel. Hosiery (nylon, 60 G/15 D branded and unbranded, women's seamless, and women's and children's cotton anklets), infants' and children's apparel, underwear and nightwear (panties, warp and circular knit, nylon slip) and knit outerwear (sweater, women's).
 - 24 Cotton blouse (January 1961=100) recorded no change since its inclusion in the index.
 - 25 In the Consumer Price Index, hose, nylon, full fashioned and seamless is matched with nylon, women's seamless branded in the Wholesale Price Index.
 - 26 Represents a weighted average consisting of Oxford, Goodyear, Elk/hide upper, Goodyear calf upper and Goodyear kid upper in the Wholesale Price Index.
 - 27 Represents a weighted average consisting of pump, cemented, calf upper, cemented kid upper, medium quality and cemented kid, low medium quality.
 - 28 Lubricating and materials group.
 - 29 Toilet goods in the Consumer Price Index is matched to cosmetics and other toilet preparations and toilet soap in the Wholesale Price Index.

March 1959=100.

** Weight in Consumer Price Index includes whiskey and wine. 1964 price represents whiskey only.

Note.—BLS does not report weights for each individual item for which it obtains prices. Rather, it reports weights separately only for "the most important items" which "were selected with certainty." BLS reports "the remaining weight of each expenditure class is shared equally by the probability items." (Consumer Price Index, New Series). Relative Importance of Major Groups, Subgroups and Individual Items, December 1963 and Comparison with Old Series. (Undated but apparently 1964.) Thus, for example, the weight shown for bakery products is 1.65 percent of the total with 0.60 assigned to white bread; 4 items (cookies, whole wheat bread, layer cake and sweet rolls) are shown to have an aggregate weight of 1.05 percent. For these latter items the 1.05 percent was distributed equally among the 4 items each of which was given a rounded out weight of 0.26.

The subgroup indexes for items in common have been derived by using the December 1960 weights for the Wholesale Price Index and the December 1963 weights for the Consumer Price Index. This procedure undoubtedly introduces some error into the weighted index. The relative weights as of December 1964 or the year 1964 would vary from those listed because the individual indexes have had different rates of change. The error would be greatest where wide fluctuations in prices have taken place within a group. For example, for canned and frozen fruits and vegetables price changes varied from a decline of 11.9 percent for fruit cocktail to a rise of 33.1 percent for orange juice concentrate; the relative weight for fruit cocktail would, therefore, be lower as of December 1964 while that for orange juice would be higher than in December 1960. However, this limitation does not apply to the comparisons of changes in the specific wholesale and retail prices which are listed on the table. Moreover, since the weights in the Consumer Price Index are as of December 1963, the magnitude of any error generally would be very small in a period of one year (December 1964) or less (average for 1964). A somewhat larger error would be possible in the Wholesale Price Index subgroup indexes. BLS describes the method of weighting it recommends in U.S. Department of Labor, Bureau of Labor Statistics, "Wholesale, Prices and Price Indexes, 1954-56," *Bulletin No. 1214*, September 1957, pp. 12-14.

Source: U.S. Department of Labor Bureau of Labor Statistics.

1958	1.9	2.3	4.7	1.3	2.1	1.8	.5	1.1	1.6	2.0	2.5	2.2	1.4						
1959	1.9	2.2	4.4	1.2	1.9	1.7	.5	1.0	1.4	1.6	1.9	1.5	.8	0.2					
1960	1.8	2.1	4.2	1.1	1.7	1.5	.5	.9	1.2	1.4	1.6	1.1	.6	.1	0.1				
1961	1.7	2.1	4.0	1.0	1.5	1.3	.4	.7	1.0	1.1	1.2	.8	.3	(1)	-1	-0.4			
1962	1.7	2.0	3.8	1.0	1.4	1.2	.4	.7	.9	1.0	1.1	.7	.3	(1)	(1)	0.3			
1963	1.6	1.9	3.7	.9	1.3	1.1	.3	.6	.8	.9	.9	.6	.2	(1)	(1)	-0.1	-0.3		
1964	1.6	1.9	3.5	.8	1.2	1.1	.3	.6	.7	.8	.8	.5	.2	(1)	(1)	(1)	(1)	0.2	

IMPLICIT PRICE INDEX

1926																			
1929	-0.5																		
1939	-1.3	-1.6																	
1948	2.0	2.4	7.0																
1949	1.9	2.3	6.2	-0.6															
1950	1.9	2.2	5.8	.4	1.4														
1951	2.1	2.4	5.9	2.5	4.0	0.7													
1952	2.1	2.4	5.6	2.4	3.4	4.5	2.2												
1953	2.0	2.3	5.2	2.1	2.8	3.3	1.6	0.9											
1954	2.0	2.3	5.0	2.0	2.5	2.8	1.5	1.2	1.5										
1955	2.0	2.3	4.8	1.9	2.3	2.5	1.5	1.3	1.5	1.5									
1956	2.0	2.3	4.7	2.1	2.5	2.7	1.9	1.8	2.1	2.4	3.4								
1957	2.1	2.4	4.6	2.3	2.7	2.8	2.2	2.2	2.5	2.9	3.6	3.7							
1958	2.1	2.4	4.5	2.3	2.6	2.8	2.2	2.3	2.5	2.8	3.2	3.1	2.6						
1959	2.1	2.3	4.4	2.2	2.5	2.7	2.2	2.2	2.4	2.5	2.8	2.6	2.1	1.6					
1960	2.1	2.3	4.2	2.2	2.5	2.6	2.1	2.1	2.3	2.4	2.6	2.4	1.9	1.6	1.7				
1961	2.1	2.3	4.1	2.1	2.4	2.4	2.0	2.0	2.1	2.2	2.4	2.2	1.8	1.5	1.5	1.3			
1962	2.0	2.3	4.0	2.1	2.3	2.3	1.9	1.9	2.0	2.1	2.2	2.0	1.6	1.4	1.3	1.2	1.1		
1963	2.0	2.2	3.9	2.0	2.2	2.2	1.9	1.9	1.9	2.0	2.1	1.9	1.6	1.4	1.3	1.2	1.2	1.3	
1964	2.0	2.2	3.8	2.0	2.2	2.2	1.9	1.8	1.9	2.0	2.0	1.9	1.6	1.4	1.3	1.3	1.4	1.5	1.7

¹ Less than ±0.1 percent.

NOTE.—The average annual changes shown above were calculated by the compound interest method: $A=P+(1+r)^n$ where A =terminal year; P =initial year; n =number of years minus 1; r =rate of growth.

How to use this table: The annual change for any period covered by the table may be

determined by selecting the appropriate initial year at the top of the table and the desired terminal year in the column at the left. Follow the vertical column below the initial year to the point where the figure intersects the selected terminal year. This figure is the compounded annual change from the initial year to the terminal year. For example, from 1926 to 1964 the average annual change in prices was 1.5 percent as shown by the CPI, 1.6 percent as shown by the WPI, and 2 percent as shown by the IPI.