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CHAPTER II

Pre-War Changes in Commodity Prices

THE flow of physical goods must for many purposes be viewed as a stream of pecuniary values. In this form it is amenable to the operations of business, for only as a pecuniary flow can the stream be divided, apportioned and regulated as the interests of business require. But this value stream is not an exact counterpart of the stream of physical quantities. It has variations, sinkings and risings of its own. Changes in the fortunes of producers and consumers cannot be understood without a knowledge of the movements of both streams—of commodities and of values. Prices are the link between goods and values, and shifting prices may constitute elements of economic change as important as are alterations in physical volume.

In tracing price movements over a period those general changes which reflect alterations in the purchasing power of monetary units are of obvious interest. But the story of price movements should go beyond these. Perhaps of greater immediate importance are the inequalities of price movements which alter the terms of exchange among different industrial groups. The general dispersion of prices resulting from such unequal changes may be studied as a problem in itself. In more concrete form, these shifts may be examined with reference to the fortunes of specific economic groups. A pronounced rise in the prices of one class of commodities, such as manufactured goods or agricultural products, a rise not shared by other groups, will materially affect economic processes. Such an alteration in the terms of exchange among economic groups may occur as a result of a sharp price movement or as a result of persistent secular tendencies. In either case the effect may endure for years. These shifting relations, measured in the abstract by index numbers of dispersion and manifest in concrete form in the varying movements of commodity prices in different groups, are matters of concern in a survey of price movements during a given economic era.

The fortunes of certain groups are of particular interest in such a survey. Are products of cultivation rising in value, in relation to other commodities? Are raw materials becoming higher priced, relatively, while the prices of products of manufacture decline? Are goods destined for human consumption rising or falling in price, in relation to goods entering into the capital equipment of the economy? What industries are marked by the falling prices of their products, and what by rising prices? If persistent and differing tendencies in the price movements of major commodity groups are discernible, light will be thrown on important aspects of our economic development.

These price movements must be studied with reference to the production tendencies discussed in the preceding chapter. It is of interest to know whether, over a period of years, there is a consistent relation between price trends and production trends. Again, questions of stability must concern us in this study. In what industrial groups are prices most stable? least stable? To what extent are unstable prices associated with unstable production? Finally, there are questions of cost to be considered. Our information concerning costs of production falls short of what might be desired, but it has been possible to measure movements of certain important cost elements for products of manufacture. Trends in general fabrication costs, in labor costs and in overhead costs plus profits may be traced, in connection with price and production changes.

General Measurements

In summarizing the movements of prices during the pre-war period we deal first with changes in the general level of wholesale prices and in the general price structure. Certain of these changes are defined by the measurements in the next table, which are shown graphically in Figure 11, on page 55.

During this pre-war era the rate of advance in wholesale prices averaged 1.8 per cent a year. The degree of instability in the level of wholesale prices, that is, the degree of departure from a uniform rate of increase, is measured by an index of 2.2. This figure (which is to be judged with reference to similar measurements relating to production and to other series) is relatively low, indicating fairly regular changes from year to year in the general price level.

The general price index does not tell the whole story of the

TABLE 18

CHANGES IN THE LEVEL OF WHOLESALE PRICES IN THE UNITED STATES, 1901-1913

Year	Index numbers of wholesale prices [a]	Year-to-year change in wholesale prices (per cent)
1901	100.0	....
1902	106.5	+6.5
1903	107.8	+1.2
1904	108.0	+0.2
1905	108.7	+0.6
1906	111.8	+2.9
1907	117.9	+5.5
1908	113.7	−3.6
1909	122.2	+7.5
1910	127.3	+4.2
1911	117.4	−7.8
1912	125.0	+6.5
1913	126.2	+1.0

[a] The index numbers are those of the U. S. Bureau of Labor Statistics, with base shifted to 1901

major price changes of this period. Such an index measures the intensity of the force, or combination of forces, which is affecting the purchasing power of the dollar in wholesale markets. There are many specific price-making forces which affect, primarily, the prices of individual commodities. These forces operate to change individual commodity prices unequally, and to prevent the prices of individual commodities from accommodating themselves promptly to changes in the purchasing power of the dollar. The influence of these disruptive forces is reflected in the dispersion of prices. The less direct the incidence of the forces acting upon the price level, and the greater the relative importance of specific price-making factors, the more widely dispersed will prices be. These disruptive forces possess considerable economic significance, for every inequality of movement affects the buying and selling relations upon which the movement of goods depends.

Index numbers designed to measure the year-to-year dispersion of prices, for the period 1901-1913 are given in Table 19, together with geometric means of annual link relatives. For comparison there is given an average of index numbers of dispersion computed from annual link relatives covering the ten years 1891-1900.[1]

[1] The index of dispersion is the antilogarithm of a fractional part (.6745) of the logarithmic standard deviation. It defines, in percentage form, the approximate

TABLE 19

INDEX NUMBERS OF ANNUAL PRICE CHANGES AND OF PRICE DISPERSION IN THE UNITED STATES, 1901-1913

Geometric Means and Measures of Dispersion Computed from Weighted Link Relatives of Wholesale Prices, 1901-1913, with an Average Measure of Dispersion for the Period 1891-1900 [a]

Year (or period)	Number of price series	Geometric mean of link relatives	Index of year-to-year dispersion
1891-1900	195	....	9.0
1901	195	99.2	7.9
1902	195	107.3	8.6
1903	205	100.8	9.2
1904	205	99.6	10.2
1905	205	100.6	7.4
1906	205	103.6	7.7
1907	205	106.4	5.7
1908	205	96.0	8.7
1909	205	106.1	7.6
1910	205	102.9	7.9
1911	205	94.5	8.7
1912	205	106.8	7.3
1913	205	101.1	8.4

[a] The commodities employed are those for which wholesale price quotations are published by the U. S. Bureau of Labor Statistics. The weights are based upon the approximate values of the quantities marketed during the period 1920-1923.

It is significant that only twice during the years from 1901 to 1913 did the index of dispersion exceed the average value for the ten years preceding. The decade of the 'nineties was marked by a relatively high degree of dispersion, that is, by relatively severe disturbances in price relations. Greater stability characterized the years from the turn of the century to the outbreak of the war.

We investigate another characteristic of pre-war price behavior by measuring the variability of the prices of individual commodities, that is, the degree of price change occurring within a stated period of time. Such variability may not be registered at all in changes in the price level. Though price-level changes and the variability of individual prices are not unrelated, the one furnishes no accurate index of the other. For each of more than 200 com-

limits of the zone within which would fall 50 per cent of the price relatives at a given date, and on a given base. Thus a value of 10 for a given date means that, on that date, approximately half the price relatives deviated from the geometric mean of all the relatives by less than 10 per cent. For a full description of this measure, see *The Behavior of Prices,* National Bureau of Economic Research, New York, 1929, pp. 256-262.

modities we have a measure of the variability of prices within each of the years studied.[1] The averages of these annual measurements are given in Table 20, for the period 1901-1913, together with an average for the ten years 1891-1900.

The points noted in connection with the dispersion of prices appear to be true of these measurements. The decade of the 'nineties was marked by high price variability. Not once between 1901 and 1913 was the mean measure of variability as great as the average for the years 1891-1900. The lowest value for the period is found in 1913, the last year covered.

The measurements of dispersion and price variability define the degree of sub-surface disturbance occurring in the price system, disturbance resulting from month-to-month variations and from inequalities in the year-to-year movements of the prices of individual commodities. Conditions of high price variability and marked disturbance of established price relations offer opportunities to business men for those conjunctural profits (or losses) which re-

TABLE 20

MONTHLY VARIABILITY OF WHOLESALE PRICES

Averages Computed from Measures of Price Variability for Individual Commodities, 1901-1913, with an Average Measure of Monthly Variability for the Period 1891-1900

Year (or period)	Number of price series	Arithmetic mean of measures of price variability
1891-1900	206	5.0
1901	205	4.3
1902	214	4.7
1903	214	4.8
1904	214	4.1
1905	214	4.5
1906	214	3.5
1907	214	4.5
1908	214	4.7
1909	214	4.6
1910	214	4.3
1911	214	4.3
1912	214	4.6
1913	213	3.7

[1] This measure is the average deviation of monthly prices from the mean price for the year. Each average deviation is expressed as a percentage of the mean annual price. See *The Behavior of Prices*, pp. 39-49.

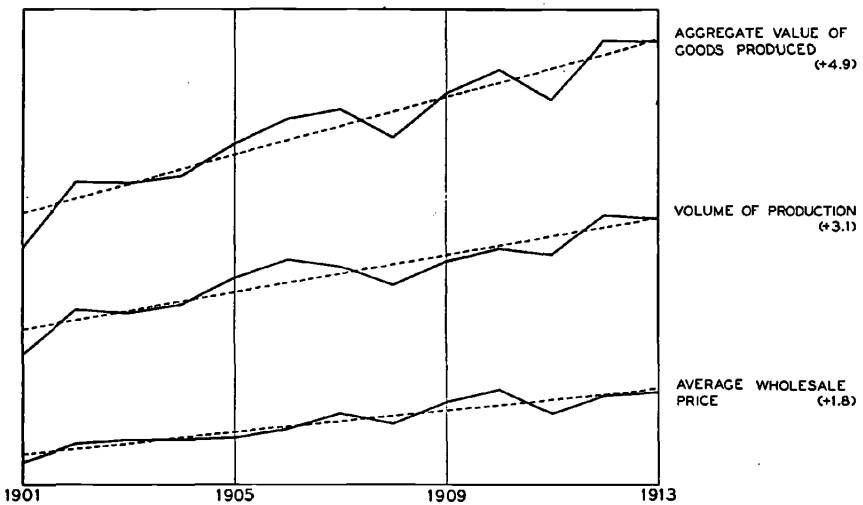
sult from faulty economic adjustments and temporary dislocations. Uncertainty is introduced into business dealings by the existence of such conditions, and the speculative element in business is intensified. It is a notable fact that the degree of such disturbance, which was high during the decade of the 'nineties, appears to have been relatively low during the years immediately preceding the war. At a later point we shall revert to this apparent gain in stability, in relation to a possible corresponding loss in flexibility.[1]

Comparison of Movements of Wholesale Prices and Production, All Commodities

Strictly comparable index numbers of prices and production are lacking. Such annual index numbers as we have differ in respect to commodities included, weights employed and technical methods used in averaging the observations. However, for the sake of getting a

FIGURE 11

CHANGES IN VOLUME OF PRODUCTION, AVERAGE PRICE AND AGGREGATE VALUE OF GOODS PRODUCED IN THE UNITED STATES, 1901-1913



Plotted on ratio scale. The figures in parentheses define average annual rates of change (in percentage form).

[1] The two tables immediately preceding, and the accompanying discussion, are adapted from the chapter on "Price Movements and Related Industrial Changes" in *Recent Economic Changes,* Vol. II, pp. 610-613.

general picture of the relative movements which have occurred in these two fields of interest, and of approximating the changes in aggregate values between 1901 and 1913, we may accept the price index of the Bureau of Labor Statistics as representative of general price changes at wholesale and the index of aggregate production cited in the preceding chapter as representative of production changes. Making these assumptions, we secure index numbers of changes in the total value of goods produced in the United States between 1901 and 1913. These, with corresponding price and production index numbers, are given in the next table, and are plotted in Figure 11.

TABLE 21

INDEX NUMBERS OF PHYSICAL VOLUME, PRICES AND AGGREGATE VALUES OF GOODS PRODUCED IN THE UNITED STATES, 1901-1913

Year	Physical volume of production	Wholesale prices	Aggregate values [a]
1901	100	100	100
1902	116	107	124
1903	115	108	124
1904	118	108	127
1905	129	109	141
1906	137	112	153
1907	134	118	158
1908	126	114	144
1909	136	122	166
1910	142	127	180
1911	139	117	163
1912	158	125	198
1913	156	126	197
Average annual rate of change (per cent)	+3.1	+1.8	+4.9
Index of instability	3.7	2.2	4.9

[a] The above price index measures changes in the average wholesale prices of units of goods, both raw and processed; the production index measures change in output of units of raw and processed goods. The value series, derived by multiplying these index numbers together, measures changes in the aggregate value of transactions involved in the productive process. It does not relate to the total value of finished products alone.

During the thirteen-year period covered by these measurements aggregate values increased at an average annual rate of 4.9 per cent. The flow of physical goods increased at a rate of 3.1 per cent a year, while prices, rising at a rate of 1.8 per cent a year, accounted for the additional increment in total values. The index of aggregate values shows annual deviations from constancy of growth averag-

ing almost 5 per cent a year. Prices, as we have already noted, were the more stable of the two elements of total value.

We turn now to certain of the details of the picture.

Price Movements, Major Commodity Groups

Raw Materials and Manufactured Goods

In the following table are given index numbers of the prices, at wholesale, of raw materials and of manufactured goods, together with measurements of changes in the prices of identical commodities in the raw state and in manufactured form.[1]

TABLE 22

Raw Materials and Manufactured Goods

Index Numbers of Wholesale Prices in the United States, 1901-1913[a]

(1) Year	(2) Prices of raw materials	(3) Prices of manufactured goods	(4) Prices of identical commodities	(5) Prices of identical commodities
			In raw state	In manufactured form
1901	100.0	100.0	100.0	100.0
1902	108.2	102.9	106.8	106.6
1903	108.5	103.6	106.0	105.4
1904	106.9	102.9	109.6	105.8
1905	109.1	105.8	108.3	108.6
1906	112.7	111.9	112.6	107.4
1907	119.5	117.5	119.9	115.6
1908	110.0	110.0	115.9	113.9
1909	116.7	111.4	126.2	120.0
1910	119.6	116.3	132.1	124.4
1911	120.2	111.4	119.5	114.0
1912	128.5	114.1	131.7	122.3
1913	121.2	116.2	138.5	122.7

[a] The index numbers of wholesale prices of raw materials given in column (2) are based upon 49 price series, those in column (4) upon 27 price series. The index numbers of prices of manufactured goods given in column (3) are based upon 178 price series (168 in 1901-02); those in column (5) upon 70 price series.

[1] The general index numbers of the prices of raw and of manufactured goods are unweighted geometric means of price relatives, computed by the National Bureau of Economic Research. The index numbers of prices of identical commodities in raw and manufactured state have been derived by the U. S. Bureau of Labor Statistics from weighted aggregates of actual prices. See pp. 28-34 of *Bulletin No. 440* (1926), Wholesale Price Series, U. S. Bureau of Labor Statistics.

The reader should note that the group index numbers of the National Bureau

These index numbers are plotted, with their respective lines of trend, in Figure 12. Measurements summarizing the behavior of these series during the period 1901-1913 are given below.

TABLE 23

WHOLESALE PRICES OF RAW AND MANUFACTURED GOODS

Summary of Rates of Change and Measurements of Instability, 1901-1913

Commodity group	Average annual rate of change, 1901-1913		Index of instability, 1901-1913
	In current dollars (per cent)	In purchasing power [a] (per cent)	
Raw materials (general index).	+1.6	+0.3	2.3
Manufactured goods (general index)	+1.2	−0.1	2.1
Index numbers, identical commodities:			
In raw state	+2.5	+0.3	2.5
In manufactured form.....	+1.6	−0.5	2.1

[a] Measurements of changes in purchasing power relate to the annual index numbers of prices of the several commodity groups divided ('deflated') by an index number of wholesale prices. These deflated measurements may be taken to define changes in the values of goods in the several commodity groups, measured in terms of commodities in general, at wholesale. The index numbers relating to identical commodities in raw and processed form have been deflated by an index of the prices of commodities in the two groups, in combination.

In each case the rate of change of the deflated series has been secured by dividing the rate of change of the undeflated value by the rate of change of the all commodities index. (For this purpose rates of change must be expressed in full, e.g., as 1.03, rather than as +3 per cent.) See note at end of Chapter I for a discussion of this procedure.

The measurements relating to the two sets of index numbers cannot be expected to agree in detail, but they show the same general relations between the price movements of raw materials and of manufactured goods. Raw materials were rising in price, the gain in real value per unit approximating 0.3 per cent a year, while

of Economic Research are not necessarily consistent with the general price index of the U. S. Bureau of Labor Statistics, which was cited in earlier sections. The general index of wholesale prices constructed by the National Bureau of Economic Research shows a rate of change of +1.3 per cent a year, between 1901 and 1913, as compared with a rate of +1.8 per cent for the index of the U. S. Bureau of Labor Statistics. The rates of change of the commodity sub-groups of the National Bureau of Economic Research are consistent with the first of these figures.

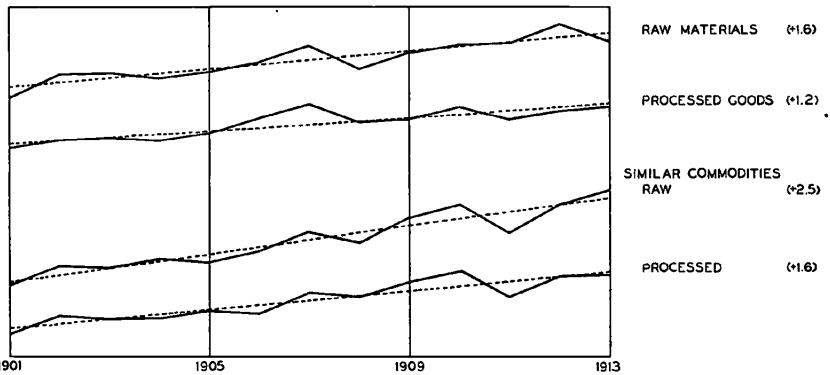
In the discussion, comparability of group measurements derived from different sources is secured by reducing rates of change to purchasing power form. This is done by dividing the rate of change of actual prices for each group by the rate of change of the general index to which it is subordinate.

manufactured goods were being progressively cheapened. The divergence of trends is pronounced in the case of the index numbers derived from identical commodities in raw and processed form. With respect to long-term movements during this period, price tendencies were the reverse of production tendencies. The volume of

FIGURE 12

MOVEMENTS OF WHOLESALE PRICES IN THE UNITED STATES, 1901-1913

RAW MATERIALS AND PROCESSED GOODS



Plotted on ratio scale. The figures in parentheses define average annual rates of change (in percentage form).

manufacture was increasing between 1901 and 1913 at a rate materially higher than that at which the volume of production of raw materials was increasing. This was accompanied by a gradual cheapening of manufactured goods (prices being expressed in dollars of constant purchasing power), and a sustained advance in the real prices of raw materials.

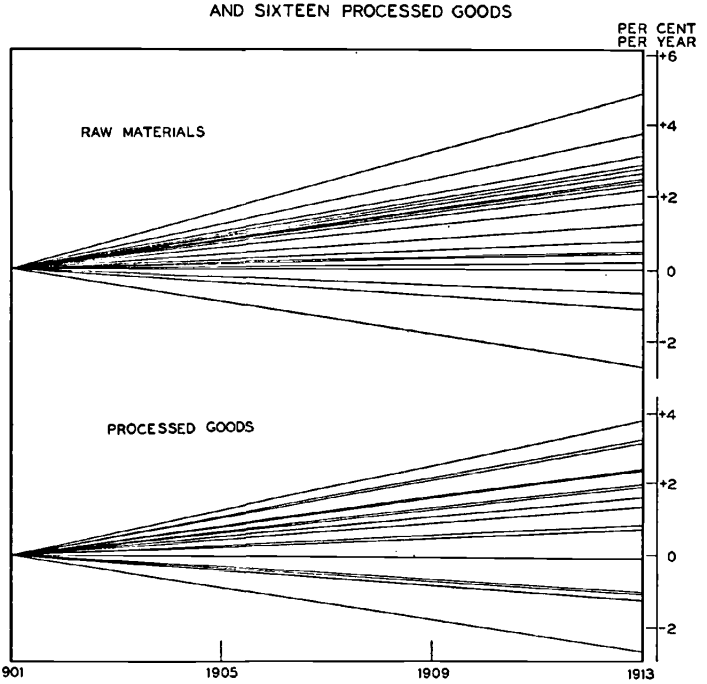
As in the case of the production measurements cited in the last chapter, each of these averages conceals a host of divergent movements. This is brought out graphically in Figure 13, which portrays the price trends of 20 raw materials and 16 processed goods.[1] Considering first the entire group of 36 price series, the degree of divergence is indicated by a standard deviation (unweighted) of

[1] The actual prices of these commodities are plotted in Figure 14. These are but samples of the commodities included in the index numbers; as regards degree of divergence the samples are undoubtedly representative of the groups from which they come. The data here plotted, with descriptions of the price quotations employed, may be found in the bulletins on *Wholesale Prices,* published by the U. S. Bureau of Labor Statistics.

FIGURE 13

MOVEMENTS OF WHOLESALE PRICES IN THE UNITED STATES, 1901-1913*

PRICE TRENDS OF TWENTY RAW MATERIALS AND SIXTEEN PROCESSED GOODS



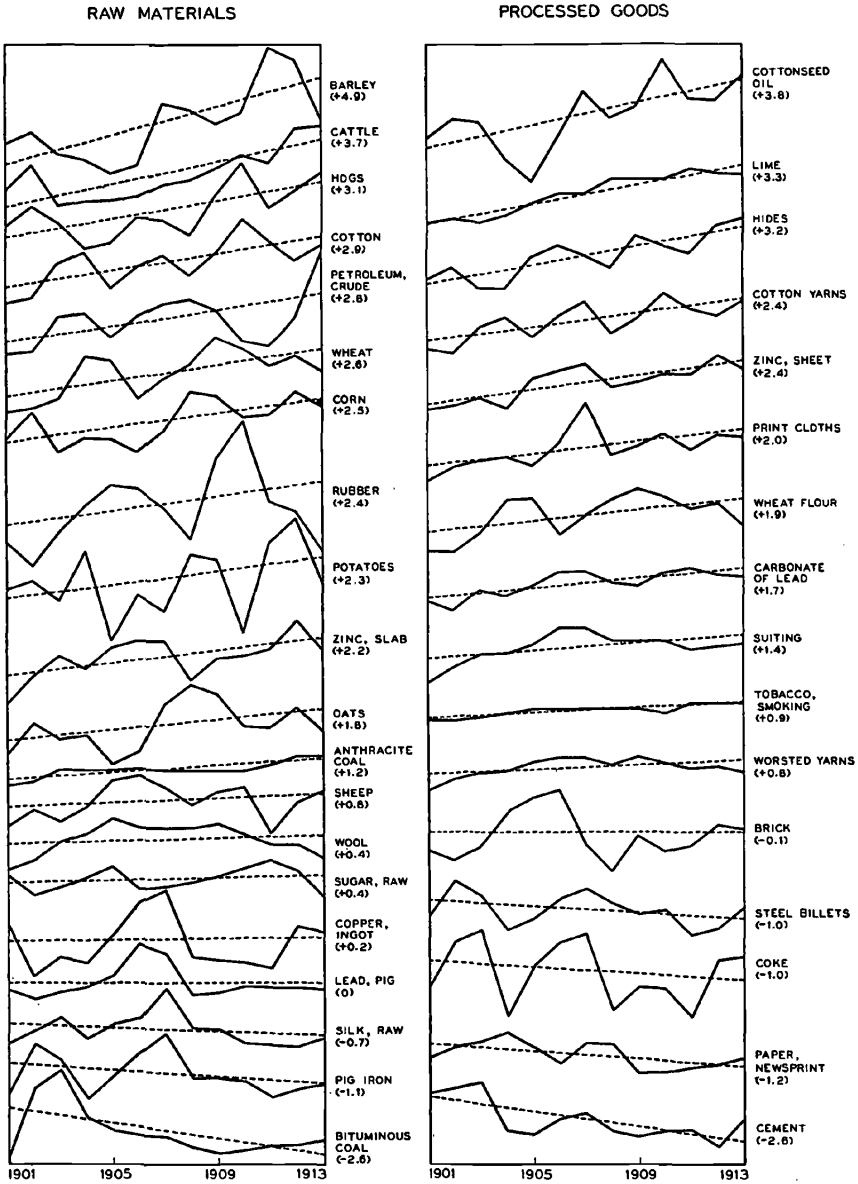
* Plotted on ratio scale. The lines here plotted relate to the commodities in the order in which they appear in Figure 14.

1.8. Among production series relating to the same 36 commodities the standard deviation of the rates of change was 3.1. There were notable differences of trend among the price series, but the differences among production tendencies were even more pronounced.

Breaking the price series into two groups, relating to raw and processed commodities, no significant difference between standard deviations of rates of change is revealed. For raw materials this measurement is 1.8; for processed goods it is 1.6. Here again the price materials differ from those measuring the production of the same commodities. Among processed goods included in the present sample production advanced or declined, between 1901 and 1913, at rates which varied widely, as is shown by a standard deviation of 3.6. This is more than twice as great as the divergence among the prices of the same commodities. The standard deviation of rates of

FIGURE 14

MOVEMENTS OF WHOLESALE PRICES
IN THE UNITED STATES, 1901-1913



PLOTTED ON RATIO SCALE. THE FIGURES IN PARENTHESES DEFINE AVERAGE ANNUAL RATES OF CHANGE.

change relating to the production of individual raw materials is 2.5, appreciably higher than the corresponding measure for prices, but much lower than the measure of divergence in the production of processed goods.

In discussing the continuing divergence of production series reference was made to the effects of such divergence upon the operations of the economy. The varying rates of growth or decline prevailing in different industries necessarily involve constant industrial shifts, continuing readjustments of labor and capital. The persistent divergence of prices is another aspect of the process of continual change which is characteristic of modern economic systems. We are prone to think of seasonal and cyclical fluctuations, particularly the latter, as the forces primarily responsible for the shifts and changes in industrial processes. Perhaps more important as elements of enduring alterations in economic relations are the divergent trends of production and prices. These sustained tendencies, which involve alterations in the purchasing power of important economic groups, in the volume of employment available in different industrial fields, in the demand for capital by different economic interests, are prime factors in economic change. To what extent adaptation to these movements is made by a series of minor alterations, carried out month by month and year by year as the secular shifts occur, and to what extent by periodic and more violent adjustments to conditions resulting from the cumulation of such secular changes over a period of years, it is impossible to say.[1]

The entries in the last column of Table 23 indicate that the prices of raw materials were somewhat less stable than the prices of manufactured goods during the years preceding the war. These entries relate only to annual deviations from constant rates of growth. Measurements of two other types, bearing on the variability of prices of raw and manufactured goods, are available for the period 1898-1913. (This includes three years, 1898, 1899 and 1900,

[1] The existence of diverging trends among production and price series is not necessarily evidence of a condition of 'maladjustment'. Such divergence may itself be the form that adaptation takes, as when a rapid increase in the demand for a new product leads to a sharp advance in the output of that commodity and a decline in the output of displaced commodities. Yet, whether cause or consequence of economic shifts, divergent tendencies are evidence of a process of cumulative change, change which must include economic readjustment over wide areas. It is reasonable to assume that the more pronounced the divergencies the more pressing is the need for adaptability in the economic system and for flexibility and mobility among the elements of that system.

which did not fall in the period first studied.) One defines the average magnitude of the variations of monthly prices about annual average prices, while the other measures the frequency of price changes.[1] The latter is a coefficient which ranges in value between 0 and 1, a value of 0 indicating no price changes whatever during the period in question, while a value of 1 indicates a change in price during every month of the period covered.

TABLE 24

RAW MATERIALS AND MANUFACTURED GOODS

Measurements of Variability of Wholesale Prices, 1898-1913

Commodity group	Number of price series	Measurement of monthly variability of prices	Measurement of frequency of price change
Raw materials	49	8.2	.82
Manufactured goods ..	158	3.6	.34

These measurements show that during the period in question the prices of raw materials were decidedly more variable and were subject to much more frequent changes than were prices of manufactured goods. Raw materials changed in price, on the average, during 82 per cent of the months covered, while manufactured goods changed in price during only 34 per cent of these months. The average magnitude of the fluctuations of monthly prices was over twice as great for raw materials as for manufactured goods.

§ The index numbers of production and of prices of raw and processed goods are not directly comparable, as regards composition. Instability measurements for these groups are suggestive of the relations between production and price movements, though their evidence is by no means conclusive.

Commodity group	Measurement of instability	
	Index of production	Index of wholesale prices
Raw materials	3.8	2.3
Manufactured goods	4.7	2.1

For each group production was less stable than price; the margin of difference was much greater for processed goods. More important,

[1] See *The Behavior of Prices*, pp. 39-49, 56-60, for explanations of these measurements.

perhaps, is the indication that the process of manufacture brings reduced stability of production, increased stability of price.

Measurements relating to the production and prices of identical individual commodities may be compared with more confidence.

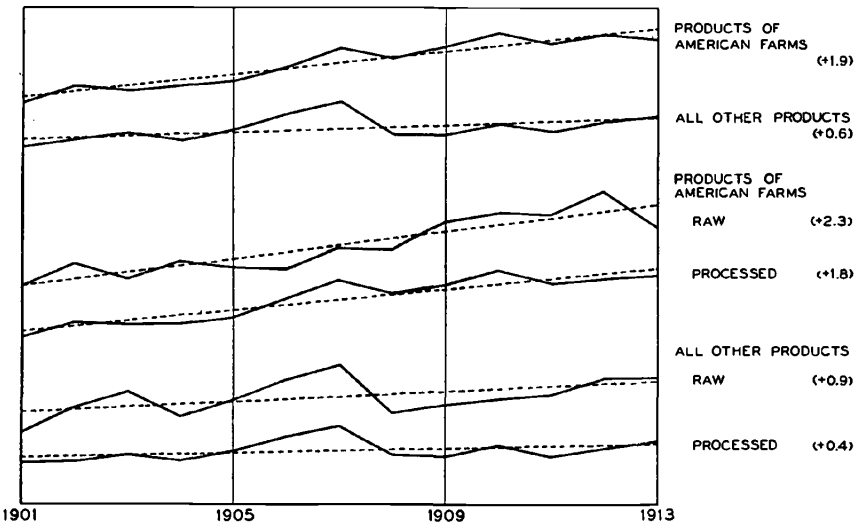
Commodity group	Number of commodities	Averages of measurements of instability	
		Production	Wholesale prices
Raw materials	20	7.1	10.0
Manufactured goods	16	7.5	7.6

These averages, which are not subject to the offsetting which occurs in the construction of general index numbers, indicate that the prices of raw materials were distinctly more variable than was their volume of production. For the somewhat smaller sample of manufactured goods the difference was not marked. Control of production and consequent adaptation to fluctuating conditions of demand is more readily achieved in manufacturing industries than in those producing raw materials. This power to control and vary production has been used in some manufacturing industries to secure relative stability of prices. Among many classes of raw materials the erratic swings of production are not readily adapted to changing demand, and high price variability results. These characteristics are not unfamiliar, but it is useful to have precise measurements of the varying modes of price behavior.

FIGURE 15

MOVEMENTS OF WHOLESALE PRICES IN THE UNITED STATES, 1901-1913

PRODUCTS OF AMERICAN FARMS AND ALL OTHER PRODUCTS



Plotted on ratio scale. The figures in parentheses define average annual rates of change (in percentage form).

Products of American Farms and Other Products

What alterations were occurring between 1901 and 1913 in the terms of exchange between agricultural producers and other producers? How stable were price conditions for these two groups of producers? What relations prevailed between the trends of production and the trends of prices for these two groups? The index numbers following, shown graphically in Figure 15, have a bearing upon these questions.

TABLE 25

PRODUCTS OF AMERICAN FARMS AND ALL OTHER PRODUCTS

Index Numbers of Wholesale Prices in the United States, 1901-1913 [a]

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	Products of American farms		All other products		All products of American farms	All other products
	Raw	Processed	Raw	Processed		
1901	100.0	100.0	100.0	100.0	100.0	100.0
1902	108.0	104.8	108.3	100.8	105.6	102.5
1903	102.4	104.3	114.5	102.8	104.0	105.3
1904	108.6	104.7	105.3	100.8	105.7	101.7
1905	106.6	107.1	111.5	104.4	107.0	105.9
1906	105.8	113.9	119.5	109.8	112.5	111.9
1907	113.6	121.0	125.4	113.7	119.5	116.3
1908	113.0	115.9	107.0	103.6	115.4	104.4
1909	124.0	119.7	110.0	102.8	120.7	104.4
1910	127.4	125.4	112.4	107.0	125.9	108.2
1911	126.9	119.9	114.1	102.7	121.5	105.2
1912	137.4	122.1	120.4	105.9	125.2	109.0
1913	121.8	123.4	120.6	108.6	123.2	111.2

[a] Unweighted geometric averages constructed by the National Bureau of Economic Research from data compiled by the U. S. Bureau of Labor Statistics. The number of price series in each group is given below:

All products of American farms	
Raw	24
Processed	94 (87 in 1901-02)
Total	118 (111 in 1901-02)
All other products	
Raw	25
Processed	84 (81 in 1901-02)
Total	109 (106 in 1901-02)

Measurements which summarize the behavior of these series are given in the following table.

TABLE 26

WHOLESALE PRICES OF AMERICAN FARM PRODUCTS AND OF ALL OTHER PRODUCTS
Summary of Rates of Change and Measurements of Instability, 1901-1913

Commodity group	Average annual rate of change, 1901-1913		Index of instability, 1901–1913
	In current dollars (per cent)	In purchasing power (per cent)	
All products of American farms			
Raw	+2.3	+1.0	3.4
Processed	+1.8	+0.6	2.3
Total	+1.9	+0.7	2.0
All other products			
Raw	+0.9	−0.4	4.1
Processed	+0.4	−0.8	2.4
Total	+0.6	−0.7	2.6

Between 1901 and 1913 farm products were increasing in price at an average rate more than three times that prevailing among non-farm products. In terms of purchasing power per unit farm products were gaining at a rate of 0.7 per cent a year, while non-farm products were losing at the same rate. Within each of the major groups the rates of advance of raw material prices exceeded those of fabricated goods.

The respective indexes of instability (which measure the average degree of departure from constant rates of growth) show that between 1901 and 1913 products of American farms were more stable in price, on the average, than were non-farm products. Within each group raw products were less stable than processed goods. The difference is pronounced among the prices of non-farm products, the measurements of instability being 4.1 for raw materials and 2.4 for processed goods.

§ A comparison of instability measurements relating to index numbers of prices for these groups with corresponding measurements relating to production index numbers is illuminating.

Farm products, at their raw stage, are marked by instability of both production and prices, with fluctuations in production more pronounced. Variability of both price and production is reduced in the processed stage. Relatively high variability of prices and production

characterizes raw non-farm products. Processing reduces the price variability, but serves to increase substantially the variations of production. Relatively stable prices and unstable production were found among processed non-farm products between 1901 and 1913.[1]

Relevant measurements for these groups are summarized below.

Commodity group	Index of instability	
	Price	Production
Products of American farms		
Raw	3.4	4.7
Processed	2.3	2.3
All other products		
Raw	4.1	3.8
Processed	2.4	6.8

These indexes of price instability may be supplemented by measurements of the month-to-month variability and of the frequency of the price change of the prices of individual commodities falling in the general classes distinguished above.

TABLE 27

PRODUCTS OF AMERICAN FARMS AND ALL OTHER PRODUCTS

Measurements of Variability of Wholesale Prices, 1898-1913

Commodity group	Number of price series	Measurement of monthly variability	Measurement of frequency of price change
Products of American farms			
Raw	24	9.0	.92
Processed	83	3.7	.42
Total	107	4.9	.53
All other products			
Raw	25	5.4	.74
Processed	75	3.4	.26
Total	100	3.9	.38

The prices of farm products were somewhat more variable than those of non-farm products. In each group the price variability of

[1] The sample of production series upon which these conclusions rest is not as large or as representative as the sample of price series. Instability of production has been characteristic of certain important industries, but by no means of all manufacturing industries. Moreover, non-farm products in the raw stage include such commodities as bituminous coal and natural gas which are not subject to further processing, and which are marked by relatively high productive stability.

raw materials was distinctly greater than that of processed goods.[1]

Summarizing, and contrasting price and production movements, we have seen that the period immediately preceding the World War was marked by an increase in the volume of agricultural production (in raw and processed form) at a rate approximately equal to the rate of growth of population. The output of non-agricultural industries was growing at a much more rapid rate. Among prices these tendencies were reversed. The terms of exchange between agricultural and non-agricultural industries were being altered to the distinct advantage of the former. The average real price per unit of agricultural products (that is, the purchasing power of such products in terms of all commodities at wholesale) was increasing at a rate of 0.7 per cent a year. Their purchasing power in terms of non-agricultural products was increasing at a rate of 1.3 per cent a year. This change was accompanied by corresponding declines in the purchasing power of the products of non-agricultural industries. These tendencies contributed to a definite improvement in the status of the farmer.

As regards stability of production there were differences of some importance among the groups under review. The output of raw farm products appears to have been less stable than the output of processed agricultural products. Explanations of this difference are found, in part, in the prompt reaction of export trade in raw agricultural products to variations in domestic production; exceptional variations in crop production were partially absorbed by foreign markets. In addition, domestic fabrication processes introduced elements of productive stability. Presumably a reservoir in the form of stocks of cotton, wheat, etc., was used to offset the natural fluctuations in agricultural production, so that the stream of products, as it reached the consumer, was steadier than it was at the source. On the other hand, non-farm products which had undergone some degree of fabrication seem to have been more variable than raw products of the same general class.

No significant difference appears between farm and non-farm products, as major classes, in the matter of price instability. Within each of the groups, however, there was an appreciable difference

[1] It is noteworthy that the measurement defining the month-to-month price variability of processed non-farm products declined from 4.0 for the period 1898–1905 to 2.9 for the period 1906–1913. The tendency toward greater price stability which prevailed before the war has already been mentioned.

between the prices of raw and manufactured goods, with raw materials distinctly more variable in each case. The production and marketing of raw farm products were characterized by instability of output and by variability of prices; production became more stable and prices became less variable as the degree of fabrication increased. Among raw non-agricultural products we find somewhat steadier productive processes and prices which, while relatively variable, were less so than those of farm products. In general, prices became more stable as the degree of fabrication of non-agricultural products increased, but in certain important industries production became less stable with increasing fabrication. Manufacturers of these goods appear to have secured stability of price in spite of (or, more likely, by means of) highly unstable processes of production.

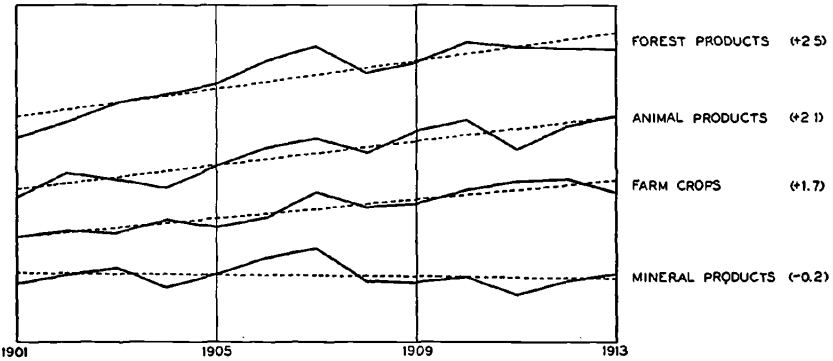
Farm Crops, Animal Products, Mineral Products and Forest Products

In classifying commodities into farm crops and animal, mineral and forest products, we define groups marked by characteristic conditions of production and marketing. The effects of these conditions may be expected to appear in the measurements descriptive of production and price behavior. Index numbers of the prices of commodities in these several groups are given in the following table. They are plotted in Figure 16.

FIGURE 16

MOVEMENTS OF WHOLESALE PRICES IN THE UNITED STATES, 1901-1913

FOREST PRODUCTS, ANIMAL PRODUCTS, FARM CROPS AND MINERAL PRODUCTS



Plotted on ratio scale. The figures in parentheses define average annual rates of change (in percentage form).

TABLE 28

FOREST PRODUCTS, ANIMAL PRODUCTS, FARM CROPS AND MINERAL PRODUCTS

Index Numbers of Wholesale Prices in the United States, 1901-1913 [a]

(1) Year	(2) Forest products (raw and processed)	(3) Animal products (raw and processed)	(4) Farm crops (raw and processed)	(5) Mineral products (raw and processed)
1901	100.0	100.0	100.0	100.0
1902	105.6	108.9	102.4	103.0
1903	112.7	106.5	101.3	104.9
1904	116.1	103.4	105.8	98.4
1905	120.4	111.3	103.3	102.9
1906	130.3	118.8	106.9	108.8
1907	137.3	122.4	116.3	112.3
1908	125.7	116.9	110.6	100.4
1909	129.8	126.1	112.2	100.2
1910	139.3	130.5	117.5	102.1
1911	136.9	118.1	120.9	96.0
1912	136.5	127.7	121.9	100.3
1913	136.1	132.4	116.5	102.9

[a] Unweighted geometric averages constructed by the National Bureau of Economic Research from data compiled by the U. S. Bureau of Labor Statistics. The number of price series in each group is given below:

Forest products	22
Animal products	52 (47 in 1901-02)
Farm crops	74 (72 in 1901-02)
Mineral products	70 (67 in 1901-02)

Nine price series included in the all commodities index have been omitted from these averages because of the difficulty of proper classification.

Measurements derived from the above index numbers appear in the next table.

With reference to the change in relative position of the several groups here shown, the figures in column (3) of Table 29 are probably most significant. Mineral products (both raw and processed) were falling in purchasing power per unit at a rate of 1.4 per cent a year—a notable decline, indeed. Products of all other types were gaining in purchasing power, the advance in prices of forest products being most pronounced.

A record of comparative stability is furnished by the indexes appearing in column (4) of Table 29. But these do not provide unequivocal measurements of the average degree of price instability of the individual commodities falling in the several groups. Off-

TABLE 29

WHOLESALE PRICES OF FOREST PRODUCTS, ANIMAL PRODUCTS, FARM CROPS AND MINERAL PRODUCTS

Summary of Rates of Change and Measurements of Instability, 1901-1913

(1) Commodity group (raw and processed)	(2) Average annual rate of change, 1901-1913: In current dollars (per cent)	(3) Average annual rate of change, 1901-1913: In purchasing power [a] (per cent)	(4) Index of instability, 1901-1913
Forest products	+2.5	+1.2	—[b]
Animal products	+2.1	+0.8	3.2
Farm crops	+1.7	+0.4	2.1
Mineral products	—0.2	—1.4	2.9

[a] Purchasing power measured in terms of general commodities at wholesale.
[b] The measurement for forest products is omitted. Because of a change in the rate of increase in the prices of forest products after 1907 the fit of the trend line is poor.

setting fluctuations in the prices of different commodities in the same group may give the index numbers a quite misleading appearance of stability. The following averages, derived from measurements of the magnitude of monthly fluctuations and of the frequency of changes (from month to month) during the period 1898-1913 in the prices of individual commodities, are not subject to such offsetting.

TABLE 30

FOREST PRODUCTS, ANIMAL PRODUCTS, FARM CROPS AND MINERAL PRODUCTS

Measurements of Variability of Wholesale Prices, 1898-1913

Commodity group (raw and processed)	Number of price series	Measurement of monthly variability of prices	Measurement of frequency of price change
Animal products	46	5.1	.59
Farm crops	69	4.9	.52
Forest products	20	3.9	.32
Mineral products	63	3.7	.36

This record shows animal products to have been the most variable in price, and to have been subject to the most frequent

price changes, with farm crops and their derived products a close second. Forest and mineral products stand close together, both considerably less variable in their monthly price movements than the two classes of farm products.

TABLE 31

WHOLESALE PRICES OF FOREST PRODUCTS, ANIMAL PRODUCTS, FARM CROPS AND MINERAL PRODUCTS, IN RAW AND PROCESSED FORM

Summary of Rates of Change and Measurements of Instability, Pre-war

(1) Commodity group [a]	(2) Average annual rate of change, 1901-1913: In current dollars (per cent)	(3) Average annual rate of change, 1901-1913: In purchasing power [b] (per cent)	(4) Index of instability of price index 1901-1913	(5) Measurement of monthly variability of prices 1898-1913	(6) Measurement of frequency of price change 1898-1913
Forest products [c]					
Processed	+2.5	+1.2	—	3.7	.28
Animal products					
Raw	+1.8	+0.5	3.9	8.0	.88
Processed	+2.2	+0.9	3.1	3.9	.48
Farm crops					
Raw	+2.8	+1.5	5.6	8.5	.91
Processed	+1.3	0	1.8	3.8	.39
Mineral products					
Raw	+0.3	−0.9	4.7	5.2	.69
Processed	−0.4	−1.6	2.7	3.1	.23

[a] The numbers of price series upon which these measurements are based are given below:

Commodity group	Number of price series relating to entries in Columns (2)-(4)	Columns (5)-(6)
Forest products		
Processed	21	19
Animal products		
Raw	13	13
Processed	39 (34 in 1901-02)	33
Farm crops		
Raw	17	17
Processed	57 (55 in 1901-02)	52
Mineral products		
Raw	18	18
Processed	52 (49 in 1901-02)	45

[b] Purchasing power is measured in terms of the commodities in the wholesale price index of the National Bureau of Economic Research.

[c] All forest products included in the sample with the single exception of crude rubber, have been classified as processed goods. No measurement of instability is given for this group because of the inadequacy of the fitted trend line.

The story of price changes in these groups during the pre-war era may be continued with reference to the measurements in Table 31 relating to raw and processed commodities under each head. Corresponding price index numbers are given in Appendix III.

The necessity of distinguishing raw from processed commodities in a given group is clear from a survey of these figures. Farm crops in raw form were increasing in purchasing power at a rate of 1.5 per cent a year, while processed farm crops showed no net change in purchasing power. Animal products in processed form were gaining in purchasing power somewhat more rapidly than were raw products. Processed mineral products were declining in real value, per unit, at a rate substantially greater than that measuring the drop in the values of raw minerals. Of the three groups for which comparison is possible (forest products being excluded) two showed a relative cheapening of processed goods, with reference to raw materials. Among animal products this tendency was reversed.

Without exception, the various measurements of instability and of price variability show raw materials to be materially less stable in price than processed goods. Raw farm crops appear to have been least stable, whether judged with reference to their annual deviations from trend, to their monthly price variations or to the frequency of price changes. Most stable, with reference to annual movements, were processed farm crops, while processed mineral products were most stable in their monthly changes. The superior stability of processed mineral products is most clearly manifest in the figures showing frequency of price change. In less than one month out of four (23 per cent) did the prices of such products vary from the prices prevailing during the preceding month. For processed animal products the ratio is close to one out of two (48 per cent), while for raw farm crops it approaches unity (91 per cent).

The constancy shown by the prices of manufactured mineral products may represent a desirable freedom from untoward fluctuations, or it may represent failure to conform to changes in market conditions due to the exercise of price control. That such price stability does not necessarily represent stability of the corresponding industrial processes is shown by the relatively high indexes of instability relating to the production of processed minerals. Instability in the stream of mineral manufactures is higher than

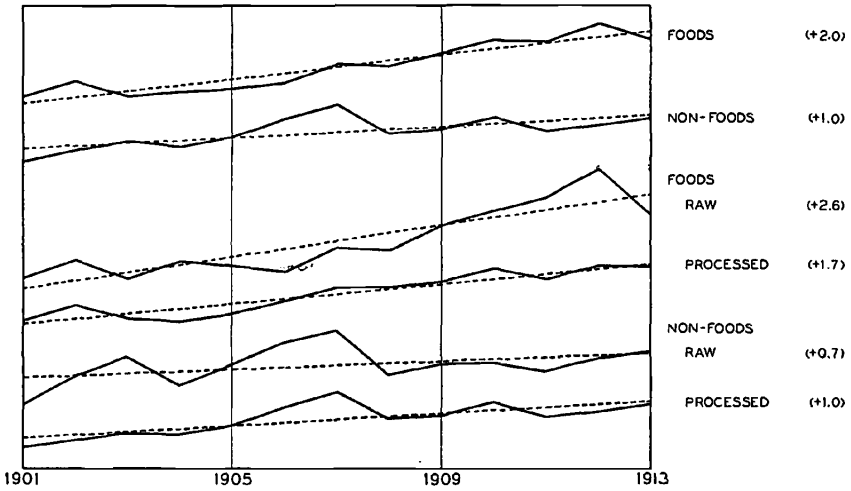
that recorded for any other production group, while the averages of instability measurements for the production of individual commodities are highest for processed non-farm products (primarily mineral). Price stability and productive instability appear to have been characteristic of industries fabricating mineral products.

Comparison of rates of change in prices and production is possible for certain of the above groups. Between 1901 and 1913 the volume of crop production (as measured by the index of mass of crop production compiled by the United States Department of Agriculture) advanced at a rate of 1.5 per cent a year; the per-unit purchasing power of raw farm crops was increasing at the same rate during this period. The volume of production of raw mineral products expanded at a rate of 5.6 per cent a year, while the per-unit purchasing power of such products declined by 0.9 per cent a year. This cheapening of mineral products and the advancing real price of farm crops were natural accompaniments [1] of the sharply differing rates of change in production volume.

FIGURE 17

MOVEMENTS OF WHOLESALE PRICES IN THE UNITED STATES, 1901-1913

FOODS AND NON-FOODS



Plotted on ratio scale. The figures in parentheses define average annual rates of change (in percentage form).

[1] Neglecting possible effects of foreign trade movements.

Foods and Non-foods

Pre-war price changes in two other major categories, and in their raw and processed subdivisions, are traced in the next table. These index numbers are plotted in Figure 17.

TABLE 32

FOODS AND NON-FOODS

Index Numbers of Wholesale Prices in the United States, 1901-1913 [a]

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Year	Foods		Non-foods		All foods	All non-foods
	Raw	Processed	Raw	Processed		
1901	100.0	100.0	100.0	100.0	100.0	100.0
1902	106.3	104.9	109.9	102.1	105.4	103.5
1903	99.7	100.4	116.9	104.5	100.2	106.6
1904	106.0	99.6	107.8	103.9	101.7	104.7
1905	104.0	102.0	113.8	106.9	102.6	108.2
1906	101.9	106.3	123.0	113.8	104.7	115.4
1907	110.5	111.2	127.9	119.4	111.1	120.9
1908	109.1	111.2	110.5	109.4	110.4	109.7
1909	118.7	113.4	114.8	110.6	115.2	111.5
1910	124.7	118.0	115.1	115.7	120.2	115.7
1911	130.1	114.5	112.0	110.4	119.6	110.9
1912	142.8	119.6	116.9	112.3	127.1	113.1
1913	123.0	119.4	119.6	115.0	120.7	115.9

[a] The index numbers are unweighted geometric averages of relative prices, computed by the National Bureau of Economic Research from price quotations compiled by the U. S. Bureau of Labor Statistics. The number of price series in each group is given below:

Foods		Non-foods	
Raw	23	Raw	26
Processed	44 (43 in 1901-02)	Processed	134 (125 in 1901-02)
Total	67 (66 in 1901-02)	Total	160 (151 in 1901-02)

Measurements of the price behavior of commodities in these groups are summarized in Table 33, on the next page.

The general picture is one of food products rising in purchasing power per unit, with non-food products becoming relatively cheaper. This was, of course, a period of rapid expansion in the output of non-foods, with consequent possibilities of mass production at lower costs. The output of non-foods increased at an average annual rate of 3.9 per cent, between 1901 and 1913, while the production of foods increased at a rate of 1.9 per cent a year.

In the matter of instability the picture is much like that presented by other classifications. The raw materials are distinctly

TABLE 33

WHOLESALE PRICES OF FOODS AND OF NON-FOODS

Summary of Rates of Change and Measurements of Instability, Pre-war

(1) Commodity group [a]	(2) Average annual rate of change, 1901-1913: In current dollars (per cent)	(3) Average annual rate of change, 1901-1913: In purchasing power [b] (per cent)	(4) Index of instability of price index 1901-1913	(5) Measurement of monthly variability of prices 1898-1913	(6) Measurement of frequency of price change 1898-1913
Foods					
Raw	+2.6	+1.3	4.3	9.2	.95
Processed ..	+1.7	+0.4	1.9	5.1	.57
Total	+2.0	+0.7	2.4	6.5	.70
Non-foods					
Raw	+0.7	−0.6	4.0	5.3	.72
Processed ..	+1.0	−0.2	2.6	3.0	.26
Total	+1.0	−0.3	2.7	3.4	.34

[a] The numbers of price series for the entries in columns (2) to (4) are given in the footnote to the preceding table; for the entries in columns (5) and (6) they are given below.

Foods		Non-foods	
Raw	23	Raw	26
Processed	43	Processed	115
Total	66	Total	141

[b] Purchasing power is measured in terms of the commodities in the wholesale price index of the National Bureau of Economic Research.

more variable in price than are the processed goods. Foods in both raw and processed forms are less stable in price, in their month-to-month movements, than are the corresponding classifications of non-foods. The annual deviations of the group index numbers from constant rates of growth, as measured by the index of instability, were slightly greater for non-foods than for foods.

Producers' Goods and Consumers' Goods

Particular interest attaches to the changes occurring in the prices of goods in shape for final consumption (consumers' goods) and of goods destined for use as capital equipment, or not yet in shape for use by the final consumer (producers' goods). Relevant index numbers are given in the following table, and are shown graphically in Figure 18.

TABLE 34

PRODUCERS' GOODS AND CONSUMERS' GOODS

Index Numbers of Wholesale Prices in the United States, 1901-1913 [a]

(1) Year	(2) Producers' goods	(3) Producers' goods	(4) Consumers' goods	(5) Consumers' goods	(6) All producers' goods	(7) All consumers' goods
	Raw	Processed	Raw	Processed		
1901	100.0	100.0	100.0	100.0	100.0	100.0
1902	110.0	102.7	101.9	103.0	105.2	102.9
1903	109.4	103.6	105.4	103.4	105.7	103.6
1904	105.7	100.6	111.0	104.5	102.4	105.1
1905	110.0	105.1	105.8	106.1	106.9	106.1
1906	114.2	112.4	107.1	111.5	113.3	111.1
1907	124.4	116.9	103.9	117.7	119.7	116.3
1908	110.9	106.1	106.3	112.9	107.9	112.2
1909	119.0	107.7	108.6	114.2	111.6	113.7
1910	123.2	113.7	107.3	118.2	116.9	117.1
1911	120.9	107.1	117.6	114.8	111.7	115.1
1912	127.6	109.3	130.9	117.9	115.3	119.1
1913	122.9	111.6	115.3	119.6	115.5	119.2

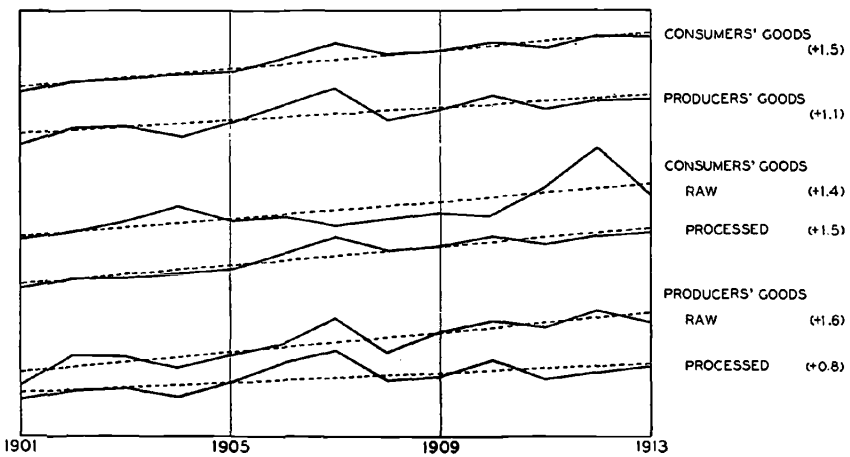
[a] The index numbers are unweighted geometric averages of relative prices, computed by the National Bureau of Economic Research. The commodities employed are those for which prices are compiled by the U. S. Bureau of Labor Statistics. The number of price series in each group is given below:

Producers' goods		Consumers' goods	
Raw	38	Raw	11
Processed	77 (73 in 1901-02)	Processed	101 (95 in 1901-02)
Total	115 (111 in 1901-02)	Total	112 (106 in 1901-02)

FIGURE 18

MOVEMENTS OF WHOLESALE PRICES IN THE UNITED STATES, 1901-1913

PRODUCERS' GOODS AND CONSUMERS' GOODS



Measurements relating to the movements of these index numbers, and to certain other aspects of the behavior of the prices of producers' and consumers' goods, are summarized in the next table.

TABLE 35

WHOLESALE PRICES OF PRODUCERS' GOODS AND OF CONSUMERS' GOODS

Summary of Rates of Change and Measurements of Instability, Pre-war

(1) Commodity group [a]	(2) Average annual rate of change, 1901-1913: In current dollars (per cent)	(3) Average annual rate of change, 1901-1913: In purchasing power [b] (per cent)	(4) Index of instability of price index 1901-1913	(5) Measurement of monthly variability of prices 1898-1913	(6) Measurement of frequency of price change 1898-1913
Producers' goods					
Raw	+1.6	+0.4	2.9	6.5	.80
Processed	+0.8	−0.5	2.7	3.6	.32
Total	+1.1	−0.2	2.6	4.6	.49
Consumers' goods					
Raw	+1.4	+0.1	3.4	9.3	.90
Processed	+1.5	+0.2	1.6	3.6	.36
Total	+1.5	+0.2	1.2	4.2	.42

[a] The numbers of price series relating to the entries in columns (2) to (4) are given in the footnote to the preceding table; for the entries in columns (5) and (6) they are as follows:

Producers' goods		Consumers' goods	
Raw	38	Raw	11
Processed	71	Processed	87
Total	109	Total	98

[b] Purchasing power is measured in terms of general commodities at wholesale, as these enter into the index of the National Bureau of Economic Research.

Between 1901 and 1913 goods ready to be purchased by the consumer for immediate and personal use were increasing in real value (i.e., in per-unit purchasing power) at a rate of 0.2 per cent a year, a very slight annual change. Producers' goods were declining each year in real value per unit at the same rate. Such a slight margin is negligible, of course, over a short period, but as an element to be compounded it becomes substantial in time. An inspection of the annual records in Table 34 reveals an interesting reversal of the relative movements of these index numbers after 1907. During the prosperous period which preceded the break in October, 1907, producers' goods remained higher in price, in rela-

tion to the 1901 base, than consumers' goods. (Only in 1904, a year of depression, was this not true.) In 1908, also a time of depression, these positions were reversed. Producers' goods fell sharply in price, and consumers' goods were left with higher real values. This situation continued without a break through 1913. Even the relatively good times of 1909 and 1912 failed to restore the parity of 1901.

If we separate the raw and processed goods falling in each of these broad classes we secure a clearer view of certain tendencies of this era. The sample of raw consumers' goods [1] is so small (including only 11 price series) that no general conclusions may be drawn from the movements of this index number. The trend of prices of these commodities between 1901 and 1913 was substantially the same as that of all consumers' goods. Much sharper is the divergence between the trends of producers' goods in raw and processed forms. Raw materials advanced in price and in purchasing power, with temporary checks during the recessions of 1904, 1908 and 1913. Processed producers' goods (fabricated goods intended for use in the construction of capital equipment, or for human consumption after further processing) were affected most immediately by the increased productivity of labor and by economies of large scale production during this period. Such goods were progressively cheapened during this period, in relation to other goods. In 1913 their real value, per unit, was 5 per cent lower than in 1901.

With respect to stability, the several measurements cited in Table 35 indicate that the prices of consumers' goods were more stable than the prices of producers' goods, a conclusion supported by various other types of evidence. Raw consumers' goods, a small and highly erratic group, were the least stable of the sub-groups, with raw producers' goods standing next in order.

The group of producers' goods includes two quite distinct classes of commodities, goods intended for use in the construction of capital equipment (e.g., structural steel) and goods intended for human consumption, after further fabrication. Measurements de-

[1] The division of consumers' goods into raw and processed classes calls for a word of comment. In all cases consumers' goods are in shape for final consumption; the classification into raw and processed forms is a mutually exclusive one. The two classes do not, as in the case of certain other divisions, represent the same goods in different stages of fabrication. Goods that may be consumed either in raw or processed form constitute the only exceptions to this rule.

fining changes in the prices of goods in these classes are given in the following table.

TABLE 36

PRODUCERS' GOODS DESTINED FOR USE IN CAPITAL EQUIPMENT AND FOR HUMAN CONSUMPTION

Index Numbers of Wholesale Prices in the United States, 1901-1913 [a]

Year	Producers' goods destined for use in capital equipment	Producers' goods destined for human consumption
1901	100.0	100.0
1902	105.2	105.2
1903	106.8	103.8
1904	100.4	105.3
1905	108.0	105.3
1906	118.0	106.6
1907	123.3	114.3
1908	107.0	108.8
1909	107.9	116.7
1910	114.0	121.0
1911	108.3	116.3
1912	111.5	120.6
1913	113.6	117.9
Average annual rate of change in wholesale prices (per cent).....	+0.7	+1.5
Average annual rate of change in purchasing power (per cent)...	−0.5	+0.3

[a] The number of price series in each commodity group is given below:

Producers' goods destined for use as capital equipment	67 (64 in 1901-02)
Producers' goods destined for human consumption	48 (47 in 1901-02)

It is clear that the figures in the general index conceal two differing trends. The net change over the period was in the direction of distinctly lower purchasing power, per unit, for goods intended for use in the construction of capital equipment; the average annual rate of decline was 0.5 per cent. Goods intended for ultimate human consumption showed a net advance in purchasing power, per unit, at an average rate of 0.3 per cent each year. (The predominance of mineral products among articles of capital equipment has a bearing on these movements, of course.) Here again we find a notable reversal of trend occurring about the middle of the period. The boom times which culminated in 1906 and 1907 placed articles of capital equipment at somewhat of a premium (these were worth in 1906 5.2 per cent more, per unit, than in 1901),

and lowered the real worth of goods intended for ultimate consumption (these were worth in 1906 5.0 per cent less, per unit, than in 1901). Thereafter, goods for use in capital equipment declined steadily in value, while goods for human consumption advanced. Even in the comparatively good years of 1909 and 1912 there was no advance in the worth of goods intended for capital equipment, a condition in sharp contrast to that prevailing in 1903, 1906 and 1907. The nine years preceding 1908 had been marked by only brief lapses from prosperity; the prosperous years following that date were interludes in a period of subnormal business activity.

During this pre-war period the output of goods intended for use in capital equipment increased at a more rapid rate (5.0 per cent a year) than did consumption goods in general (2.6 per cent a year). It is a notable fact that there was no such relative decline in the output of capital equipment after 1907 as occurred in the per-unit worth of goods intended for use in capital equipment. The index numbers cited in the preceding chapter show that between 1908 and 1913 the production of capital equipment continued the advance which had prevailed between 1901 and 1907. Relatively high production of capital equipment co-existed with low prices during the years immediately preceding the war.

Summary: Pre-war Movements of Commodity Prices

The threads of economic change during an epoch are interlaced in subtle ways. The movements of a dynamic economy are not amenable to simple description or to ready explanation. This is as true of variations in prices and costs as it is of any other phase of economic change. Certain general features of changing price levels and fluctuating relations among major commodity groups are readily established, but the interpretation of these changes and their linking with other economic movements are problems of a different order. To these problems the present discussion is merely an introduction.

The rising tendency of the price level during the years prior to the outbreak of the World War placed a distinctive impress upon the economic life of that era, affecting buying and selling practices, altering the relations of debtors and creditors, shaping the character of business cycles. This price advance caused aggregate commodity

values to increase more rapidly than the volume of physical goods, injecting into the economic situation values not based on new services or additional commodity units. We may not trace with any high degree of accuracy the effects of this slow, secular inflation upon the values of goods and services of different types, for these effects are interwoven with the results of numerous other economic changes. The introduction of novel production methods, the fluctuations of consumption habits and those broader movements that mark the passing of economic power from one group to another all influence the course of prices. Our present concern is with the combined effects of all these forces upon the purchasing power of the commodities marketed by different groups of producers.

Conspicuous among the economic changes occurring in the United States between the opening of the twentieth century and the outbreak of the World War were the advancing real worth of raw materials and the declining real worth (per unit) of manufactured goods. Here, it is probable, the secular change in the value of money, technical improvements in processes of fabrication and the widening of markets characteristic of this era all worked in the same direction, to cheapen products of manufacture in relation to their raw ingredients. Experience indicates that the effects of changes in the value of money are felt, in general, in raw material markets before they are felt in the markets for finished goods. Certain elements of manufacturing cost are particularly slow to react to changes in monetary values, a condition which tends to hold the prices of manufactured goods to a pre-existing level when general prices move either upward or downward. During any period of rising prices we thus have forces at work in the direction of higher real values of materials, lower real values of manufactures. These tendencies were reënforced between 1901 and 1913 by improved industrial technique, and by the repercussions upon costs and prices of widening markets and of increasing emphasis upon mass production in manufacturing industries.

Among raw materials the gains in real worth, per unit of product, were greatest for farm crops; the purchasing power of these commodities increased at the notable rate of 1.5 per cent a year. Raw animal products gained at a lower rate. Producers of raw minerals suffered a decline in purchasing power per unit of product, a decline which was associated with a remarkable increase in the volume of production of these materials. In the group of manu-

factured goods, processed forest and animal products actually gained in purchasing power per unit, while processed farm crops remained practically constant. The full effects of the forces acting in the direction of lower real values were felt among fabricated mineral products, a group of major importance in an industrial civilization. These declined in exchange value per unit at a cumulative rate of 1.6 per cent a year during the years before the war.

If we separate products of American farms from all other commodities, we find clear-cut differences in price behavior. The real value of farm products, per unit, was being steadily enhanced during pre-war years; the per-unit value of other commodities was steadily declining. The terms of exchange between agricultural and non-agricultural producers were being modified, on a per-unit basis, to the advantage of agricultural interests. Every unit of farm produce was commanding, year by year, an increasing quantity of other goods. This steady gain contributed to the rising scale of well-being of American farmers which was one of the outstanding economic characteristics of this period.

The shift in the terms of exchange between farm and non-farm elements of the population during these years was due, in considerable part, to differences in productive conditions. The volume of agricultural production was increasing at a rate slightly below that at which population was growing; the volume of production of non-agricultural commodities (in which mineral products are the most important element) was increasing at a rate approximately two and one-half times as high as the rate of population increase. It is true, of course, that wants were expanding more rapidly in the latter field, but not with sufficient rapidity to enable this swelling mass of goods to be marketed without material reductions in the amounts asked in return for each unit of product. Such reductions were possible partly because of the advantages conferred by mass production, partly because the reduction of real manufacturing costs which a rising price level permits [1] worked to the particular advantage of the industries which were able to expand production at a rapid rate. These were, notably, industries fabricating non-agricultural products.

If we consider the change of values during this pre-war era with reference to consumers' budgets, interest attaches to the distinction between foods and non-foods. Foods satisfy certain wants

[1] Because of the lag of labor costs and various elements of overhead costs.

which are not capable of great expansion, but which stand first in order of necessity. Less urgent, but capable of wide expansion and great diversity, are other wants of human kind. During the years under review food values advanced, in relation to other commodities, while non-foods were progressively cheapened. It was in the latter field, again, that volume of output was advancing most rapidly. Mass production permitted lower prices, and lower prices stimulated demand for a wider variety and for greater quantities of goods. The characteristic features of industrial advance during the years before the war were found in their clearest form in the production and marketing of non-food products. The nature of food products and the conditions circumscribing both supply and demand in this field did not permit the full flowering of the new technology.

Another classification has to do with the relative price trends during pre-war years of consumers' goods and producers' goods—of goods in shape to serve or to be consumed by the final consumer, and of all other goods. Here we have a classification of obvious economic significance, since it separates goods which are only one degree removed from ultimate consumption (one degree removed because the prices here employed, even for consumers' goods, are wholesale prices) from goods which are still several stages removed from ultimate use. Purely business considerations, considerations of profit and loss, dominate in the markets for producers' goods. These considerations still are of weight in the wholesale markets for consumers' goods but do not have full sway. The stabilizing effect on prices of the relative inertia of mass demand is felt; considerations of utility and of ready marketability are more immediate and pressing in the markets for consumers' goods. As a result we should expect consumers' goods to be more stable in price and, in particular, to be less sensitive to changes in the purchasing power of money. We should expect producers' goods to react more promptly to the monetary factors which affect all prices, with consumers' goods lagging during both rising and falling prices. This would lead us to look for a cheapening of consumers' goods during the pre-war era of rising prices.

The actual figures, however, do not bear out our expectations. The two groups moved with but a slight margin between them during the years 1901-1913, producers' goods being cheapened slightly, consumers' goods gaining slightly in real value. If we are right in assuming that consumers' goods are less sensitive to changes

in the value of money than producers' goods, some other factor must have been in operation, serving to cheapen producers' goods and to offset the tendency of such goods to react promptly to changing values of the monetary unit. If we break producers' goods into two groups, raw and processed, the nature of this offsetting factor is suggested. Raw producers' goods advanced in real value between 1901 and 1913, at a rate exceeding the advance of raw and of processed consumers' goods. Processed producers' goods (a class including 77 commodities during the pre-war years) declined in real value, at a rate of 0.5 per cent a year. Processed producers' goods are heavily weighted by fabricated mineral products, destined for use in the construction of capital equipment. This class of goods felt most immediately the effects of improved manufacturing technique, of falling production costs, of mass production, all of which were characteristic of this era. The actual movement of the prices of producers' goods during the pre-war era thus reflected the resultant of two conflicting tendencies, a tendency to rise because of a characteristic sensitivity to changing monetary values, and a tendency to decline because of falling production costs and widening markets.

Similarly, it may be hazarded, the prices of consumers' goods moved in response to conflicting forces pulling in opposite directions—toward lower real value per unit, because of a tendency to lag behind general prices, toward higher real worth because of the heavy weight given to farm products among consumers' goods. The net movement of per-unit purchasing power was slightly upward.

This discussion of the movement of prices among producers' and consumers' goods during the pre-war era is suggestive, apart from its historical interest, because of its bearing on more recent tendencies. The close concordance of pre-war price movements among these two groups of goods, and the failure of a marked secular divergence to emerge, was perhaps due to an offsetting of conflicting tendencies within each group. Under different conditions the tendencies prevailing among commodity prices in each of these groups might reënforce one another, and a pronounced divergence of trends might result. If sustained by the influence of continuing secular movements, divergence of this sort would present novel economic and business problems. This subject will be considered further in the treatment of more recent tendencies.

A significant feature of the price movements of the pre-war

period is found in the cheapening of commodities destined for use in capital equipment, a cheapening which was in evidence, however, only after the crisis of 1907. During the sustained business advance of the years preceding that recession goods for use in capital equipment were bid up in price, selling at substantial premiums in 1906 and 1907. Thereafter they declined in exchange value, either because of diminished demand during the lean years between 1908 and 1913 or because of large supply. In respect to prices of materials, these latter years were particularly favorable for capital expansion.

Divergent price trends of the type dealt with in the preceding paragraphs have a clear bearing upon the fortunes and status of different groups of producers. For such divergent trends reflect the play of forces which are altering the real worth of goods of various kinds, changing their command, in exchange, over other goods. Price changes of another type are matters of concern to producers and dealers. These are fluctuations over short periods, and departures from the regular movements suggested by the annual rates of change which have been cited in discussing long-term tendencies. These short-period movements are indications of price variability. They may reflect necessary and orderly adaptations to changing conditions of supply and of demand, they may reflect ill-ordered production or marketing programs, or they may be due to faults and excesses of other sorts in the working of the competitive system. Whatever the cause, each fluctuation represents some degree of uncertainty to the producers and dealers concerned, an injection of a speculative element into the engineering task of combining productive elements for a specific technical purpose. In this sense, then, price variability represents economic instability, though the factors of instability may lie far below the monetary surface.

There was evidence of a considerable degree of price instability in the United States at the opening of the century. There was further evidence, however, of a tendency toward greater stability during the years preceding the war, with signs of a distinct lessening of the speculative element in business transactions. In brief summary of the survey of price variations:

> Raw materials were less stable in price than manufactured goods. The difference was not great, as regards deviations of annual averages from long-term trends, but the superior stabil-

ity of manufactured goods was much more pronounced with reference to the degree and frequency of monthly price fluctuations.

In stability of secular price movements farm products, both raw and processed, ranked slightly higher than non-farm products. In their monthly movements, however, prices of farm products were considerably less stable than the prices of non-farm products. Most violent in their monthly price changes were raw farm products. Among such products crops were more variable in price than animal products, though both were highly unstable. After fabrication, however, crop products became more stable in price than animal products. Mineral products in processed form showed a relatively high degree of price stability, a condition which stands in interesting contrast to the marked instability of production characteristic of such goods.

Non-foods were less stable than foods, in respect to deviations of annual averages from constant rates of growth, but in their month-to-month price movements foods were distinctly less stable.

Consumers' goods were more stable in price than producers' goods, a condition to be expected. Among consumers' goods, however, a small group of raw materials were marked by a very high degree of price instability.

Finally, we have emphasized the general significance of the divergence of secular trends among commodity prices. Such divergence represents a constant shift of purchasing power from group to group, and a constant readjustment among the elements of the price system. The notable feature of this aspect of economic change is that it is continual and cumulative, that the margins between commodity prices expand or contract year after year. The degree to which these expanding margins represent adaptations to other economic changes, the degree to which they necessitate readjustment among other elements, cannot be stated. Nor may we say whether the adjustment of other economic elements to these divergent movements is secured through continual adaptation, or whether the periodic disturbances which constitute one phase of business cycles represent (in part) more painful adaptations to secular price divergence. We know only that such mutual adjustment there must be; we do not understand its precise mechanism.