2

Long-Term Changes in the National Income of the United States of America since 1870

by

SIMON KUZNETS

CONTENTS

	Page
I. THE OVER-ALL TOTALS	29
1. The concepts used	
2. The methods of estimation	
3. Possible weaknesses in the estimates	
4. The major biases	
5. The rate of growth	
II. POPULATION AND PER CAPITA	53
1. Population and national product per capita	
2. Flow of goods to consumers, per capita	
3. Value of leisure	
III. LABOR FORCE AND PRODUCT PER WORKER	70
1. Labor force and product per labor unit	
2. Capital and rise of product per worker	
3. Capital-product ratio and share of property income	
IV. DISTRIBUTION BY INDUSTRIAL ORIGIN	88
1. Distribution in current prices	
2. Shares based on values in constant prices	
3. Industrial distribution of labor	
4. Industrial distribution of fixed capital	
5. Effects of inter-industry shifts	
V. DISTRIBUTION BY TYPE AND SIZE OF INCOME	131
1. National income and aggregate payments	
2. Distribution by type of income	
3. Distribution by size of income	
VI. DISTRIBUTION BY TYPE OF USE	152
1. The shares of flow of goods to consumers and capital formation	
2. Components of flow of goods to consumers	
3. Components of capital formation	
4. Shorter-term changes	
VII. FLOWS ACROSS BOUNDARIES	196
1. The migration of men	
2. The movement of capital	
3. The flow of goods	
4. General comments	

Page

APPENDIX: NATIONAL INCOME ESTIMATES FOR THE PERIOD PRIOR TO 1870 221

1. Contrast between 1800–40 and 1840–80: R. F. Martin's estimates
2. The shift toward non-agricultural industries, 1800–40
3. Changes in ratio of workers to total population, 1800–40
4. Product per worker, Martin's estimates, 1800–80
5. Trends in product per worker in agriculture
6. Trends in product per worker in non-agricultural industries
7. W. I. King's estimates back to 1850

Author's Note

The paper that follows is incomplete, despite its length. It fails to deal with several aspects of the structure of national income – its distribution by origin in productive activities grouped by type of organization (corporations, individual or family enterprises, etc.), or by size of the economic unit (plant or firm), or among various regions or sub-areas within the country. For some of these changing characteristics of the structure of national income a rough picture of secular trends could be obtained, but to do so would require more time and effort than could be spared at present.

Nor is the analysis of long-term changes in national product that are discussed complete or conclusive. Completeness is hardly possible with the currently available supply of data and the scanty stock of results of past work in the field; and conclusiveness is clearly not attainable in a discussion that stays on the level of countrywide aggregates and of statistically measurable phenomena. The paper pursues the more modest aim of presenting the statistical evidence that is at hand; organizing it so that its bearing upon what we conceive to be important questions can be more clearly seen; and raising these questions as possible leads for further work.

It would be impossible to summarize these questions effectively here, since the discussion in each of the seven parts raises one or two problems that seem to me important and the full understanding of which requires a look at the particular measurement context in which they arise. I would, therefore, prefer to leave the paper as it stands, without a summary – as an incomplete effort to see the outline and to list the problems in using national income and wealth measures as tools in the study of the economic growth of a nation.

The discussion draws heavily upon the results of the work of other staff members and myself at the National Bureau of Economic Research. In particular, a stimulus to a closer review of past estimates with special attention to the longer-term changes in the structure of national product was provided by a study recently initiated at the National Bureau on trends and prospects in the formation and financing of capital in the United States, an inquiry requested and financed by the Life Insurance Association of America. I am indebted to the National Bureau of Economic

Research for full permission to use the results of its work, past and current.

The Social Science Research Council, through its Committee on Economic Growth, assisted in the mimeographing of this and other papers bearing upon the topic and submitted to the 1951 meeting of the International Association for Research in Income and Wealth; and facilitated my attendance at the meeting, the discussion at which stimulated revisions in the original draft. Miss Lillian Epstein of the National Bureau of Economic Research rendered valuable assistance in the calculation and checking of the numerous tables included. Miss Phyllis Deane, the Secretary of the International Association for Research in Income and Wealth, edited the manuscript and undertook the heavy burden of seeing it through the press. To all these organizations and friends I am sincerely grateful.

LONG-TERM CHANGES IN THE NATIONAL INCOME OF THE UNITED STATES OF AMERICA SINCE 1870

by Simon Kuznets

I. THE OVER-ALL TOTALS

TABLE I presents estimates of gross and net national product for the United States for eighty years, 1869–1948. In order to reduce detail, minimize error, and permit a clearer view of the longer-term changes, the estimates are in decade averages.

Interpretation of the evidence must rest upon a clear understanding of: (1) the concepts used; (2) the methods by which the estimates were secured; (3) the major statistical weaknesses from which they suffer; and (4) the broad biases which estimates of this type, regardless of their accuracy, possess when viewed as approximations to growth of a nation's net output. These four topics, in the order indicated, are discussed in Part I, which concludes with (5) indications of the rates of growth which the estimates reveal and of the questions that arise and that can be dealt with only through analysis that penetrates below the surface of over-all totals. That analysis and the estimates of components upon which it is based are presented in subsequent parts.

1. *The concepts used*

The concept of national income or net national product (the two terms as used here are interchangeable) that would have been followed, were the data available and the necessary analysis at hand, was described at length in 'Government Product and National Income'.[1] Viewed from the final products approach, it would include flow of all commodities and services to ultimate consumers, at cost to them; services rendered by governments to ultimate consumers; net additions to stocks of commodities in the hands of business enterprises and governments – the latter inclusive of munitions and military supplies; and net changes in claims against foreign countries, with unilateral transfers deducted if they are treated as costs (rather than gifts). The corresponding total, viewed from the flow of income approach,

[1] See *Income and Wealth*, Series I, International Association for Research in Income and Wealth (Bowes & Bowes, Cambridge, 1951), pp. 178–244.

would include payments to all factors, net of all taxes; direct services by governments to ultimate consumers; undistributed profits of corporations; net savings by governments, derived as the excess of their current receipts over current expenditures (with an analogous treatment of unilateral transfers abroad). Gross national product would equal net national product or national income thus defined, plus current consumption of durable capital in the hands of business enterprises and governments.

TABLE 1

Gross and Net National Product (Income), U.S.A. Annual Averages for Overlapping Decades, 1869-1948

(Dollar figures in billions – thousands of millions)

Decades	1929 Prices		Current Prices		Implicit Price Index [(3) : (1)] × 100
	G.N.P. (1)	N.N.P. (2)	G.N.P. (3)	N.N.P. (4)	(5)
1. 1869–78	10.4	9.40	7.06	6.51	68
2. 1874–83	14.9	13.7	8.99	8.38	60
3. 1879–88	19.5	17.9	10.7	9.94	55
4. 1884–93	23.1	21.0	11.8	10.9	51
5. 1889–98	26.8	24.2	12.7	11.7	47
6. 1894–03	33.2	30.1	15.9	14.5	48
7. 1899–08	41.3	37.5	21.7	19.8	53
8. 1904–13	49.6	44.8	28.6	26.1	58
9. 1909–18	56.2	50.3	40.1	36.3	71
10. 1914–23	64.4	57.2	61.9	55.3	96
11. 1919–28	77.8	69.0	81.2	72.2	104
12. 1924–33	82.8	73.3	79.1	70.1	96
13. 1929–38	81.7	72.0	70.0	61.3	86
14. 1934–43	99.2	87.9	92.2	80.4	93
15. 1939–48	128.4	108.9	154.8	128.5	121

Lines 1–13: From *National Product since 1869* (NBER, N.Y., 1946), Table II-16. The only change made was to take account of revised estimates of changes in claims against foreign countries since 1919, and to re-estimate the decade totals for that item prior to 1919.

Lines 14–15: Based on annual estimates for 1919–38 (*National Product since 1869*, Table I-14, column 3), extrapolated forward (by components) on the basis of the Department of Commerce estimates for years since 1938. In every case the relation for 1936–38 was used to carry earlier figures forward.

The derivation of estimates corresponding to these concepts would require, among other things, a functional analysis of

government expenditures designed to segregate services to ultimate consumers – the final product part of government activity – in accordance with an agreed interpretation of what such services are. As indicated in the earlier paper, the interpretation I prefer would limit final product of government activity to services that directly reach ultimate consumers as individuals and that have an analogue on the private markets (e.g. medical and educational services). Be that as it may, no such functional analysis is at hand, even for recent years, let alone the decades that reach back to the mid-nineteenth century. And the compromise adopted was, for 1919–38, to measure final product of government by the direct taxes paid by individuals plus the excess of the increase of capital in hands of government over the increase in government debt. Thus implicitly, final product of government was equated to direct services to ultimate consumers as measured by their direct taxes plus the net increase in government capital financed out of current receipts. In carrying this total forward and backward in the statistical estimation to be described below we assumed that direct services by government to ultimate consumers moved proportionately to the volume of consumer expenditures.

This departure from the desired, plus other shortcomings of the estimates (e.g. incomplete coverage of government capital, resulting from inability to include government inventories), does not affect materially the longer-term changes in the over-all totals through most of the period covered in Table 1. This is demonstrated in Table 2, where we compare our estimates of gross national product with the U.S. Department of Commerce totals designated by the same name, but which should properly be termed gross national expenditures. The concept employed in Table 2 differs from that followed in Table 1 and throughout this paper by the inclusion, in addition to consumer expenditures, business gross capital formation, and net changes in claims, of *all* government expenditures on commodities and services. In other words, the final product of government is identified with all expenditures of government on goods (i.e. all outlays except transfers). The difference between the two estimates, prior to the quinquennia of World War II, ranges between 6 and 14 percent of the smaller total (Table 2, column 5). All indications are that the proportion of the government sector decreases as we go back in time; and we can, therefore,

assume that the ratio in column 5, if extended back to 1869, would be nearer 1 for the earlier decades.[1]

TABLE 2

Gross National Product (NBER) and Gross National Expenditure (D. of C.), U.S.A.

Annual Averages for Successive Quinquennia, 1909-1948

(Dollar figures in billions)

Quinquennia	G.N.E. (D. of C.)		G.N.P. (NBER)		Ratio of (1) to (3)
	1929 Prices (1)	Current Prices (2)	1929 Prices (3)	Current Prices (4)	(5)
1. 1909–13	56.2	34.3	52.9	32.2	1.06
2. 1914–18	67.3	53.2	59.6	46.6	1.13
3. 1919–23	75.3	81.5	69.2	74.9	1.09
4. 1924–28	91.9	93.1	86.4	87.5	1.06
5. 1929–33	86.9	76.9	79.3	70.7	1.10
6. 1934–38	96.1	78.9	84.2	69.2	1.14
7. 1939–43	140.7	135.0	114.2	115.1	1.23
8. 1944–48	176.5	226.5	142.5	194.5	1.24

Cols. 1 and 2: Lines 5–8 are taken directly from the Department of Commerce estimates, published in the *Survey of Current Business,* July 1950 and January 1951. Lines 1–4 are based on an extrapolation of the Department of Commerce totals by a series taken from our estimates of national product, with an adjustment based on a ratio of government expenditures on commodities and services to government payments of salaries.

Cols. 3 and 4: Lines 3–8 are from the same source as Table 1. Lines 1–2 are based upon extrapolation of annual estimates for 1919–38 by W. I. King's series on national income adjusted for comparability (for the latter see *National Product in Wartime,* NBER, 1945, Appendix Table III-9, p. 141, covering 1914–21. Comparable data for 1909–13 were taken from worksheets underlying that table).

2. *The methods of estimation*

The basic estimates in the series are those for 1919–38, described in detail in *National Income and Its Composition*

[1] The difference reflected in column 5 of Table 2 is, in general, a function of the share of government in national income or aggregate payments estimated by the flow of payments method, since expenditures of government on *commodities* are related to those on services, and the latter determine the estimate for government in the national income totals. To the extent that this relation exists, the ratio in column 5 of Table 2 can be extrapolated back by the movement of the share of government in national income or aggregate payments.

R. F. Martin's estimates indicate that the share of government in aggregate payments changes as follows: 1909–18, 6.3 percent; 1899–1908, 5.6 percent; 1889–99, 6.0 percent; 1879–89, 4.9 percent; 1869–79, 4.4 percent (see my *National Income: A Summary of Findings,* NBER, 1946, Table 11, p. 40). This suggests that the ratio in column 5 would drop to about 1.04 in 1869–79.

(NBER, 1941) and carried forward to 1943 in *National Product since 1869*, Part I (NBER, 1946). They are derived by the flow of incomes approach, i.e. estimating for each major industrial sector compensation of employees, entrepreneurial income, dividends, interest, rent, undistributed profits, etc.; and taking a total of the estimates for all industries (including the net flow of income across the boundaries).

The estimates have been carried forward through recent years by using corresponding estimates of the Department of Commerce. The detail in which the latter are available permits the selection of items that assure continuity of the concept. In addition to the modifications necessary to assure correspondence to the concept used here, one other major change was made in the Department of Commerce estimates in using them to carry forward our figures: we valued war output, particularly munitions and war construction, on the assumption that it was substantially overpriced compared with nonwar production.[1] The general procedure was to splice our 1919–38 estimates to the selected Department of Commerce figures using 1936–38 as the overlap.

For the decades prior to 1919, the estimates for 1919–38 were extrapolated on the basis of approximations to the flow of finished goods and capital formation. Use of detailed production statistics on commodities permitted segregation of finished products ready for purchase by ultimate consumers. The values of these finished products were adjusted for imports and exports to estimate output destined for domestic consumption; and after further adjustment for inventory changes and addition of distribution and transportation charges the results approximated cost to ultimate consumers. These estimates reflected flow of perishable, semidurable, and durable commodities to ultimate consumers; flow of producers' durable to business enterprises and governments; flow of construction materials into consumption, and with appropriate additions for labor costs, etc., the total volume of construction. Budget studies yielded an approximate ratio of consumer expenditure on services to consumer expenditure on commodities, by which we derived comprehensive consumer outlay totals that were used to extrapolate backward the similar total for 1919–38. Finally, rough approxima-

[1] For more detailed discussion see *National Product in Wartime* (NBER, 1945) and Section I-3 below.

tions to net change in inventories and to net changes in claims against foreign countries made it possible to complete the totals of both gross capital formation and gross national product (the latter a sum of consumer expenditures and gross capital formation); and an estimate of consumption of producers' durable and construction, based on application of constant life spans to cumulated totals of flow, permitted an estimate of net national product.

One point should be emphasized. We did not have an independent estimate of flow of services to ultimate consumers for 1919–38; but we did have independent estimates of all other categories in gross or net national product (consumer expenditures on commodities, gross and net capital formation). Our estimate of expenditures on services during 1919–38 is thus a residual – derived by subtracting from national income or net national product obtained by the income flow approach, all the categories estimated by the final products approach. This means that while the final products approach is used to extrapolate the 1919–38 estimates back to 1869, it is used only as an extrapolator. The basic estimates are those derived by the flow of incomes method. Only for recent years did the Department of Commerce succeed in estimating national income and related totals by two methods, the income flow and the final products approaches – and the discrepancies are substantial in some years, even though there is some interdependence in the figures underlying the two approaches.

For further discussion of this and related points, reference should be made to *National Product since 1869* (NBER, 1946) and to William H. Shaw's *Value of Commodity Output since 1869* (NBER, 1947). For measurement of long-term changes, problems caused by discrepancies between the two approaches and by the necessity of deriving a continuous series by a combination of one method, used for 1919–38 and later years, with another method, used as extrapolator for earlier years, are not as serious as they are when interest is centered upon absolute levels and short-term changes.

3. *Possible weaknesses in the estimates*

The purely statistical defects in the estimates are numerous, and it would be neither feasible nor desirable to list them completely. We are concerned rather with those that might signi-

ficantly affect the longer-term trends; and even here we can only be selective.

(a) *The assumption of constancy of transportation and distribution charges.* This assumption was used in *National Product since 1869* for years prior to 1919, to pass from flow of commodities into domestic consumption at producers' prices to cost to ultimate consumers, both in 1929 prices. What is the extent of bias imparted to the secular movement of the decade figures – because of the growth in the relative magnitude of transportation to which commodities have been subjected and a likely growth in the proportional volume of distribution services attached to them?

One point is to be noted in this connection. The assumption related to values in 1929, i.e. constant prices, and implied a constancy of the proportional addition represented by transportation and distribution charges of finished products and of construction materials. One may ask whether, if pricing is concerned with commodities delivered to their ultimate users, a given commodity produced at place x and then transported 100 miles to a consumer should not be valued at the same price as the same commodity produced at place y and transported 10,000 miles to the consumer. If increased hauling of commodities is due to a spatial concentration of production *vis-à-vis* spatial dispersion of consumers, should we allow the price of a commodity at final cost to consumers, i.e. the goods delivered to consumer, to rise merely because of greater hauling? If we should not, then the assumption of constancy of relative transportation margins for values expressed in constant prices is valid, regardless of the increase in hauling and cross-hauling. And the same would apply, *pari passu*, to any distribution services, in so far as they do *not* represent an increased service to ultimate consumers.

If this point is valid, our assumption for estimates in 1929 prices is valid. On the other hand, our estimates in current prices may be questioned – since for final cost to consumers we use price levels governed by movements of producers' prices. The latter may well have declined *more* than the total current cost of transportation and distribution. Thus, final prices, prices to ultimate consumers, could we have measured them, might have reflected the increased hauling and volume of distribution handling not representing any real addition to final service. No

allowance for such addition is to be made in constant prices of final goods; in estimating current dollar payments by consumers, any possible increase in the relative share of payments for transportation and distribution of finished product should be included. Yet in our current price estimates prior to 1919 it is most probably excluded.

In the case of transportation charges this error is probably not sizable – largely because prices of transportation have declined so sharply during the periods when hauling has increased most. Indeed, during the decades prior to 1919 transportation prices may well have dropped much more sharply than prices of finished commodities; and the differential may go far to offset the increase in volume of transportation service. The major question concerns the distribution charges, both because they affect current dollar volumes and particularly because of a possible element in them of increased real service.

In this connection we note the figures quoted by Harold Barger in the 31st Annual Report of the National Bureau (for 1950). According to his current study of *Employment and Productivity in Trade*, gross distributive margins as a percentage of the retail value of all finished goods increased by one percentage point every decade from 33 percent in 1869 to 37 percent in 1909, remained constant through 1939, and rose to 38 percent in 1947. This means that during the decades under discussion gross distributive margins increased about one-tenth. Were we to make full allowance for this factor, whose effect on the national product totals is reduced by the inclusion in the latter of services, we would have to raise the 1909 levels by about 7 percent (or lower the 1869 levels by 7 percent). The effect on the rate of secular growth would be moderate indeed.

One could thus argue with some reason that our constant price totals, viewed as approximations to volumes of commodities delivered to consumers, are not subject to serious bias because of the assumption of a constant proportion for transportation and distribution margins between 1869 and 1919; that our current price totals may be subject to a greater error on this score, but that even here systematic errors that could cumulate into significant discrepancies, if present, are not likely to be large. At any rate, there does not seem to be much basis at present for revising the decade estimates on that score.

(b) *Changes, 1869–78 to 1879–88.* The estimates of product in

1929 prices show an unusually large increase from 1869–78 to 1879–88. The rise in gross and in net national product is close to 40 percent of the mid-decade base.[1] No comparable rises occur in any other decade in the period.

This large rise is directly traceable to that shown for the 1869–79 decade by Shaw's series in constant prices: the sum of finished products plus construction materials rises from $2,298 million in 1869 to $4,353 million in 1879, both in 1913 prices (see *Value of Commodity Output since 1869*, Table I-3, p. 76), or 38 percent of the mid-decade base.

The possibility of an understatement in the Census of Manufactures for 1869 has been noted by Shaw (*ibid.*, pp. 80–1) who sets the possible undercoverage at about 5 percent; and in *National Product since 1869* (p. 60), where a maximum possible understatement of 10 percent is admitted. In a lengthy discussion of the Census of Manufactures deficiencies, Francis A. Walker calculates the possible omissions from the 1869 Census (allowing for underreporting and omissions associated with the $500 exemption, failure of marshalls, etc.) to be about 13 percent in terms of gross value product (see *The Ninth Census of the United States*, Vol. III, pp. 371 ff.). However, in his discussion in the 1880 Census of the rise in manufacturing between 1850 and 1880, he makes no correction in the totals for 1869 although he does refer again to discrepancies between Census of Manufactures and Occupational Census data – an oblique indication that he no longer felt sure about the legitimacy of the upward adjustment made a decade earlier. Be that as it may, one can reasonably assume that the understatement in the 1869 Census of Manufactures is not larger than 10 percent; and is perhaps somewhat smaller.

If there were a firm basis for such an adjustment for 1869, and particularly if with such an adjustment the totals for 1879 could stand as published, the estimates could have been modified easily. Indeed, anyone can change the figures in column 1 of Table 1 by raising the 1869–78 average 5 percent, and that for 1874–83, 2.5 percent. Subtraction of capital consumption (derivable from columns 1 and 2) would yield a corresponding total of net national product in 1929 prices; and application of the

[1] The base for all calculations of percentage changes here is the geometric mean of the initial and terminal values in the comparison, thus avoiding the exaggeration of the rate of increase caused by using the initial value as base and the understatement of the rate of increase caused by using the terminal value as base.

price index in column 5 would yield adjusted figures for current price volumes in columns 3 and 4. We did not make the adjustment here, because we had no firm basis for 10 percent in 1869 and 0 in 1879, and because the effect on the *decade* averages was relatively minor.[1]

(c) *The war periods.* Two aspects of the estimates for war years are subject to qualification: one relates to omissions because of the exclusion from Shaw's figures of government plants; the other concerns the valuation problem.

Since the Shaw series, basic in the estimates, omit government manufacturing establishments, finished products that the latter turn out are automatically excluded from the estimates. Such an omission is insignificant during peacetime, but becomes sizable during war years. More specifically, our estimates for 1918 and 1919 are probably on the short side because of this omission: the shortage affects both gross and net national product totals in so far as output of munitions (but not of any other war item) by government plants was not included.[2] At present we have no adequate basis for correction; nor does such an adjustment seem important in any use of the estimates for analysis of secular changes.

The Shaw series are not used in our estimates after 1918–19, and hence the totals for World War II are not affected by the omission just noted: they are based on Department of Commerce totals as extrapolators, and should reflect any increase in munitions output caused by increased output in government plants. The problem for this period is one of comparative valuation of war production and civilian production: presumably a similar problem existed in World War I, but it was much smaller, partly because of the relatively smaller weight of war

[1] An additional difficulty would arise in adjusting the components. Since there is no proper basis for specific adjustment of components, it may well become necessary to provide an adjusted variant for the over-all totals alone; and retain the unadjusted totals in dealing with the components. Furthermore, revision of producers' durable commodities and construction between 1869 and 1879 would affect the estimates of capital consumption in subsequent decades. A revision, if it is to be made, would thus have to specify at least the adjustments in producers' durable commodities and construction.

[2] We mention 1918 and 1919 because large war output by government plants was not attained until after 1917 and continued for a while after the war was over.

The Spanish-American War of 1898 is not discussed because its effect on the economy was quite minor. But it may have contributed to the excess of the share of government in aggregate payments in 1889–98 compared with its share in the first decade of the twentieth century (see Martin's figures quoted in footnote, p. 32).

production, partly because the contrast between controlled price levels of civilian output and the relatively uncontrolled price levels of war output was less striking then.

The estimates here utilize the downward adjustment of price levels of war production through 1943 discussed in *National Product in Wartime*; and assume that after 1943 no further changes in relative levels between munition prices and civilian prices occurred. (This assumption is implicit in the use of Department of Commerce 1939 price totals as extrapolators.) They also, unlike Department of Commerce totals, exclude from gross national product all nondurable war expenditures (as well as all other government purchases of services that are not covered in the implicit allowance for direct taxes paid by individuals).

The element of arbitrariness in the treatment of the comparative price levels of war output is obvious indeed; yet one cannot help but feel that without such an adjustment, the resulting estimates make little sense. The Department of Commerce alternative of using the 1944 prices of munitions, instead of the 1939 (*Survey of Current Business*, January 1951, p. 11), is a partial solution of the difficulty, but still neglects the obvious fact that there was a marked and accelerated rise in efficiency of war production from 1941 to 1944, and thus underestimates the true rise in the volumes of at least the complex types of munitions from 1941–42 to 1944. What is more important, in using the 1944 price levels, it assumes that there was no overpricing of war production in that year relatively to price levels in civilian production – whereas our estimates still assume substantial overpricing of war output even in 1944.[1]

Partly because of the allowance for overpricing of certain

[1] In the estimates in *National Product since 1869* (see Table I-10, p. 44) we used, in deflating the prices of munitions and war construction, an index based on assumption *a* in *National Product in Wartime* (see Table II-4, p. 52). The price index of war output on assumption *a* is there shown as 165 in 1939 and 182 in 1943, compared with a price index for flow of goods to consumers of 100 in 1939 and 134 in 1943. The implicit price indexes in the Department of Commerce 'deflation' are: for personal consumption expenditure—100 in 1939, 131 in 1943, and 138 in 1944; for federal government expenditure on goods—100 in 1939, 139 in 1943, and 136 in 1944.

While the Department of Commerce price index for federal government purchases is not directly comparable with our index of prices of war output, the levels for 1943 and 1944 should be roughly comparable because of the preponderance of war output in total federal expenditures. Thus, our estimates imply an overpricing of war goods at a level of about 36 percent in 1943 and 1944 (compared with 65 percent in 1939), whereas no such overpricing is allowed in the Department of Commerce estimates (where 1944 munitions prices are treated as comparable with 1944 civilian prices).

types of war production, partly because of the exclusion of non-durable war output (essentially pay and subsistence of armed forces), the movements of both the constant price volume and the implicit price index in our gross national product total differ substantially from those in the Department of Commerce gross national expenditure during war years.

	Gross National Product		D. of C. Gross National Expenditure	
	Volume: 1929 prices ($ billion) (1)	Price index 1929=100 (2)	Volume: 1929 prices ($ billion) (3)	Price index 1929=100 (4)
1939	96.8	83.1	110.3	82.8
1940	105.5	84.7	120.8	83.9
1941	117.9	92.6	139.6	90.5
1942	122.5	112.2	156.7	103.1
1943	128.3	124.2	176.1	110.4
1944	131.5	130.2	189.6	112.7
1945	134.9	131.1	185.4	116.1
1946	146.2	129.1	167.2	126.2
1947	149.6	139.6	167.5	139.3
1948	150.5	150.8	172.9	149.9
1949	147.7	149.0	172.0	148.6

Whereas our figures for volume of output rose to a peak in 1948, and the rise in prices was already large during the war years, the Department of Commerce showed a peak in volume in 1944 and only a moderate price rise during the war. It seems to me that on both scores the Department of Commerce totals yield results difficult to accept; and that the adjustment for over-pricing of war production, arbitrary as it may be, is preferable to no adjustment, or to one which, like that of the Department of Commerce, fails to meet the issue.

4. *The major biases*

The possible statistical weaknesses just discussed deal with questions of accuracy alone, and do not touch upon the major biases that may be inherent in all estimates of the type presented, no matter how precise the data on which they are based. These major biases are discussed under three broad heads: (a) scope, (b) netness, (c) valuation.[1]

[1] The ideas presented in this section parallel those discussed in comparisons of national income measures for industrial and pre-industrial countries, in 'National Income and Industrial Structure' (published for the Econometric Society in *Proceedings of the International Statistical Conferences*, Vol. V, Calcutta, 1950, pp. 205–41).

(a) *Scope.* In a growing economy, with increasing industrialization, commercialization, and urbanization, a number of economic processes formerly carried on within the household or the family unit are either completely abandoned or replaced by similar processes organized on a commercial basis. It is rarely possible to include in estimates of national income the full product of processes carried on within the household and in many cases the latter is specifically excluded for lack of data. In contrast, the estimates do attempt, fairly successfully, to include all products turned out by business firms, particularly those organized in corporations or in firms in which the business processes are strictly separate from the household and family life. It follows that a series covering a period during which the proportion of total economic activity carried on within the household and the family has declined, is subject to an upward bias if taken as an approximation to total economic product – because its growth is in part the result of a shift of production from the unrecorded sphere of the family and the household to the recorded area of organized business and public.

Numerous illustrations of this point can be adduced. They fall into two major classes: (i) types of production carried on in the past within the household (baking, preserving, sewing, etc.) that are either discontinued or replaced by similar functions carried on in the business sphere; (ii) types of capital formation within individual firms, particularly farm enterprises (farmers' work on clearing, draining, etc.). A somewhat less important class is (iii) products of side-line occupations within the family or the household (cultivating gardens, keeping cows). Finally, one must consider (iv) the services that a large and well knit family organization renders to its members (as a kind of bank, insurance company, etc.), although this may be treated as a subclass of (i) above.

There is little doubt that customary national income estimates, like those in Tables 1 and 2, fail almost completely to cover economic production of the type suggested by the classification in the preceding paragraph. It is also clear that the decline in *relative* importance of such production over the period covered by our estimates must have been quite marked. During these decades urban population increased from about a quarter of the total in 1870 to almost 60 percent in 1950; population in places of 100,000 inhabitants or more rose from somewhat over

10 percent of the total in 1870 to almost 30 percent in 1950; the median size of family dropped from somewhat under 5 in 1870 to slightly over 3 in 1940. There was in addition, under the impact of technological change and increasing productive power, a marked penetration of the business economy into the household, an increased replacement of household performance by business performance – even if, as in the case of household equipment and recreation tools, the production still took place within the home rather than outside. And as far as activity within the individual firm is concerned, there was in addition an upward trend in accountability, which added to the upward bias associated with limitation of scope.[1]

Although aware of the upward bias associated with the limitation of scope, we cannot, at the present writing, assign any magnitudes to it: we cannot tell whether the rise shown by the present estimates should, on this account, be scaled down 1 percent, 10 percent, or more. The adjustment could be made by careful and detailed study of the operations of the household economy and of individual firms in the past, compared with their performance and the performance of the business and public economy today. No such study is at hand.

(b) *Netness.* In an economy of the type discussed here, growth is accompanied by increasing complexity of organization which in turn imposes certain costs. These costs are borne by consumers and producers, and in fact enter the magnitudes of consumer expenditures and of net capital formation, i.e. enter the 'nettest' measure of the nation's total product, in either current or constant prices. Yet these elements are costs rather than net product in any genuine sense of the term: they do not represent additions to the real stock of goods flowing to ultimate consumers, nor to the stock of capital for future use – certainly not as compared with identical goods flowing in the past either to ultimate consumers or into net additions to stock.

These costs that enter our net product measures in increasing proportion in recent decades may be grouped under three heads. The first is the increased volume of transportation and distribution (and such overhead costs as are represented by intermediate governmental services, when they are included in national pro-

[1] For example, increased taxation burdens in recent decades made for a much more complete accounting of internal capital formation, whereas formerly, even corporations were negligent in their accounting practices.

duct), occasioned by the concentration and growing complexity of organization of production. In a nation with growing population, rising technology and increasing scale of productive operations, the amount of hauling, distributive services, and supervision of the economy involved in getting the increasingly complex industrial system to work properly grows more than apace. Compared with a simpler situation where producers are in proximity and more direct contact with consumers and ultimate purchasers, and where a smaller burden falls upon the supervising social agencies, the increase in transportation, distribution, and supervision services is to a large extent a cost rather than a net return to society. Yet the corresponding inputs of resources are entered in national income or net national product; and no price adjustment can be counted upon to eliminate fully this increasing element of grossness in our net totals.

The second category is associated with added costs of urban living, a large part of which is designed to offset the extra burdens of city life, compared with the simpler type of living away from urban centers. The higher cost of shelter, the added cost of transportation in urban communities compared with non-urban, are illustrative of this category. The increasing element of grossness introduced by these extra costs of urban life, like that introduced by added transportation and distribution costs, might perhaps be handled statistically through a close cross-section analysis of prices for comparable commodities and services in the city and in the country. It might be possible to derive from such an analysis an approximation to the greater cost of a comparable bundle of final goods associated with the shift of the national economy from rural to urban life. Such an analysis, which would have to take into account the shift not only from the farm to the city but also toward larger communities within the urban area, is unfortunately not at hand; and its difficulties, inherent in the marked difference of the structure of consumer expenditures among communities of different size and in the different distributions of final buyers of capital goods are apparent enough.

The third category includes the additional costs involved in participation in the highly developed money and credit civilization accompanying economic growth in countries like the United States. The expenditures on banking and related services, on

group organizations of various descriptions (such as trade unions, producers' associations, organizations that handle assets belonging to individuals) are surely in the nature of costs rather than of payments for any ultimate services of benefit to individuals as human beings. Yet they are included in consumer expenditures, and thus in the nettest total that is available.

The elements included under the three categories just described obviously also introduce an upward bias into the estimates of net national product, in constant prices, if they are considered approximations to the total *net* output of the economy. The magnitude of such a bias, for the period covered in Table 1, could be approximated only from a functional analysis of consumer expenditures, standards, and cost of living, and of differential pricing between communities of various sizes. No such analysis is at hand, at least for a period long enough to be useful for our purposes. However, some suggestion as to the effect of the shift from the country to the city on a proper price adjustment of our totals is provided in Part II.

(c) *Valuation.* Discussion of this point should take account of the adjustment for price changes followed in deriving the estimates in constant prices. This adjustment involves for most of the period: (i) securing estimates of flow of finished products, at *current* prices, by the narrowest categories the production statistics permit; (ii) obtaining price indexes for corresponding groups of products, 1929 being the base year; (iii) dividing the current price volumes by the price indexes, thus obtaining estimates in 1929 prices; (iv) summing the volumes under (iii) to secure gross (and finally net) national product or income in 1929 prices. It must also be remembered that the available price data most often underrepresent *new* products, those that technological progress and the growth of the productive capacity of the nation bring on the scene; and that for products that have had marked quality changes, such changes are not properly reflected in the price data.

We should consider the effect on our measures of growth over time of two aspects of the price adjustments procedure just outlined: (i) the use of 1929 as the base year; (ii) the underrepresentation in the price data of new products and of quality changes. These effects can be illuminated by simple arithmetical illustrations.

Assume that at point I, say 1869, and at point II, 1929,

national product consists of two finished products, A and B, and that their quantities and prices are as follows:

	I	II
1. Quantity of A (units)	1,000	10,000
2. Price per unit of A	$10	$5
3. QPA (1×2)	$10,000	$50,000
4. Quantity of B (units)	2,000	4,000
5. Price per unit of B	$15	$20
6. QPB (4×5)	$30,000	$80,000
7. National product, current prices	$40,000	$130,000

The price adjustment corresponding to our procedure, on the *assumption* that we have complete price information and that the prices listed above reflect quality changes, can be set up as follows:

Price adjustment, using II as base year, complete information

	I	II
1. Price index for A	200	100
2. QPA, 1929 prices	$5,000	$50,000
3. Price index for B	75	100
4. QPB, 1929 prices	$40,000	$80,000
5. National product, 1929 prices (2+4)	$45,000	$130,000

Percentage rise from I to II equals 289 — (1,000, % rise in quantity production of A) × (0.11, weight of A at I, with quantities weighted by prices of II) + (200% rise in quantity production of B) × (0.89, weight of B at I, with quantities weighted by prices of II).

If we use I (i.e. the earlier year) as the base for price indexes, the rise shown in the national product in constant prices is appreciably greater.

Price adjustment, using I as base year, complete information

	I	II
1. Price index for A	100	50
2. QPA, 1869 prices	$10,000	$100,000
3. Price index for B	100	133.3
4. QPB, 1869 prices	$30,000	$60,000
5. National product, 1869 prices (2+4)	$40,000	$160,000

Percentage rise from I to II equals 400 — (1,000) × (0.25, weight of A at I, with quantities weighted by prices of I) + (200) × (0.75, weight of B at I, with quantities weighted by prices of I).

The choice of the base year has this effect so long as the implicit assumptions of the illustration are kept, viz. that there is a *negative* correlation between the proportional changes in quantities and the proportional changes in prices. Because in the illustration, the greater growth in the quantity of A is combined with a price decline in A, whereas the lesser growth of B is associated with a price rise in B, the percentage rise in national product in prices of II is much smaller than that in national product in prices of I. Yet this implication is, on the whole, valid: among the several products, greater growth would be exhibited by relatively new products subject to rapid technical improvement and correspondingly to a rapid downward (or lesser upward) price movement.

But while the use of a recent year as price base results in a smaller rate of growth than the use of an initial or earlier year, and in a sense imparts a *downward* bias to the estimates, 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, shown in the illustration, 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 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.[1]

While there may be some quarrel with this view of the current year (or generation) base as desirable in the analysis of long-term growth, there will be little dispute about the effects of the other aspect of the price adjustment procedure – underrepresentation of new products and inadequate reflection of quality changes. Since new products are precisely those likely to show the greatest price declines or smallest price rises, the failure to give them proper weight will necessarily underestimate the extent of a price decline (or overestimate the extent of a price rise). Consequently, the growth shown in total product in constant prices will be smaller than it is in reality. For example, if only the price for B (an old product) is available for I and we have to use this price to estimate the price change in A (a new product), the national product for I in 1929 prices will become $53,333; and the percentage rise from I to II will be 243, compared with 289, when complete price data are available. Likewise, since quality changes are, in the overwhelming majority of cases, improvements, failure to reflect them introduces an upward bias into the price indexes and a consequent downward bias in the price adjusted estimates of national product.

The magnitude of the downward bias introduced by failure to take account of quality changes can scarcely be measured, but offhand it seems quite large for certain types of products – particularly those that are furthest removed from the elemental needs of food and clothing and that have grown proportionately so rapidly in a high consumption economy like the one under consideration. The quality changes in many capital goods are even more striking.

[1] The analysis in the text applies to adjustment for price changes for *each* good or for each category of goods within which the price movements are *identical*. If, however, we adjust for price changes by dividing current price totals by aggregative price indexes, the use of a price index with terminal year weights will yield a production index with initial year price weights; and, vice versa, dividing by a price index with initial year weights will yield a production index with terminal year price weights. Obviously the division referred to above, substituted for the multiplication used in the examples (and equivalent to division by price indexes for each good), reverses the biases emphasized in the text. I am indebted to my colleague, Richard Easterlin of the University of Pennsylvania, for calling my attention to this point.

5. *The rate of growth*

If the estimates of the type presented here are subject to these major biases, should any further attention be paid to them? Is the effort of preparing the estimates and of calculating patterns of change warranted if, as approximations to the true net product of all economic activity, they are subject to major biases whose magnitude cannot be measured?

The question must be faced squarely; and if answered affirmatively, the implication of such an answer should be brought out. It is my belief that the answer should be in the affirmative, for two basic reasons. The first is the assumption, for which there are some plausible grounds, that the biases are not so large as to invalidate completely differences in the rate of change over time when these differences are truly conspicuous. If, in using customary measures of national product, we find that in one country the rate of growth over the last 70–100 years was about 1 percent per decade, whereas in another it was 30 percent per decade, it would seem to me beyond reasonable doubt that the growth of the economy's unduplicated total product was significantly greater in the latter than in the former country. Likewise, if in studying the record for the United States, on the basis of estimates whose statistical foundation is acceptably firm, we find that over one period of some 30–40 years, the rate of growth per decade was almost twice as large as that for another period of the same duration, I would be strongly inclined to accept this as evidence of a significant difference in the rate of growth. In other words, the biases discussed above cannot be assumed to be so large as to negate completely large differences in the statistical totals. How large such differences should be before they can be assigned significance depends partly upon the nature of the inference to be made, partly upon the consistency of the differences over time and among the significant components of the total, and partly upon the extent to which the statistically shown differences can be 'explained', i.e. connected with other information (outside the range of the estimates themselves) that has been accumulated within the framework of economic analysis and study.

The second basic reason for proceeding with the effort, despite the major biases, is that such measurement seems to me the only way or perhaps one among very few ways of building

up empirical knowledge in our field in a consistently cumulative fashion. It is an inestimable advantage of quantitative measures of the type used here that they can be tested; and despite continuous revisions, retained as a basis of ever increasing stock of knowledge. Even the need for continuously shifting the bases of valuation does not invalidate this observation: while our successors a generation hence will be recalculating all our measures with a new system of weights, much of the information contained in our present work will be retained, and the proportion of the latter is likely to be high. In this respect, empirical studies of the type discussed here carry the advantage of cumulability of results which, unfortunately, is not possessed by the results of application of analytical imagination checked and buttressed only by data whose provenance may be direct and untestable observation (or introspection) and whose character is such that no quantitative comparison and addibility is possible. It is, therefore, an indispensable part of long-term strategy in the development of accepted knowledge in the field that we proceed with the measurement, in full cognizance of the limitations to which the results are subject.

All this is by way of preface to and apology for the calculation of the rates of change and growth in the over-all totals presented so far, and similar calculations to be applied to other aspects of the measures or their components in later parts of this paper.

The rates of change presented in Table 3 are in percentage terms, per decade; and, for reasons indicated in footnote, p. 37, are calculated with the geometric mean of the initial and terminal values of each interval as base. The figures in brackets reflect a rough adjustment for possible underestimate associated with the undercoverage of our figures in 1869–70 – on the assumption that the 1869–78 gross national product total is 95 percent and that for 1874–83 97.5 percent of the true levels.

The conclusions suggested by this simple analysis can now be briefly summarized.

(*a*) It is apparent that the rates of change, even though based on decade averages and hence presumably eliminating almost completely changes associated with business cycles, are still subject to marked fluctuations. Three long swings emerge: one with a tentative peak about the late 1870's and a trough about the early 1890's; the second with a peak about the early 1900's and a trough about 1910–12; the third with a peak about the

TABLE 3

Percentage Rates of Change per Decade, National Product in 1929 Prices, U.S.A., 1869-1948

Intervals	Gross National Product		Net National Product	
	Change from Decade to Decade (1)	Five-item Geometric Mean (2)	Change from Decade to Decade (3)	Five-item Geometric Mean (4)
1869–78 to 1874–83	43.3 (39.6)		45.7 (42.0)	
1874–83 to 1879–88	30.9 (27.6)		30.7 (27.4)	
1879–88 to 1884–93	18.5	26.1 (24.8)	17.3	26.2 (24.9)
1884–93 to 1889–98	16.0	22.6 (22.0)	15.2	22.3 (21.7)
1889–98 to 1894–1903	23.9	20.5	24.4	20.1
1894–1903 to 1899–1908	24.4	19.5	24.6	19.1
1899–1908 to 1904–13	20.1	19.2	19.5	18.8
1904–13 to 1909–18	13.3	18.6	12.3	18.1
1909–18 to 1914–23	14.6	14.9	13.7	14.3
1914–23 to 1919–28	20.8	10.5	20.6	10.0
1919–28 to 1924–33	6.4	12.0	6.2	11.8
1924–33 to 1929–38	−1.3	14.8	−1.8	13.7
1929–38 to 1934–43	21.4		22.1	
1934–43 to 1939–48	29.4		23.9	
1869–78 to 1939–48	19.7 (19.2)		19.1 (18.7)	

Entries in brackets, ( ), reflect an upward revision of the product levels for 1869–78 and for 1874–83 (see text).

All calculations are based on Table 1. Percentage changes, here and in all subsequent tables unless otherwise noted, are to the geometric mean of values for the initial and terminal decades of each interval.

middle of the 1920's and a trough about the middle of the 1930's; and an incomplete fourth, whose trough is in the middle of the 1930's and whose peak cannot be dated at present with any confidence. These fluctuations in the rate of growth are marked, to a point where any approximations to underlying trends and any attempt to deal with average rates of growth and their retardation must depend upon our ability to interpret these swings and cancel them out, both statistically and analytically.

The swings just noted are appreciably shorter than the 50 year Kondratiev cycles, and much longer than the 9 to 12 year Juglar cycles – both championed by Professor Schumpeter. But we cannot, and need not, concern ourselves here with an attempt to 'type' these swings: a better basis will be provided when similar measures are available for several countries, and when

the movements of the components are analyzed. Nor is it useful to attempt to distinguish phases within the period covered, in accordance with the practices of historical accounts: so many important events, distinguished in historical accounts as revolutionary and epoch making, find little apparent reflection in the massive statistical aggregates for the economy at large. In a sense all history is a succession of innovations and changes; yet the broad institutional patterns of society in many periods change only slowly and statistical aggregates tend to persist. At any rate, it seemed undesirable to limit the possibilities of analysis by excluding war periods, drawing lines that would distinguish a new era or phase from an old, and the like. Instead, the estimates for decades, the shortest unit for which they are fully available for the period, were used; rates of change were calculated for them; and any shorter term perturbations in these rates were eliminated by a simple statistical smoothing procedure.

(*b*) After smoothing out the swings by simple statistical devices, we find that the underlying rates of change show a significant drop – from a level of about 20–25 percent per decade at the beginning of the period, to about half that level at the end. Even prior to the depression of the 1930's, which pulls the rate of growth down so drastically, there is a distinct decline in the rate of growth. The impression of a significant retardation in the rate of secular growth persists; and is much stronger when the later periods are included, with full allowance for offsetting the great depression of the 1930's by the expansions that preceded and that followed it.

(*c*) The average rate of growth over the period as a whole, calculated from first to last decade, is 20 percent per decade for gross national product and 19 percent for net national product. Whether such growth is markedly large, about average, or small, could be known only from comparisons with the experience in other countries. Only from such comparisons can greater meaning be read into the figures, in the sense that these various rates of growth would be associated with differing bodies of experience.

At this point it is perhaps appropriate to raise another basic question, the discussion of which would serve as a useful prelude to the analysis that follows in the other parts. Should rates of change, of the type presented in Table 3, be referred to as rates of *growth* or of *secular movement*? The former expression implies that there is, for national economies, a process of growth similar

to that of other types of organized systems such as biological species; and that the rates shown here are measures of growth similar, let us say, to an index that would combine increase in height, weight, length of various organs, etc., for a living individual. The idea carries with it a normative concept of growth, so that departures from the latter (either excesses or deficiencies) would be considered evidence of abnormality. In this sense, the rate of change may be too high and instead of growth be hypertrophy; and there may be cases of too low a rate of change, even a decline, which would imply inadequate growth or decay. And even if we deal with the more neutral concept of secular movement, the implication is that the rates reveal some persistent trend over time – so that those shown, particularly the ones that result from smoothing the longer swings, are somehow indicative of the paths that the national economy is likely to pursue in the future. In other words, the rates of change are viewed as reflecting some long standing and only slowly changing factors so that the trends have a projection value into the future and are not mere descriptions of the past.

There is little question that the deep interest that attaches to measures of long-term change in aggregates of the type presented here is associated with the normative implications of the concept of growth, or with the analytical implications of the concept of secular movements, or with both. No matter how strongly we may fight shy of these implications, it is commonly our hope that further study and particularly further analysis of the components of long-term change and of its pattern over time will yield results that will permit us to assay more clearly the implications just alluded to. We want to study the long-term changes not only in the over-all totals but also in all their components – some of which will be discussed in the later parts – because a process of change where a rapid rise in national product is accompanied by a huge growth in population and by stability in per capita income has quite a different meaning from one where the rise in national product is accompanied by a significant rise in per capita income. A long-term rise in national product in which increasing diversification among industries occurred has a different meaning from one which was due almost exclusively to one industry (e.g. building public monuments for a dictatorial government, or producing munitions for a warlike state while the population continues to live on a

pittance). Examples of such differences in meaning could be multiplied; and it is clearly the possibility of such differences that almost naturally leads to pushing the measurement and analysis of long-term changes into the structural framework of the economy and of the society. This is obvious enough. But the point to be emphasized here is that these different meanings reflect some notions that we have concerning 'healthy growth' or 'hypertrophy' – however differently we may define the criteria involved and however far each of us may be willing to go in using concepts of welfare as guides in diagnosing the meaning of changes in aggregate national product. Also, the meanings are different in the sense that we have some knowledge or at least some notion as to the types of change that provide a basis for future change, the types of secular movements that are likely to carry into the future, and those that are not – however we may differ in the readiness to push our analysis of individual and group motivation, or of the theory of relation among factors of production in the long run, as basis for such inferences. It seems to me important to recognize that our strong interest in and effort to extend measurement of long-term changes to such components as are revealed by industrial classifications, relation of income to population and to capital, the distribution of product by final use, etc., all stem either from convictions that there are criteria of 'healthy' and viable growth, or from hopes that further analysis will at least lead us toward a better perception of these criteria and to a salutary scepticism concerning such criteria as are urged without due regard to the variety of historical experience.

II. POPULATION AND PER CAPITA

In the present part long-term movements of national output are compared with those in the country's population, using three variants of the former: (1) net national product or national income; (2) flow of goods to consumers; (3) the latter, including allowance for increased leisure resulting from a decline in standard working hours. All measures of output or consumption are, for obvious reasons, in constant prices. The aim of the comparisons is to relate net output of the economy to the number of people for the satisfaction of whose wants the economy is presumably operating.

1. *Population and national product per capita*

The estimates of total population (Table 4, column 1) are based, for years prior to 1920, on annual totals for foreign born whites, derived from a special NBER study of immigration and foreign born statistics by Ernest Rubin, and on totals for native born (plus foreign born non-whites, a negligible fraction) interpolated annually along a *log* straight line between decennial census totals. Beginning with 1920, an acceptable annual estimate of population based upon birth rates, death rates, and migration has been prepared by the Bureau of the Census.

The longer-term movements in population are similar to those observed in net national product in constant prices, in two respects. Like the latter, they show a distinct retardation in the rate of growth, particularly apparent when the decade rates are smoothed by a five-item moving geometric mean (column 3). The drop in the rate of growth per decade, to about half that shown in the beginning of the period, is of almost the same order of magnitude as the drop in the rate of increase per decade in national product.

Of more interest, because less expected, are the long swings in the rate of growth in total population – not dissimilar in duration to those observed in national product (see Table 3). But the timing shows, fairly consistently, a lag in the turns of these swings in population rate of growth behind those in national product.

Further discussion of the relation between growth of population and national product must await the analysis of components. We merely note here that a reciprocal relation seems to exist between the rates of growth of the two aggregates; and at least on the basis of timing, the swings in the rate of growth of national product seem to induce, with some lag, swings in that of population.

More relevant in the present connection is the movement of net national product per capita (columns 4–6). On the average, per capita product, in real terms, increased about 10 percent per decade; this rate of increase is characterized by swings of 20–25 years in duration; and the underlying trend, suggested by the five-item geometric means, is a decline in the rate of growth. However, the retardation in the rate of increase in per capita product is much less marked than that in the rate of growth of total national product observed in Table 3.

TABLE 4

Population and Net National Product (1929 *Prices*) *Per Capita U.S.A.*, 1869-1948

(Annual averages for overlapping decades)

Decade	Population (million) (1)	Percent Change per Decade (2)	Five-item Geometric Mean of (2) (3)	N.N.P. per Capita $ (4)	Percent Change per Decade (5)	Five-item Geometric Mean of (5) (6)
1869–78	43.5			216		
1874–83	48.8	12.2		281	30.1	
1879–88	54.9	12.5		326	16.0	
1884–93	61.2	11.5	11.2	343	5.2	13.5
1889–98	67.6	10.5	10.7	358	4.4	10.4
1894–03	74.0	9.5	10.3	406	13.4	8.9
1899–08	81.3	9.9	9.8	461	13.5	8.5
1904–13	89.6	10.2	9.2	500	8.5	8.8
1909–18	97.6	8.9	8.8	515	3.0	8.6
1914–23	104.9	7.5	8.2	545	5.8	5.7
1919–28	112.9	7.6	7.1	612	12.3	2.7
1924–33	120.6	6.8	6.0	607	−0.8	5.5
1929–38	126.0	4.5	5.6	572	−5.8	7.7
1934–43	130.8	3.8		672	17.5	
1939–48	137.8	5.4		790	17.6	
1869–78 to 1939–48		8.6			9.7	

Col. 1: For years prior to 1920, the sum of annual series for foreign born white, estimated by Dr. Ernest Rubin in a detailed analysis of migration and foreign born data, and of census totals for other population interpolated along a *log* straight line between census dates. Beginning with 1920, annual estimates of the Bureau of Census (*Historical Statistics of the United States*, Washington, 1949, Series B-31, p. 26).

Col. 4: Col. 2 of Table 1 divided by col. 1.

Dates of Peaks (*P*) *and Troughs* (*T*) *in Rate of Growth per Decade Net National Product in* 1929 *Prices and Total Population*

Net National Product	Population	Lag in Decades
P* . 1869–78 to 1874–83	P . 1874–83 to 1879–88	0.5
T . 1879–88 to 1884–93	T . 1889–98 to 1894–03	1.0
P . 1894–03 to 1899–08	P . 1899–08 to 1904–13	0.5
T . 1904–13 to 1909–18	T . 1909–18 to 1914–23	0.5
P . 1914–23 to 1919–28	P . 1914–23 to 1919–28	0
T . 1924–33 to 1929–38	T . 1929–38 to 1934–43	0.5
P* . 1934–43 to 1939–48	P* . 1934–43 to 1939–48	0

* These dates are tentative since they occur at the beginning or end of the period.

The most important testimony of Table 4 is in connection with the marked increase in per capita product – amounting for the seven decades to over 250 percent. The judgment upon such a record is quite different from that which would be provoked by, say, a threefold increase in national product accompanied by a threefold increase in population, and a constant level of per capita product. A record showing a rise in aggregate national product accompanied by a constant per capita product would most likely be judged more negative than that revealed in Tables 3 and 4.

Three reasons for this probable difference in judgment immediately come to mind. First, the assumed growth of population associated with and causing per capita income to remain constant (despite large growth in aggregate product) would most likely keep the structure of consumer demand heavily weighted by necessities, and by correspondingly greater pressure upon natural resources in extractive industries. Second, failure of per capita product to rise would presumably mean failure to build up economic reserves (and leisure), thus limiting a fruitful source of further increase in over-all productivity usually found in increased outlays on education and other services associated with rising product per capita. A constant per capita product (presumably at levels lower than would otherwise be the case) would thus bar improvements in quality of the labor force and additions to the stock of technological knowledge that ordinarily result from greater outlays on education, health, etc. Third, the free choice of individuals and society between increase in the standard of living associated with higher per capita real income and increase in numbers is not likely to be exclusively in favor of the latter. In other words, because of the first two reasons, a rise in aggregate product offset by an equal growth in population provides a much less viable basis for further growth than the combination of a large growth in both aggregate and per capita product. As to the third reason – that a growth in aggregate income combined with an equal growth in population does not correspond to the free choice of individual consumers and society – if such a combination does materialize it can, most probably, be ascribed to lack of free choice. While it is difficult to compare welfare equivalents for social groups of different size, we somehow sense a lower standard in a combination of large growth in aggregate product, an equally large growth in

population numbers and constant per capita product, than in the combination of an identical growth in aggregate product, smaller growth in population, and a substantial increase in per capita product.

The notes just made contrast a situation in which per capita income increases substantially with one in which there is no increase; and even so our judgment may be at fault. But this provides little illumination on a much more difficult problem: What particular rate of growth of population is most conducive to the maximum increase in aggregate product, or in per capita product? If the population of the United States had increased not to about 150 million but to perhaps 175 or 200 million in 1950, as it easily might have with a different immigration policy after World War I, might the growth not only in the aggregate but also in per capita income have been greater than it actually was? Or if the population of the United States had grown more slowly, say because of an earlier limitation of immigration, might the growth in aggregate product have been the same and in per capita terms higher? The question is particularly intriguing and realistic for a country like the United States which has a high attractive power, and which, therefore, does not have to rely on the slowly moving natural factors for its population increase. But intriguing as the question is, we have no clearly discernible basis upon which to deal with it. Both our empirical data and our theory as to the interrelation between population numbers, total product, and per capita product in the process of economic growth are too scanty for the purpose; and they are particularly inadequate for dealing with the question in its bearing upon the United States where alternatives in population policy would have wide international ramifications and alternative consequences not only within the country but in the international situation.

2. *Flow of goods to consumers, per capita*

Section II-1 dealt with total national product, including net capital formation; yet the emphasis in the discussion here is on the meaning of product as a source of satisfaction of the wants of ultimate consumers. It may be argued that from this standpoint the flow of goods to consumers alone should be taken into account. The argument is defensible only on the assumption that net capital formation is not negative and the flow of goods

to consumers does not increase at the expense of capital stock, imperilling the viability of the whole process of economic growth; or on the assumption that continued growth is possible with a decreasing per capita stock of capital, a premise that is not as absurd as it may seem if the decrease is kept within moderate limits. But regardless of the validity of the argument, it may be of interest to observe long-term movements in flow of goods to consumers per capita – to see whether they differ materially from those in total national product per capita.

The rate of growth in aggregate flow of goods to consumers reveals the same retardation as and even more marked swings than that of national product (Table 5). But since, as will be indicated below, flow of goods to consumers accounts for the overwhelmingly dominant proportion of net national product, averaging well over 85 percent of the latter, it is not surprising that its rates of growth are, on the whole, fairly similar to those in aggregate product.

In columns 4–6 flow of goods to consumers is related to total population. Conversion of population to 'equivalent consumer units', based on weights assigned to various age and sex groups, has been attempted in some analyses in the past.[1] I hesitate to use them because the weights reflect only in small part purely physiological differences in needs, but are heavily influenced by income class levels. For example, in a well-to-do family an infant or child does not necessarily require a smaller amount of consumer goods than an adult, if the need for additional services (nursing care or education) is considered: it is only the limitation of income that explains a greater share of expenditures going to an adult on whose minimum well-being the family's earning or life depends. Be that as it may, estimates of consuming units, as distinct from unweighted population numbers, suggest that the effects of conversion would be quite small: the ratio of consuming units to total population rises from 0.67 in the first decade in our period to about 0.73 or 0.74 in the last – a reflection largely of the decreased proportion of infants and children. But the rise in the ratio is quite small, about a tenth;

[1] See, for example, Warren S. Thompson and P. K. Whelpton, *Population Trends in the United States* (McGraw-Hill, 1933), Table 45, p. 169. The authors use the King-Sydenstricker criteria and assign consumption weights to male classes ranging from 0.3 in ages 0–4 to 1.00 in ages 20–34 and down to 0.55 in age 75+. Similar weights for females range from 0.3 in ages 0–4 to 0.8 in ages 20–44 and down to 0.55 in age 75+.

TABLE 5

Flow of Goods to Consumers, Total and Per Capita, 1929 Prices U.S.A., 1869-1948

(Annual averages for overlapping decades)

Decade	Flow of Goods to Consumers ($ billions) (1)	Percent Change per Decade (2)	Five-item Geometric Mean of (2) (3)	Flow of Goods per Capita $ (4)	Percent Change per Decade (5)	Five-item Geometric Mean of (5) (6)
1. 1869–78	8.06			185		
2. 1874–83	11.6	44.6		239	29.2	
3. 1879–88	15.3	31.0		278	16.3	
4. 1884–93	17.7	15.7	25.8	288	3.6	13.1
5. 1889–98	20.2	14.7	22.6	300	4.2	10.7
6. 1894–03	25.4	25.2	20.7	343	14.3	9.5
7. 1899–08	32.3	27.2	20.0	397	15.7	9.4
8. 1904–13	39.1	21.2	20.1	437	10.1	9.9
9. 1909–18	44.0	12.4	19.5	451	3.2	9.8
10. 1914–23	50.6	15.0	16.3	482	6.9	7.5
11. 1919–28	61.7	22.1	12.6	547	13.5	5.2
12. 1924–33	68.7	11.3	13.0	569	4.0	6.6
13. 1929–38	70.8	3.1	14.7	562	−1.2	8.6
14. 1934–43	81.2	14.6		620	10.3	
15. 1939–48	100.3	23.6		728	17.4	
16. 1869–78 to 1939–48		19.7			10.3	

Col. 1: Lines 1–13 from *National Product since 1869* (NBER, 1946), Table II-16, p. 119. The averages for lines 10–13 differ in minor detail from those published due to revisions in net changes in foreign claims. For lines 14 and 15 see notes to Table 1, lines 14 and 15.

Col. 4: Col. 1 divided by Table 4, col. 1.

and the consequent effect of the conversion from persons to 'equivalent consumers' on the rate of growth in the flow of consumer goods per unit would be correspondingly limited.

The most impressive item of evidence in Table 5 is the large and sustained increase in flow of goods per capita, in constant prices (column 4). This estimate, which does not reflect and is not distorted by the recent large increase in personal taxes, shows that the per capita volume of commodities and services purchased by ultimate consumers has almost quadrupled between the first and last decades. Even if we allow for a possible underestimate of the levels in 1869–78 by the already noted 5 percent, the rise would still be from $195 to $728.

Against the background of this large increase, the adjustment for the upward bias resulting from reduction in scope of household activity, increase in the extent of hauling, distribution, and other services, and the rise in prices associated with the shift of population from the countryside to the cities (not reflected in the indexes used to convert to 1929 price levels) – all discussed in Part I – would seem moderate. At any rate, my judgment is that such an adjustment, while obviously reducing the increase now shown in column 4, would still leave a strikingly large rise over the period in per capita flow of goods to consumers.

Two items of evidence can be cited in corroboration of this judgment. The first is suggested by the illustrative calculations in an attempt to make the national income estimates for the United States and China more comparable.[1] This attempt involved assigning rough weights that would increase the estimates for China (1931–36) to allow for comparable fabrication, increased transportation, a greater variety of urban life services, higher costs in cities, etc. These adjustments raised per capita flow of goods to consumers in China from 37 to 65½ U.S. dollars; and further adjustments could easily double the lower figure. The contrast between the United States in the 1870's and in the 1940's is far less marked than that between China and the United States in the early 1930's: per capita consumption in the United States in the 1870's was five times as large as that directly estimated for China in 1931–36. An adjustment, along these lines, of the U.S. level in the 1870's, to make it more comparable with that in the 1940's might raise the 1869–78 figure 50 percent – a rather generous allowance. Per capita flow of goods to consumers in 1869–78 would be about $280; and $728, the estimate for 1939–48, is still over 2½ times as large.

The other item of evidence is more specific. Data are available in the United States on the shift of population from the rural areas to urban communities of different size. We can make broad assumptions concerning differences in price levels between rural and urban areas for comparable commodities and services – assumptions based largely upon recent data. For this calculation we assumed the price levels in the small cities to be 20 percent higher than those in the rural areas, in middle-size

[1] See my article, 'National Income and Industrial Structure', in *Proceedings of the International Statistical Conferences*, Vol. V, pp. 231–9.

TABLE 6

Illustrative Calculation of the Effect of Rural-Urban Movement of Population on the Price Levels of Consumer Goods and on Flow of Goods to Consumers per Capita in Constant Prices

Census Year	Percent of Population in				Price Indexes reflecting Shifts 1930=100	Flow of Goods per Capita $	
	Rural areas	Urban Areas				1929 Prices	Adjusted
		2.5 to 50 thousand	50 to 500 thousand	500 thousand and over			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1870	74.3	12.9	8.6	4.2	92		
1880	71.8	13.8	8.1	6.2	93	185	200
1890	64.9	16.5	11.5	7.1	95	278	296
1900	60.3	17.4	11.7	10.7	96	300	314
1910	54.3	19.0	14.1	12.5	97	397	411
1920	48.8	20.3	15.5	15.5	99	451	460
1930	43.8	21.2	17.9	17.0	100	547	550
1940	43.5	22.1	17.4	17.0	100	562	562
1950	41.3	23.5	17.6	17.6	101	728	724

Cols. 1–4: Based on various Census reports, and given in *Statistical Bulletin*, Metropolitan Life Insurance Company, Vol. 32, No. 9, September 1951, p. 2. The definition of rural and urban places for the period are those used in the 1940 Census. The classification was slightly modified for the 1950 Census, and the data for 1950 are preliminary.

Col. 5: Derived by assuming that the prices for similar goods are in the following ratio for community groups: col. 1, 1.00; col. 2, 1.20; col. 3, 1.30; col. 4, 1.40. These four columns are weighted accordingly and reduced to 1930 as 100.

Col. 6: From Table 5, col. 4 for the successive 9–8 decades beginning with 1869–78.

Col. 7: Col. 6 adjusted by the index in col. 5. The latter index is averaged for each successive pair of entries.

cities 30 percent, in large cities 40 percent.[1] This set the stage for the calculations in Table 6.

The allowances for price differentials used in Table 6, if conceived as reflecting differences in prices for comparable goods, are quite generous and may well exaggerate the true disparities.

[1] Some corroboration of these assumptions is given in Nathan Koffsky's 'Farm and Urban Purchasing Power', *Studies in Income and Wealth* (*Volume Eleven*, NBER, 1949), pp. 151–219. Even without assuming any differential in cost of housing, Koffsky finds that for 1941 the differential between city and farm prices was between 30 and 12 percent, depending upon whether farm or city expenditure weights are used (see his Table 8, p. 170).

Yet the effect, under conditions of rapid urbanization of the country indicated in columns 1–4, is moderate. The rural-urban population shifts mean a 10 percent increase in the price index over the 70 year period; but their effect on the estimates of the flow of goods per capita, in constant prices, is small. These newly adjusted estimates (column 7) are still $3\frac{1}{2}$ times larger in the last decade than in the first.

We may now turn back to Table 5 and the movement of flow of goods per capita that it shows, with some assurance that the large rise in the latter, even if reduced by the various adjustments for the biases discussed in Part I, would still signify a striking increase in the supply of commodities and services to ultimate consumers. Two further questions remain. The first is raised by the conspicuous fluctuations in the rate of growth (column 5). The swings in these decade-to-decade rates of change in flow of consumer goods per capita have distinctly wider amplitude before the 1930's than those in total national product per capita (Table 4, column 5). Since in the short run changes, associated with business cycles, fluctuations in flow of goods to consumers are of much narrower amplitude than those in total national product, this apparent reversal in the comparison of long swings in rates of increase poses an intriguing problem. Its discussion must obviously rely upon the analysis of components of flow of goods to consumers, as well as direct attention to capital formation totals and their components – and is, therefore, deferred to Part VI below.

The second question is suggested by the movement of the trend rate of growth (column 6). Because of the marked amplitude of the swings, the five-item geometric mean does not completely eliminate them. Yet although the retardation in the rate of increase in flow of consumer goods per capita is much less marked than that of either aggregate or per capita national product, it is still evident here. And it would presumably be somewhat more conspicuous were we to have converted from number of persons to 'equivalent consumer units'.

It may seem offhand that a decrease in the long-term percentage rate of growth of consumer goods per capita raises no problem: why should the secular trend in this supply of goods per consumer show an undiminished rate of percentage increase? But the question does have meaning if it is recognized that the long-term movements permit far going extension and trans-

formation of consumer wants; that unless obstacles arise, either because of limitations of technology or because of extraordinary pressures of other demands on national product, there is no plausible limit to what people may want and be able to consume; and that at any rate, cross-sectional differences in consumer expenditures show substantial groups in the population enjoying a flow of consumer goods per unit vastly larger than that for the rest of the population. If say consumer expenditures per capita of the upper 5 percent of the country's population are, in real terms, three times as large as those shown for the last decade in Table 5, there is a real question why per capita increase should not have continued undiminished and yielded a closer approximation to what people presumably want.

The answer would require analysis of the factors that determine growth of both national product and that part flowing to ultimate consumers; and, in a sense, therefore, the question must await the results of further work, both for this and other countries. But one relevant point can be raised here. The increase in national product and flow of goods to consumers was attained in the face of significant reduction of working hours. This suggests two implications. First, the choice between producing more of the goods that determine the magnitude of national product or consumers' outlay (as we measure it) by adhering to the longer work week, and producing less of these goods and having more leisure, was decided partly in favor of the latter. In other words, one major reason why individuals and society have permitted a lower average rate and eventually a decline in the rate of increase in both national product and flow of goods to consumers was that they preferred to have more leisure. Second, in any estimate of what the increased flow of goods to consumers meant in satisfying the wants of individuals we should, at least as an alternative variant, make some allowance for increased leisure as if the latter were, in itself, part of the product of the economy.

3. *Value of leisure*

The calculations that follow have at best illustrative, and to some extent, only curiosity value. Even the basic data involved are thin; and their conversion to what is wanted must, perforce, be most arbitrary. But we deal here with problems that have

either been overlooked, or, if recognized, dismissed lightly because they lie outside the boundaries of economic discipline as narrowly defined; and the neglect or dismissal of these problems is likely to be more detrimental to the understanding of the process of economic growth than even crude attempts to deal with them.

Column 1 of Table 7 presents an estimate of the standard weekly hours in the United States – hours that are customary rather than actually worked in any given year. These basic data rest upon a most tenuous basis, since they must reflect hours of entrepreneurs as well as of employees and, to be adequate for our purposes, must cover the whole economy. In fact, adequate data on the standard work week are available for manufacturing alone beginning in the 1890's, and for recent decades for selected public utilities. The extremely shaky character of the figures should induce caution in interpreting their testimony. That standard work hours declined and declined substantially over the seven decades, is hardly a disputable conclusion; and that the magnitude of the decline was of the order of one-quarter to one-third is also perhaps beyond serious doubt. But can we trust the indication of column 1 that standard hours declined much more during the second half of the period, from 59 to 48 or about one-fifth, than during the first half, from 67 to 59, or about one-eighth? It would be of interest to pursue this suggestion further and see whether a more careful examination of the data confirms it; for the present it must remain unproven.

The reduction in standard hours obviously means increase in leisure. Since we cannot assume that the latter was 0 during the first decade, some estimate of leisure must be made – by assuming hours available for work and deducting them from the standard work week. The assumption made here is that the initial standard work week provided full engagement through six days of the week, and that weekly leisure amounted to a sixth of the working hours. This implied that the maximum work week standard was 78 hours; and that the reduction in the work week would increase leisure, as standard hours would be subtracted from a constant diminuend of 78 (see column 2).

One can easily quarrel with this assumption and derive a somewhat different set of entries for column 2. But delaying discussion of alternatives, we now pass to the most difficult problem of all. Assuming that leisure hours per week, for the

TABLE 7

Calculation of the Value of Leisure, on Two Assumptions, U.S.A. 1869-1948, 1929 Prices

(Annual averages for overlapping decades)

Decade	Approx. Weekly Standard Work Hours	Estimated Weekly Leisure Hours (78 – col. 1)	Percent Col. 2 of Col. 1	Col. 2 as Percent of Committed Hours (of 168 – col. 2)	Value of Leisure (N.N.P.) × 0.8 × Col. 3 × Col. 4 ($ billions)	
	(1)	(2)	(3)	(4)	(5)	(6)
1869–78	67	11	16	7	1.2	0.5
1874–83	66	12	18	8	2.0	0.9
1879–88	65	13	20	8	2.9	1.1
1884–93	64	14	22	9	3.7	1.5
1889–98	63	15	24	10	4.6	1.9
1894–03	62	16	26	11	6.3	2.6
1899–08	61	17	28	11	8.4	3.3
1904–13	59	19	32	13	11.5	4.7
1909–18	57	21	37	14	14.9	5.6
1914–23	54	24	44	17	20.1	7.8
1919–28	53	25	47	17	26.0	9.4
1924–33	51	27	53	19	31.1	11.1
1929–38	49	29	59	21	34.0	12.1
1934–43	48	30	62	22	43.6	15.5
1939–48	48	30	62	22	54.0	19.2

Col. 1: For 1870, 1880, 1890, 1900, 1910, 1920, from J. F. Dewhurst and Associates, *America's Needs and Resources* (New York, 1947), Appendix 3, p. 695; standard hours for agriculture for 1930 from same source. Nonagricultural index extrapolated to 1930 by average weekly hours in manufacturing in 1919 and 1929 (*Historical Statistics*, Series D-118, p. 67) and the combined index to 1940 and 1950 by similar data for 1930, 1940–41, and 1946–48 (*Economic Report of the President, January 1951*, Washington, Table A-15, p. 185). The figures were interpolated along a straight line to correspond to decade midpoints and then rounded.

Cols. 5 and 6: Net national product from Table 1, col. 2.

productive population, almost tripled (from 11 to 30) during the period under study, and that leisure constitutes in a sense addition to the real income of consumers, what value should we put on it?

The basic assumption used here was that hours of leisure were valued by the product of hours of work. One might argue that not the average but the marginal product per hour of work should be used in estimating the value of leisure. Yet, however

convincing such an argument might be for analysis of the short run, it is not as clearly applicable to long-term adjustments involved in the process of economic growth. Setting aside the possible effect of lack of leisure on the quality of labor and particularly on technological changes (through influence on amateur inventiveness), it would be difficult to demonstrate that in secular adjustment long hours of work could not yield a product per hour equal to or only slightly short of that attained with shorter hours. At any rate, it did not seem objectionable to assume that the value of leisure is equal to the value of work, i.e. the share of total national product assigned in the distribution of the money equivalent as compensation of labor.[1]

If we assume that the labor part of national product is assignable to labor involved in the standard work week we can: (*a*) calculate hours of leisure as a percentage of the standard work week (column 3); and (*b*) multiply this percentage by the share of national product accounted for by compensation of labor to get the value of leisure (column 5). But one may also argue that the product of labor should not be assigned merely to the hours of the standard work week: after all, men who work must also eat and sleep, and it may seem warranted to associate the value of the product of labor with all *committed* hours – not only with work hours but also with hours that must be committed to all other ends except leisure in order to permit work to go on. Increased leisure is obviously a much smaller share of committed than of work hours (column 4, where committed hours are all clock hours minus leisure); and the value of leisure is correspondingly lower (column 6).

This second variant of the economic magnitude of leisure seems to me less acceptable than the first because the low valuation it puts on leisure contradicts any rational interpretation of past experience: if the value per hour of leisure is so low compared with return per hour of work, how can we explain the drive for and easy acceptance of the marked reduction in working hours? At any given time, when such a reduction is taking place, people forgo either some current earnings or the

[1] In the calculations we took 80 percent as the share of total national product to represent compensation of labor (both employees' and entrepreneurs'). This assigns dividends, interest, and rent to the category of pure property income, and entrepreneurial income and wages and salaries to labor income. The allocation is obviously rough, and takes no account of recent changes; but is adequate for the illustrative purposes here.

possibility of an increase in product that may not be too different from average return, for the sake of shorter working hours. Surely such a choice would be much more difficult if the value of a leisure hour were in fact set at fractions of less than a half to less than a third of the return from a working hour. If we retain this second variant here, it is only for the purpose of setting a lower limit on the value of leisure.

The addition of the value of leisure to the flow of consumer goods yields a new estimate of a final product of the economy reaching ultimate consumers in 1929 prices (Table 8, columns 1 and 2). Since the rate of growth in the value of leisure is very high, reflecting both the high rate of relative additions to leisure hours and the high rate of increase in product per hour of a standard work week, the new totals are subject to much higher rates of growth over the period than the customary estimates of flow of goods to consumers shown in Table 5. The latter increased from the first to the last decade from $8 billion to about $100 billion, or twelvefold; the revised estimate of flow of goods to consumers, using the preferred variant of value of leisure, increased from $9.3 billion to $154 billion, or over fifteenfold. The rate of growth of the new estimate of per capita flow also shows a marked rise: from $213 to $1,119 or over fourfold, compared with the one in Table 5 from $185 to $728 or almost threefold. Finally, retardation in the rate of increase per capita, in the underlying trend, evident in Table 5, almost disappears if we deal with the preferred variant of the value of leisure (column 5), and disregard the first entry affected by the understatement of the 1869–78 values. In other words, if we take into account not only the material goods and services provided by the economy to its ultimate consumers but also the amount of leisure which it leaves at their disposal, the rate of growth in the economic value of goods provided for the satisfaction of consumers, on a per capita basis, does not slow down significantly.

It is hardly necessary to mention that numerous objections can be raised and qualifications attached to the calculations presented in Tables 7 and 8.[1] All can be admitted, and many

[1] One specific qualification should be noted. During the World War II decades actual hours were appreciably in excess of standard hours. Consequently, our estimates of leisure hours and of the value of leisure for these decades are too high.

TABLE 8

Flow of Goods to Consumers, including Leisure, Total and Per Capita, 1929 Prices, U.S.A., 1869-1948

(Annual averages for overlapping decades)

Decade	Total Flow (billions of dollars)		Per Capita Flow $		Five-item Geometric Mean of Percent Rates of Change per Decade	
	Assumption 1 (1)	Assumption 2 (2)	Assumption 1 (3)	Assumption 2 (4)	In Col. (3) (5)	In Col. (4) (6)
1869–78	9.26	8.56	213	197		
1874–83	13.6	12.5	280	257		
1879–88	18.2	16.4	331	298		
1884–93	21.4	19.2	349	313	15.0	13.9
1889–98	24.8	22.1	368	328	12.3	11.2
1894–03	31.7	28.0	428	378	11.3	10.4
1899–08	40.7	35.6	500	437	11.6	10.2
1904–13	50.6	43.8	565	489	12.9	11.1
1909–18	58.9	49.6	603	508	12.7	10.8
1914–23	70.7	58.4	674	556	10.6	8.6
1919–28	87.7	71.1	777	630	8.0	6.1
1924–33	99.8	79.8	827	661	9.6	7.8
1929–38	104.8	82.9	832	658	10.7	9.3
1934–43	124.8	96.6	954	739		
1939–48	154.3	119.5	1,119	867		
1869–78 to 1939–48					12.6	11.2

Cols. 1 and 2: Cols. 5 and 6 of Table 7 plus col. 1 of Table 5.
Cols. 3 and 4: Cols. 1 and 2 divided by col. 1 of Table 4.

conceded in advance. No particular importance is assigned here to the specific values, or to the specific conclusions drawn. The main purpose of the calculation and discussion is to emphasize the impression which the records for this country convey of the dominant importance that decisions of the people as a body of consumers and workers have upon economic growth as reflected in national product measures. Under conditions of consumer sovereignty such as prevailed in this country, with brief exceptions of war emergency, it is impossible to understand why

national product grew as it did, and why its composition by final product type changed as it did, unless we pay attention to the choices that people made between hours of work and hours of leisure, and the extent to which the reasons why they continued to work more or decided to work less were tied in with the kind of goods they wanted in return for their work. It is obvious also that the factors involved in a choice between larger and smaller growth of population overlap to some extent with factors that determined choice between work and leisure and choice in the apportionment of the labor force among activities designed to produce different types of product. Surely, the rate of growth and changes in the composition of national product would have been quite different if for some reason the decisions made would have meant a much larger population increase, or continuance of a much longer work week. And if the decisions were made by people as consumers, as social groups, as members of a society for whom economic production is only one of many possible activities, and if these decisions were of cardinal importance in economic growth, the direction of analysis suggested by these impressions is rather different from that in customary discussions in economic literature with its emphasis on the role of the entrepreneur and innovations that he selects among the available stock of potential technological changes. We do not deny that the entrepreneur and his behavior patterns are important in understanding the *mechanism* by which the changes are brought about and that the stock of technological knowledge and potential changes are important as a *permissive* condition. Yet the motivations of individual consumers and workers, as members of a society living by systems of values traceable in turn to persistent traits of human nature, do seem to be the basic constraint that sets boundaries within which economic growth in its different rates of change over time can manifest itself, and that fix the major channels and directions for change in the structure of the national product – by whatever categories we may wish to distinguish within the over-all totals.

III. LABOR FORCE AND PRODUCT PER WORKER

The present part relates long-term growth in net national product to growth of the labor force; and considers the observable factors, among them increasing supply of capital, with which the marked rise in product per worker or per man-hour can be associated. This leads to a view of long-term trends in the distribution of national income (or a closely related aggregate) between types of income that can be treated as compensation of labor and as compensation of capital.

1. *Labor force and product per labor unit*

The estimate of the labor force given in column 1 of Table 9 is necessarily approximate. For part of the period it should properly be designated 'gainfully occupied', a total which for 1930, an overlapping year, is some 1.4 million, or about 3 percent, larger than the total designated in recent United States statistics as labor force.[1] Also, there is some question as to the legitimacy of using the data for the Census of 1910. But these qualifications have only minor effect on trends in the labor force which appear so conspicuously in Table 9; and analysis of these trends can proceed without concern about the slight discontinuities and incomparabilities in the underlying totals.[2]

The labor force given here measures all workers and entrepreneurs ordinarily engaged, whether or not employed. It also includes members of the armed services, although figures in the brackets provide approximations to the civilian labor force.

The proportion of total population participating in the labor force increased substantially over the period (column 2). The rise was sustained during the first half of the period, from 1869–78 to 1904–13, the percentage increasing from 33 to about 41, or over one-fifth. The increase ceased for a while after 1904–13, partly because of the drastic curtailment of immigration which

[1] The main source of the difference is the inclusion among gainfully occupied in the 1930 Census of about 1.2 million seasonal workers not employed and not seeking work, who would not have been classified as members of the labor force if the 1940 Census questions had been asked. For a brief discussion of the data in this area see John D. Durand, *The Labor Force in the United States, 1890–1960* (Social Science Research Council, New York, 1948), pp. 191 ff.

[2] Durand (*op. cit.*) provides estimates of the labor force for 1890, 1900, 1920, 1930 and years after 1940 adjusted for comparability with the 1940 Census definition. His totals are for a single month in the year (April or January, which happen to be seasonally low dates) whereas the figures underlying our series are average annual levels. The latter exceed Durand's by about 2 to 7 percent. These differences are too minor to have much effect on the longer-term trends.

TABLE 9

Labor Force and Net National Product (1929 Prices) per Worker, U.S.A., 1869-1948

(Averages for overlapping decades)

Decade	Labor Force (millions) (1)	Percent of (1) to Total Population (2)	N.N.P. per Worker $ (3)	Index of Standard Hours per Week 1919–28=100 (4)	N.N.P. per Worker at Standard Hours $ (5)	Percent Rate of Increase per Decade (Five-item Geometric Mean)	
						N.N.P. per Worker (6)	Same, adjusted for Hours (7)
1869–78	14.4	33.1	654	126	519		
1874–83	16.7	34.2	820	125	656		
1879–88	19.5	35.5	918	123	746		
1884–93	22.6	36.9	929	121	768	10.1	11.7
1889–98	25.5	37.7	949	119	797	7.1	9.0
1894–03	28.4 (28.3)	38.4	1,057	117	903	5.9	8.1
1899–08	32.3 (32.2)	39.8	1,158	115	1,007	6.5	9.0
1904–13	36.6 (36.5)	40.9	1,224	111	1,103	7.8	11.2
1909–18	39.5 (39.0)	40.5	1,273	108	1,179	8.1	11.6
1914–23	41.4 (40.8)	39.5	1,380	102	1,353	5.6	9.5
1919–28	44.3 (43.9)	39.2	1,560	100	1,560	2.5	6.4
1924–33	48.2 (48.0)	40.0	1,519	96	1,582	4.2	7.9
1929–38	52.0 (51.7)	41.3	1,386	92	1,507	5.3	7.7
1934–43	56.1 (54.5)	42.9 (41.7)	1,566	91	1,721		
1939–48	61.0 (56.6)	44.2 (41.1)	1,786	91	1,963		
1869–78 to 1939–48						7.4	10.0

Figures in brackets exclude members of armed services

Col. 1: Prior to 1900, basic figures of Solomon Fabricant, derived from Daniel Carson (see *Studies in Income and Wealth, Volume Eleven*, NBER, 1949, p. 42). From 1900 to 1944, see *Economic Almanac*, N.I.C.B., 1950, p. 159; 1940 onward, Bureau of Census releases, Series P-50. For estimates of armed services, see same sources and Solomon Fabricant's current NBER study of employment and productivity in government.

Col. 2: Col. 1 divided by col. 1 of Table 4. Col. 3: Col. 2 of Table 1 divided by col. 1. Col. 4: Based on Table 7, col. 1. Col. 5: Col. 3 divided by col. 4.

in the earlier decades added much more proportionately to the labor force than to total population. The rise in the percentage of population in the labor force was resumed in recent decades, probably because of war emergencies and the marked growth of the armed services. At least during the first half of the period, the rise in per capita product of the country was due, in part, to a rise in the proportion of workers to total population, i.e. in the number of worker units per capita.

Net national product per worker grew substantially: from $654 in the first to $1,786 in the last decade, almost tripling, and the average rate of growth per decade was 7.4 percent (column 3). Thus, despite a sharp decrease in average number of hours, the net output per worker increased markedly over the period, although the rate of increase declined substantially from the early to the more recent decades (column 6).

The adjustment for the decline in the number of standard hours, even with due regard for the tentative character of that series, reveals a much greater rise in product per *man-hour* than in product per worker – the average rate of increase per decade in the former is 10 percent, or almost one and a half times that in product per worker (column 7). Also, the retardation in the rate of growth, so marked in the series on product per worker, is far less evident in product per man-hour: indeed, in the latter, no such retardation in the rate of growth can be safely inferred.

The series in Table 9 are most suitable for analysis of the over-all productivity of the economy as reflected in a ratio of product to labor output. Net output in constant prices, not any gross and duplicated totals, must be used as the measure of the accomplishment of the economy that compares *net* returns with inputs treated as costs. Also total labor force, if necessary, at standard hours, i.e. the amount of labor service that society stands ready to render, should be the measure of input – not the amount reduced by involuntary unemployment, whether because of inability of seekers to find jobs or because of abnormally short hours. For in judging the productivity of the economy, we must take into account its ability to provide employment to the members of the labor force – just as we take into account other social and technological factors that either increase or diminish product per worker or per man-hour.

With the present data, it is difficult to derive a reliable series on the number employed comparable with the labor force –

particularly for years prior to 1919; and it is next to impossible to secure a comparable series on hours of work (as distinct from standard hours) for more than a few recent years. Despite the difficulties, an attempt was made here to approximate on a decade basis the percentage of the labor force that was unemployed, which would permit a rough and ready transition from labor force to numbers employed; no such adjustment could be calculated for average hours (Table 10).

The figures in column 1 are admittedly rough. Those for years since 1919, which relate to the total economy, are extrapolated back to 1889–98 by Paul Douglas' series which, for the decades back to 1899, are approximations based on mining, manufacturing, transportation, and building construction and prior to 1899 are for manufacturing and transportation alone. No basis could be found for estimates prior to 1889; and even the variations in the percentages given may well be misleading. The sharp drop in the decade averages from 1889–98 to 1904–13 may or may not be a true picture of the situation: after all the sectors covered by Douglas' estimates accounted for only a fifth of the total labor force in the early decades. Still this decline in unemployment percentages from 1889–98 to 1904–13 does agree with the long swing in the rate of increase in net national product – total, per capita, or per worker – which is at trough from 1884–93 to 1889–98; at peak from 1894–1903 to 1899–1908; and at another trough from 1904–13 to 1909–18.

Be that as it may, the relevant point here is that the allowance for unemployment does not affect significantly the longer term trends in product per worker or per man-hour: it merely smooths out fluctuations in the decade-to-decade rates of change still affected by some of the prominent cyclical disturbances. For the comparable period, i.e. omitting the first four decades for which no adjustment for unemployment was possible, the average rate of increase per decade in product per member of the labor force is 6.5 percent; that in product per employed is 5.8 – slightly lower, because the unemployment percentage is smaller at the end of the period than at the beginning. For the same period, the average rate of increase per decade in product per standard man-hour of a member of the labor force is 9.4 percent; that in product per standard man-hour of an employed person is 8.7 percent. Since no significance should be attributed to these minor differences in percentage rates of increase, one

may conclude that the magnitude of growth, the extent of retardation in the rate of increase in product per worker, and the absence of retardation in the rate of increase in product per man-hour, are about the same, whether we take labor force and standard hours or the number employed and actual hours.

TABLE 10

Net National Product per Worker (1929 *Prices*), *allowing for Unemployment, U.S.A.*, 1889-1948

(Averages for overlapping decades)

Decades	Rough Estimate of Percentage Unemployed (1)	N.N.P. per Employed $ (2)	Col. (2) Adjusted for Standard Hours (3)	Percent Change per Decade Five-item Geom. Mean (Col. 2) (4)	Percent Change per Decade Five-item Geom. Mean (Col. 3) (5)
1889–98	12.7	1,087	913		
1894–03	10.4	1,180	1,008		
1899–08	5.3	1,223	1,063		
1904–13	5.2	1,291	1,164	6.4	9.7
1909–18	5.4	1,346	1,246	7.6	11.0
1914–23	6.7	1,479	1,450	7.5	11.4
1919–28	8.2	1,699	1,699	5.7	9.7
1924–33	13.4	1,754	1,827	6.1	9.8
1929–38	18.6	1,703	1,851	5.3	7.8
1934–43	13.4	1,808	1,987		
1939–48	6.8	1,916	2,106		
1889–98 to 1939–48				5.8	8.7

Col. 1: For recent decades (beginning with 1929–38) from Department of Commerce estimates of all fully employed (various issues of the *Survey of Current Business*) compared with labor force estimates (given in *Economic Report of the President, January, 1951*, p. 181). These were extrapolated to 1919–28 by estimates derivable from *National Income and Its Composition* (NBER, 1941), Vol. I, Table 8, p. 151; and for years prior to 1919 by two series of Paul Douglas in his *Real Wages in the United States* (Boston, 1930), Tables 177, p. 460, and 163, p. 440. For period back to 1899 Douglas' figures include mining (bit. coal), manufacturing, transportation, and building construction; prior to 1899 manufacturing and transportation alone.

Cols. 2 and 3: Based on col. 1 and Table 9, cols. 3 and 5.

But how shall we interpret these measures? The estimates in Tables 9 and 10 are of the type commonly referred to as measures of 'productivity of labor'. The term is misleading if one inter-

prets it as meaning the specific yield of the labor factor: we deal here with total net output, and if it is in any sense a product of labor, the latter is enabled to produce it because of the organizational framework within which labor is applied, of the technological knowledge that underlies the organized processes of production, and of the stock of capital put at the disposal of labor.[1] It is, therefore, not so much a measure of productivity of labor as one of productivity of the *whole economy*: the ratio compares total net output, net in that the stock of available capital remains intact, with the input of the one basic resource of society – labor, measured either in men or man-hours. The latter is a basic resource precisely because it is the only perishable human resource that society has: the other important resource – the stock of human knowledge and of capital in the way of social organization – does not perish in the process of production (except in so far as it is embodied in human beings, and thus in their labor); and material capital that does perish is allowed for already in the calculation of *net* output. There is, therefore, a sound instinct in the emphasis upon and search for comparisons of net output of the economy with input of labor: if any one ratio can describe the productivity of the economy it is this ratio.

This interpretation does not deny the roughness of the measure, stemming from the qualifications attached not only to the numerator (which were listed in Part I) but also to the denominator. Even man-hours, no matter how accurately estimated, in series such as are used here, weigh the hour of an unskilled person, perhaps too young or too old for efficient work, equally with an hour of a highly trained professional person, in the prime of his productive life. Some of these aspects of the labor force or man-hour analysis will be touched upon below, but it is impossible here to deal with them in adequate detail. Yet the qualification, while admittedly valid, should lead to a refinement of the procedure, without necessarily modifying

[1] To avoid such misinterpretation it has been the recent practice of the more cautious scholars to invert the ratio, and to describe it as 'units of labor input per unit of output' (see, for example, the various studies in this field by Messrs. Fabricant, Barger, Stigler and others published by the National Bureau of Economic Research). But the old ratio, and the old term, are still used widely; and this continued use reflects a sound instinct that attributes wide importance to the ratio in a society whose basic purpose is to provide for wants of consumers while minimizing the sacrifices involved in spending the one resource that is fundamentally scarce – time at the disposal of living, human beings.

the basic line of approach – the comparison of net output with direct labor input, and the latter alone. An entirely different argument – that if productivity of the economy is to be measured by comparing output with input, the input of all resources, not only of direct labor, should be included – is not clearly applicable to a ratio in which the numerator is net output: the only resource that enters the latter is labor, and labor alone. True, it is labor applied under conditions set by society, in a given state of technical arts and with a given supply of capital: in that sense other resources are involved. But since we deal with net output, the only resource actually absorbed is labor, all other resources remaining intact. Only if we try to measure productivity of the economy by a ratio in which the numerator is some gross output total can the input of resources other than labor enter the comparison.[1]

2. *Capital and rise of product per worker*

Growth in product per man or man-hour may be due, in the first place, to changes in the labor force proper. A more favorable selection of age and sex groups, a better physical state of the human beings involved, and more extensive training, would raise product per worker; and reduction in the number of hours, permitting more intensive work at the job, would presumably increase product per hour – even if nothing else were to change. Some indication of changes of this type in the characteristics of

[1] The discussion does not imply, of course, that in the distribution of the national product, the equivalent of total net output would, or should, form the compensation of labor. Some of it may, and should, go as compensation to other factors, though the stock of the latter remain undiminished by their involvement in the process of production.

That the argument advanced by us reflects the basic assumptions underlying the concept of net product or net output may be seen by imagining a society oriented to maximizing capital accumulation as its basic purpose. In such a society net national income would be defined as the residue remaining after needs for replacement of labor have been met; and the primary, basic resource, whose input would be watched, would be capital. The measure of productivity of the economy would then be a ratio in which the numerator would be our present gross national product minus the allowance for reproduction of the labor force and the denominator the input of capital.

With the figures at hand it would have been possible to compute a different productivity ratio: gross national product as the numerator, and man-hours weighted by per unit net income in 1929 plus the input of capital measured by the allowance for capital consumption in 1929 prices as the denominator. This ratio would, however, differ from that given in Tables 9 and 10 only by the addition to the numerator and denominator of the same absolute amount for each point of time – an amount that might form a constant or slightly changing proportion of the terms of the ratio as they appear now. The rates of growth now shown in Tables 9 and 10 would be modified only slightly by this procedure.

the labor force for the United States can easily be found. For example, Mr. Durand's comparable estimates of the labor force show that the proportion of participants below 20 years of age declines from 15.2 in 1890 to 7.5 percent in 1940; and that of participants 55 years or older rises from 11.5 to 14.2 percent. Thus, over this period of 50 years, groups in the labor force well below or somewhat above the best productive ages decline from 27 to 22 percent – a not insignificant shift. True, we observe over the same period a shift toward a greater proportion of women, from 17 percent in 1890 to 24 percent in 1940;[1] but considering the development of industries and occupations in which no detectable inferiority of women over men exists, and the reduction in the standard work week which both permitted women to enter the labor force in increasing numbers and militated against their productive inferiority, one can safely conclude that the changes in *demographic* characteristics of the labor force made, on the whole, for a significant increase in its productivity.

The case is even stronger when we consider education and training. The proportion of the labor force classified under educational and other professional activities increased from 2.6 percent in 1870 to 7.5 percent in 1940; and, more important, the proportion of unskilled labor declined from 36 percent in 1910 (the earliest date for which this classification is given) to 26 percent in 1940.[2] The rise in the level of training of the labor force must have been quite appreciable, and must have contributed significantly to the increase in product per man-hour.

The discussion here must perforce be limited to these few details on changes in the characteristics of the labor force: further analysis of them, or of the effects of shorter hours, would require more time and effort than can now be expended. It would have been particularly interesting to approximate the part of the increase in product per man-hour that can be credited to changes in characteristics of the labor force proper and to reduction in hours. But for the present we can merely

[1] John Durand, *op. cit.*, Table A-6, pp. 208–9. As Durand points out, the reduction of the work week, among other factors, permitted a much greater participation by women in the labor force. The latter explains in part the increased ratio of labor force to total population (see Table 9). Thus the reduction in work hours, while leading toward a decline in total labor hours, itself produced or permitted a partly compensating trend of women toward the labor force.

[2] *Historical Statistics of the United States*, Series D-47-61 and D-77-89, pp. 64–65.

assume that this part does not account for a dominant proportion of the growth in product per man-hour; and that the major source of increase in product per unit of labor is the extending application of scientific and related knowledge to processes of production.

The observable effects of such application can be traced either through analysis of the industrial structure, where the birth and particularly rapid growth of some sectors can be directly associated with scientific discoveries and major inventions that made the new industries possible; or through the increase in the supply of capital, made necessary because of greater capital requirements of changing technology and made feasible because of the

TABLE 11

Reproducible and Total Capital, U.S.A., 1879 to Date Selected Dates, 1929 Values

Date (beginning of year)	Reproducible Capital ($ billion)	Land ($ billion)	Total Capital (1)+(2) ($ billion)	Per Member of Labor Force ($ thousands)		Same, adjusted for Standard Hours ($ thousands)	
				Reproducible Capital	Total Capital	Reproducible Capital	Total Capital
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1879	38.8	31.5	70.3	2.32	4.21	1.86	3.37
1889	62.6	51.2	114	2.77	5.04	2.29	4.17
1899	101	77.9	179	3.56	6.29	3.04	5.38
1909	152	116	269	4.17	7.34	3.76	6.61
1919	215	151	366	5.19	8.83	5.09	8.66
1924	244	150	393	5.50	8.89	5.50	8.89
1929	283	164	447	5.87	9.26	6.11	9.65
1934	290	150	440	5.58	8.47	6.07	9.21
1939	288	144	432	5.12	7.69	5.63	8.45
1944	347	162	510	5.70	8.36	6.26	9.19

Col. 1: By addition of net flow of construction, producers' durable, and net changes in inventories to 1879 Census total (adjusted to 1929 values). The net balance of foreign claims is then added to the successive dates. See *National Product since 1869* (NBER, 1946), Table IV-10, p. 228. Data for years not given there are derived by the same procedure.

Col. 2: Based on ratios of value of land to construction and equipment (in current valuation) applied to the latter total in constant prices. For land ratios for Census years see *ibid.*, Tables IV-1, IV-2, IV-3. For other years the ratio was extrapolated on the basis of Dr. Goldsmith's recent estimates of wealth by the 'perpetual inventory' method.

Col. 4: Col. 1 divided by Table 9, col. 1.

Col. 5: Col. 3 divided by Table 9, col. 1.

Col. 6: Col. 4 divided by Table 9, col. 4.

Col. 7: Col. 5 divided by Table 9, col. 4.

greater power of capital accumulation bestowed upon society by the advancing state of technical arts. Industrial structure of national product is treated in Part IV, and effects of changes in it on the growth of product per worker are discussed there. We now turn to consideration of growth in the stock of capital.

The estimates of reproducible capital are derived by adding to the initial figure (for 1879–80) taken largely from the Census of Wealth and converted, by rough indexes, to 1929 prices, the cumulated flow, net of current consumption, of construction and of producers' durable equipment, and of net changes in inventories; and further adding the balance of claims against foreign countries (Table 11, column 1). Errors possible in such a procedure reflect: (i) errors in the initial Census figure, particularly in the allocation of 'real estate' between land and structures and improvements; (ii) errors and biases in the flows of capital, e.g. the omission of capital formation within the family enterprise (especially prominent in the case of farmers) and the exclusion from inventories of stocks in hands of governments; (iii) possible errors in the estimates of capital consumption, with some suspicion that our allowance for depreciation of residential housing is, perhaps, too large. In view of these qualifications only the most marked trends and broadest orders of magnitude are to be attributed significance.

The estimate of land in column 2, which includes the value of subsoil resources, is subject to even greater qualifications: it is based on ratios of values of land, reported in the Census of Wealth (1880, 1890, 1900, 1912, 1922), to value of construction improvements and producers' durable equipment (all in current valuation), extrapolated to recent years by similar estimates by Raymond Goldsmith, and applied to values of construction and equipment in 1929 prices.[1] The estimate for land, even though rough, is included because the supply of such natural, irreproducible resources, is important in determining productivity potentials in the economy.

Columns 1–3 indicate a marked and rapid growth in the stock of reproducible capital and in the economic magnitude of land and subsoil resources involved in the process of production –

[1] Dr. Goldsmith's recent analysis indicates that the ratios of land (to value of land and 'improvements') applied by us to the Census totals may be too high. If so, the level of the estimates in column 2 is too high, by perhaps as much as a fifth. However, such an adjustment would not affect the rate of change significantly.

about eightfold in the former and over fourfold in the latter during some 6½ decades. This represents a trend that, even with allowances for errors in rate, is beyond doubt. Of interest and quite plausible is the suggested difference between reproducible capital and land: the former shows fairly sustained growth to 1929, and a resumption of that growth after the severe depression of the 1930's; in land growth virtually stops after 1919, any increases thereafter being too small to be significant.

The rate of growth in the supply of capital per worker (columns 4 and 5) is high indeed. Reproducible capital per member of the labor force rises from $2.3 thousand (1929 prices) in 1879 to $5.9 thousand in 1929; but ceases to rise after that date, and fails to recover to the 1929 level even by 1944. A similar trend characterizes the supply of total capital per member of the labor force: a rise to over double from 1879 to 1929, and a decline thereafter. The stock of capital, at least as measured here, per member of the labor force did not increase during the recent two decades.

A somewhat different picture emerges if we relate capital to man-hours (columns 6 and 7). There is some question as to the legitimacy of such a comparison, since one could argue that the decline in the standard work hours of labor may have meant a similar decline in the standard work week of capital. The argument is valid, but only in part: in many industries capital operates continuously, either because direct labor involved is also organized by multiple shifts to operate around the clock or because (as in residential housing) it can function continuously with only discontinuous application of direct labor. Consequently the decline, if any, in working hours per unit of capital must be much smaller than in working hours per member of the labor force; and to that extent the ratios in columns 6 and 7 are warranted. They show, naturally, a much greater rise in supply of capital per man-hour than per man – about 175 percent for total capital and almost 250 percent for reproducible capital. Also, the rise is resumed after 1939, and by 1944 the level of reproducible capital is higher than in 1929, and that of total capital close to it.

That an increased supply of capital contributes to a rise in product per man-hour is a general proposition not likely to be disputed. But this does not mean that a given change in the stock of capital as measured here, on a nationwide basis, calls

forth a specified change in output – whether we deal with total stock and output, or both, on a per worker or per man-hour basis. First, the constant price volumes of capital do not reflect properly major changes in quality that make for greater efficiency. Consequently, a stock of capital represented by the same amounts of 1929 dollars say in 1879 and in 1899 is capable of rendering greater service, and thus permitting a larger output, at the later date; and there may be variations over time in the extent to which our measures fall short of reflecting the rising efficiency of capital (particularly in the case of equipment). Second, the rates at which capital is utilized may vary so that capital stock may be used fully at one time and well below its capacity rating at another; and while such variations are prominent over the short run and would be minimized in our decade averages, even the latter might be affected. Third, the several industrial sectors differ with respect to the capital which they require, proportionately to direct labor. Consequently, an increase in per worker capital stock may reflect shifts in the industrial structure of the economy; and the shift toward the more capital-intensive industries is not necessarily also a shift toward industries with larger than average net product per worker. Finally, and most important, technological progress may assume the form of capital-saving innovations as well as of capital-demanding; and their relative importance and effect are not necessarily stable or constant over time. Consequently, in some periods large rises in product per worker are accompanied by small additions to capital stock, while in others equal or even smaller rises in product per worker are associated with larger relative additions to capital stock.

For these reasons comparisons of long-term movements in the stock of capital per worker, with those in product per worker, such as are made in columns 1–3 of Table 12, can be of suggestive value alone.[1] The average rate of increase in the supply of total capital (but not reproducible) is lower than in product per worker. One would expect that the stock of capital per worker, including natural resources, would not rise as

[1] The comparison of capital and product is on a per worker basis. The results would be the same for comparisons of total capital and total product, or of both per man-hour, since the ratios now underlying columns 1–3 would be multiplied through by the same multiplicand for each point of time.
Capital stock for a specific date is related to product for the decade of which the date is the midpoint.

rapidly as product, given the possibilities of capital-saving innovations and the limits that would be imposed upon increasing weight of capital-intensive industries. But any further inferences require a much more detailed analysis of capital stock and of product, by industrial sectors – an analysis that cannot be pursued here.

There is also an intriguing relation between the successive changes in columns 1 and 2 and in 3. One would expect a large relative rise in the supply of capital to be associated with a large relative increase in product per worker, either at the same point of time or somewhat later; and a small relative rise (or decline) in the supply of capital to result in a small rise (or decline) in

TABLE 12

Rates of Change per Decade in Capital and Product per Worker and Ratio of Capital to Product, U.S.A., 1879 to Date

Date (beginning of year)	Percent Change per Decade: Capital per Worker		Percent Change per Decade: N.N.P. per Worker	Ratio, Reprod. Capital to Annual N.N.P.		Ratio, Total Capital to Annual N.N.P.	
	Reproducible (1)	Total (2)	(3)	Successive Dates (4)	Moving Average (5)	Successive Dates (6)	Moving Average (7)
1879				2.83		5.13	
1889	9.3	9.4	6.4	2.99	3.06	5.42	5.50
1899	13.4	11.7	6.7	3.36	3.25	5.95	5.79
1909	8.2	8.0	7.6	3.40	3.51	6.00	6.12
1919	11.6	9.7	6.2	3.76	3.67	6.40	6.17
1924	6.0	0.7	13.0	3.53		5.70	
1929	6.7	4.2	−2.6	3.86	3.69	6.10	5.84
1934	−4.9	−8.5	−8.8	4.03	3.58	6.11	5.50
1939	−8.2	−9.2	13.0	3.27		4.91	
1944	11.3	8.7	14.0	3.19		4.68	
1879 to 1944	7.2	5.4	6.0				

Cols. 1 and 2: Based on Table 11, cols. 4 and 5.
Col. 3: Based on Table 9, col. 3. The intervals correspond to those in cols. 1 and 2. Thus for the interval from 1879 to 1889 in cols. 1 and 2 we used that from 1874–83 to 1884–93 in col. 3.
Cols. 4–7: Based on entries in Tables 11 and 3. For product, the averages are taken for decades for which the capital stock date is the midpoint.

The moving arithmetic means of ratios in cols. 5 and 7 are of three decades for entries given at decade intervals, and of five decades for entries given at quinquennial intervals (i.e. overlapping decades).

product per worker. Hence, in comparing columns 1 and 2 with 3, we should find large entries in the former associated with large entries in the latter, either simultaneously or with the latter lagging by half a decade or a decade.

No such association emerges in Table 12. In fact, judging by the figures, changes in the stock of capital (either land or reproducible) follow by a decade or half a decade the changes in product per worker. If such *post hoc, ergo propter hoc* suggestion is accepted, large rises in product per worker, and implied large rises in product per capita, result in large volumes of net capital formation, and hence, with a lag, in large relative additions to the supply of capital per worker; and small changes or declines in product per worker, by the same mechanism, produce, with some lag, small changes or declines in supply of capital per worker. This, possibly significant, hypothesis requires further exploration, and some light on it is shed by the analysis in Part VI dealing with apportionment of national income between flow of goods to consumers and capital formation.

3. *Capital-product ratio and share of property income*

The ratio of capital, particularly reproducible capital, to product suggests the technologically and otherwise determined relations that have played such an important part in the analysis of investment determinants and short-term fluctuations (the acceleration principle and the related multiplier). True, for many of these analytical purposes such a ratio can be used only if both the numerator and denominator are for narrowly defined industries or production processes; if the numerator, viz. capital, is divided into subgroups that may well have different relations to the magnitude of the production process they serve; and if the denominator, viz. output, is taken for a period in which capital capacity is utilized at a specified rate. There is also some question whether capital stock gross or net of accumulated consumption is to be used. Clearly, the ratios shown in columns 4–7 of Table 12 are crude, relating, as they do, total capital stock, net of accumulated consumption, to the decade product on a nationwide basis, and reflecting, as they may, changes in the rate of utilization that can affect even the decade averages used in the denominator.

Nevertheless the series are of some interest – with respect to both the level and the movements of the ratio. The stock of

reproducible capital averages between three and four times the annual net product – which, of course, does not mean that it can be accumulated in three or four years. In fact, only about 10 percent, on the average, of net national product is added to capital stock (see Part VI). This means that if there were *no* growth in net national product, it would take about 30 to 40 years to accumulate the equivalent of the reproducible capital stock shown in Table 12. But, in fact, net national product rose, and at about 20 percent per decade (see Table 3) – which means that accumulation of the reproducible stock requires a much longer time than 30 to 40 years. Indeed, the number of decades involved would be infinitely large, since no matter how far back one reaches there would always be *some* stock of reproducible capital. Only by arbitrarily equating small quantities of the latter to zero can we make the period over which net stock of reproducible capital accumulates finite. This argument is, however, quite formal, and overlooks the important fact that the more rapid the rate of growth of national product, accompanying a constant ratio of net capital formation to product, the larger the proportion of current capital stock accounted for by capital formation of recent decades.

The ratio of capital stock to product rises to about 1919 and fluctuates thereafter – primarily the effect of the 1930's depression and the 1940's emergency expansion on the denominator (i.e. the volume of net output). It is particularly to be noted that the ratio of capital to output can be brought down drastically, i.e. output can be increased without a proportional increase in the stock of capital, when an emergency compels fuller employment and longer hours, and inhibits additions to equipment that would occur under normal conditions (see decline in ratios for 1939 and 1944, when the denominator includes the World War II years).

Another aspect of the capital-product ratio is perhaps more relevant here – in this case the ratio of total rather than reproducible capital is to be stressed. In the distribution of national income, most of the monetary equivalent of net national product is distributed to individuals – an observation particularly valid when we deal in decade averages and when shorter-term fluctuations in undistributed profits of corporations are ironed out. Even in recent prosperous decades the proportion of national product retained by corporations (or by governments) is minor

enough, so that in studying the broader trends we can deal with the distribution of flows to individuals by type of payment. And in classifying such payments by type we may treat wages, salaries, other payments to employees, and entrepreneurial income as overwhelmingly compensation of labor; and dividends, interest, and rent as compensation for the use of property. True, some labor services may be involved in the rent item, and some property income in income of entrepreneurs. But these elements of admixture are minor indeed, considering that the rent estimates are on a net basis and that the majority of entrepreneurs are in farming, retail trade, and certain service pursuits in which equity investment and returns on it are negligible compared with the input of entrepreneurs' own labor.

If the combined total of dividends, interest, and rent is treated as property income and if share in all income payments can thus be taken as an approximation to the proportionate compensation of all property or capital engaged in the process of production, a comparison of this share with the ratio of total capital to net national product will show the proportional net yield on all capital. This is the rationale for the comparisons presented in Table 13.

The estimates underlying the distribution of income by type are quite poor for the decades prior to 1919, for which we have to rely on the Martin-King series. The entries in column 1 summarize what we have, and the lack of comparability between the successive sets of estimates is clearly revealed by differences in their levels for the periods in which they overlap. About all that can safely be inferred is set down in column 2, although the percentages for the earlier decades should perhaps be somewhat higher. The picture suggests stability, or absence of any pronounced trend in the proportionate share of property incomes until the very recent years; and a sharp decline after the 1929–38 decade. To repeat, the series may well underestimate the shares in the early decades, and hence conceal a downward trend. But if such a trend prevailed, it was not sizable enough to emerge in the very rough estimates available.

If the percentage return on capital were constant, the share of property income in national income or net national product would have moved the way the ratio of total capital to national product moved in Table 13 – rising from the early decades to the 1930's and declining thereafter. But the entries in column 2

TABLE 13

Capital-Product Ratio and the Share of Property Income in National Product, U.S.A., 1870 to Date

Period	Percent Share of Property Income (1)	Date (beginning of year)	Percent Share of Property Income (2)	Ratio of Capital to N.N.P. (Total, 1929 prices) (3)	Percent Yield on Total Capital (2) : (3) (4)	Bond Yields: Macaulay-Durand (5)
King's Value of Product:						
1870–80	23.6	1879	20	5.1	3.9	5.4
1880–90	24.6	1889	21	5.4	3.9	4.0
1890–1900	22.4	1899	19	6.0	3.2	3.5
1900–10	24.2					
Martin's Agg. Payments:						
1899–1908	16.7					
1904–13	17.1	1909	20	6.0	3.3	3.8
1914–23	16.2	1919	19	6.4	3.0	4.6
1919–28	16.6					
NBER Agg. Payments						
1919–28	18.8	1924	18.8	5.7	3.3	4.7
1924–33	20.3	1929	20.3	6.1	3.3	4.5
1929–38	19.2	1934	19.2	6.1	3.1	4.0
1934–43	15.3	1939	15.3	4.9	3.1	3.1
1939–48	11.5	1944	11.5	4.7	2.4	2.7

Col. 1: Based on estimates in current prices. For entries prior to 1934–43 see *National Income: A Summary of Findings* (NBER, 1946), Table 15, p. 50; extrapolated through recent years by estimates of the Department of Commerce.
Col. 2: Based on col. 1.
Col. 3: From Table 12, col. 6.
Col. 5: See F. R. Macaulay, *Some Theoretical Problems*, etc. (NBER, 1938), p. A 111–12; carried beyond 1936 by David Durand's *Basic Yields*, etc. (see *Technical Papers* 3 and 6 (NBER, 1942 and 1947), carried to date).

suggest stability to the 1930's and a decline only in the forties. Hence, the rate of return per unit of capital must have declined from earlier decades to at least the 1920's – sufficiently to offset the rise in the capital-product ratio (column 4).

These derived net yield figures can be compared with a pure long-term interest rate – and it should be relatively pure since we deal here with total capital, specific differentials in risk

having been ironed out. The entries in column 5 are the calculations by F. R. Macaulay of yields on top-grade railroad bonds, adjusted for effects of closeness to maturity, and carried from 1936 onward by the recent estimates by David Durand of yields of basic corporate bonds.

The comparison reveals correspondence between movements in the bond yield rate and the calculated yield on total capital. Both drop from the early decades to 1894–03 (the yield on capital to 1914–13); rise from either 1894–03 or 1914–23 to 1924–33; and drop sharply thereafter, particularly in the last decade. This congruence in movements of two independent series is encouraging; and while in and of itself it does not constitute an explanation, it does lend credence to the combination of the stability of the shares of property income before the 1940's with the rise in the ratio of capital to current product before the 1930's.

The discrepancy in *level* between bond yields and the calculated yield on total capital should, however, be noted: the former are well above the latter, through most of the period, and the two converge only in the most recent decades. Provided that our estimate in column 4 is not so far wrong as to render the difference in levels insignificant, and it is unlikely that it could be in error to that extent,[1] we may ask what factors made for the distinctly lower yield on total capital than on prime bonds. One may have been the usual over-optimism of human nature of which Adam Smith spoke; and a large proportion of total capital must have been involved in ventures much more risky than those represented by prime bonds. The *average* return on these risky ventures may well have been much lower than the average return on safe types. Another factor may have been the expectation of capital appreciation, an expectation quite prevalent in the past among American entrepreneurs, small and big. Such expectation may well have been confirmed by experience, in the sense that a large proportion of the capital holders did enjoy capital gains. But capital gains are excluded from current income, and from any calculations relating to column 4. Since bonds do not offer similarly wide opportunities for capital

[1] The possible overestimate in value of land, already noted, is relevant here: it raises unduly the capital-product ratio in column 3, and thus depresses the yield levels in column 4. But a + 20 percent error in value of land is only a + 10 percent or smaller error in value of total capital. An adjustment of that magnitude would still leave a substantial discrepancy between columns 4 and 5.

gains, the lower yield rate on total capital may thus seem more comprehensible. Both these factors, which may possibly account for differences in level between columns 4 and 5, must have become much less important in recent decades, when risk investment and hopes of capital gains have become less prevalent. But all these are merely suggestions; and the comparison must be studied further, and much firmer estimates of distribution of income by type in earlier decades must be developed, before fuller understanding can be attained.

IV. DISTRIBUTION BY INDUSTRIAL ORIGIN

1. *Distribution in current prices*

Since our estimates of national income are derived by adding, for separate industries, income payments (wages, salaries, other compensation of employees, entrepreneurial income, interest, dividends, undistributed profits of corporations) we can express net income originating in each industry as a percentage of national income or net product in current prices (Table 14).[1] The estimates for decades beginning with 1919–28 are based on the NBER figures, carried beyond 1938 by corresponding totals of the Department of Commerce. Those prior to 1919 utilize R. F. Martin's estimates of aggregate payments (excluding undistributed corporate profits).

While the two sets of estimates are not fully comparable, the broad outline and the major trends of the industrial structure of national income are fairly clear. In recent decades commodity producing industries (agriculture, mining, manufacturing, and construction) accounted for about four-tenths of the national total; industries engaged largely in handling commodities (transportation and trade) for about two-tenths; and communications for a few percent. The remaining four-tenths of the national total originated in service industries and government.

The major trends were: decline in the shares of agriculture and construction; an initial rise, then stabilization, and more recently a suggestion of decline in those of mining and manu-

[1] Rent is treated as income originating in a distinct industry, real estate, largely because it is impossible to estimate separately *net* rent originating in each industry. However, its relative weight is small, and the resulting distortion in the distribution by industrial origin is minor.

TABLE 14

Percentage Distribution by Industry, National Income or Aggregate Payments, U.S.A., 1869-1948

(Based on values in current prices)

Period	Agriculture (1)	Mining (2)	Manufacturing (3)	Contract Construction (4)	Transportation and other Public Utilities (5)	Trade (6)	Service (7)	Government (8)	Finance and Miscellaneous (9)
MARTIN'S ESTIMATES – AGGREGATE PAYMENTS									
1869 and 1879	20.5	1.8	13.9	5.3	11.9	15.7	14.7	4.4	11.7
1879 and 1889	16.1	2.1	16.6	5.5	11.9	16.6	13.6	4.9	12.6
1889 and 1899	17.1	2.5	18.2	4.9	10.7	16.8	11.8	6.0	12.0
Decade									
1899–08	16.7	3.1	18.4	4.5	10.7	15.3	9.6	5.6	16.0
1904–13	17.0	3.3	18.9	4.3	11.0	15.0	8.9	5.4	16.2
1909–18	17.7	3.3	20.8	3.2	10.7	14.5	8.2	6.3	15.4
1914–23	15.2	3.3	22.2	3.0	11.0	14.0	8.3	7.9	15.0
1919–28	12.2	3.1	22.2	3.9	11.3	13.7	9.4	8.6	15.7
NBER ESTIMATES – NATIONAL INCOME									
1919–28	10.5	2.5	21.9	4.4	9.8	13.6	11.6	9.6	16.1
1924–33	8.7	1.9	19.6	4.2	10.4	13.3	13.4	11.8	16.7
1929–38	8.5	1.7	19.4	2.9	10.0	13.6	13.9	14.4	15.6
1934–43	9.2	1.7	24.2	2.9	8.5	13.2	12.1	15.4	12.7
1939–48	9.4	1.6	27.1	3.4	7.3	13.3	10.5	17.2	10.2

For entries through 1929–38 see *National Income: A Summary of Findings* (NBER, 1946), Table 11, p. 40. Carried forward through 1949 on the basis of Department of Commerce figures relating to income originating (excluding corporate taxes and including interest on government debt).

facturing; and a distinct upward trend in the share of government. The shares of the other industrial sectors do not display any trend of sufficient magnitude to warrant emphasis.

However, even the broad results suggested by Table 14 require scrutiny before they are accepted. Two major aspects call for further discussion: (a) the difficulties involved in relating the industrial distribution to the composition of national income viewed as the *net* product of the economy; and (b) the contribution of the various industries to national product in constant prices, which is of greater interest than their shares in totals based on current prices.

(*a*) The difficulties just mentioned can be illustrated by our experience in carrying the estimates forward through recent years. The procedure involved extrapolation of our estimates of net income for 1919–38 (sum of all income payments and undistributed profits) for each industry by similar figures of the Department of Commerce. The national income totals for years prior to World War II obtained by adding these extrapolated figures were quite close to the totals used in Part I, extrapolated by the final product estimates. But during the war years and thereafter the former total was appreciably larger than the latter. This discrepancy is easily explained: in our concept of final product, government expenditures on armed services and 'soft' war materiel were treated as intermediate product and a large depreciation charge was applied to war munitions and construction. Therefore, in estimating net income originating in government, the items just noted should have been deducted from the Department of Commerce figures representing governments' payments to employees and for interest. If we had deducted them, our estimates of net income originating in government would have been negative or very low – a result that would have been difficult to accept.

This specific illustration raises a general question. What is the significance of an industrial distribution when a given industry, in this case government, can devote resources to intermediate products – products that are absorbed by and constitute costs to the rest of the economy – and yet not charge the rest of the economy a price appropriate to such a contribution? The addition to factor payments by government of net undistributed profit or loss (represented, say, by the difference between additions to its real assets and to its debt) would, in this case,

yield very small (or possibly negative) income originating. But this low level does not reflect low productivity of government as an industry. The losses that the government sustained are chargeable to the whole economy, for the intermediate product delivered, i.e. the defense of the country, was vital to *all* industries even though other industries, and the factors engaged in them, were not charged for them. There was thus a marked discrepancy between the distribution of industries in their traceable contribution to the net national product and the distribution of industries in the visible allocation of income payments plus the net profit or loss item chargeable to them.

The discrepancy revealed by this illustration is associated with the peculiar role of government – which places upon it responsibility for general costs chargeable to the economy as a whole and puts it in a position where it neither can, nor perhaps should, charge for its services on a cost plus basis. But similar discrepancies arise in other cases if the output of some industry contains elements that offset increasing costs elsewhere and hence are not actually a net addition to national product. For example, assume that a substantial part of the services of the transportation industry offset centralization of manufacturing incompatible with dispersion of raw materials and of ultimate consumers; and that we therefore adjust national product by subtracting this portion of the value of transportation services. Where should the corresponding deduction be made in the industrial distribution of payments to factors and undistributed profits or losses? Should this item be deducted from the sum of factor payments and net profit originating in the transportation industry, thus depressing it beyond recognition? Should it be deducted from the sum of factor payments and net profit originating in manufacturing, on the score that it was the concentration of manufacturing plants, designed for greater efficiency, that threw a greater burden on the transportation industry? Or should we assume, as in fact was done in Table 14, that industries contribute to total net national product in accordance with the relative weight in them of factors as measured by income payments plus net gains or losses in the private sector; or by income payments alone in the sectors for which net gain can be properly calculated only by disregarding emergency losses sustained for the benefit of the community at large?

The point we stress here is the incongruity between the national income totals, whose units, viz. industries, are complexes of productive factors organized about the production and sale of marketable or of public goods (either final or intermediate product), and one that is the sum of final products. Since industries are not complexes for the production of final goods, it is difficult, if not impossible, to identify any specific final product magnitude with any specific industry's activity. Industries contribute the efforts of the factors of production engaged in them; and the *total* result of that effort is quantitatively identical with the magnitude of net national product viewed as a sum of final goods. But since the industries are interlocked in the production of any group of final goods, and their shares in the production of these goods cannot be directly identified, an industrial distribution of the national product must be based upon the general assumption that the contribution of each industry is proportional to the economic magnitude of the resources engaged in them. At bottom, therefore, the distribution is one of activity of productive factors, not of origin of the net product. It is this concept of the industrial distribution that was followed in the calculations underlying Table 14. We took the ratios of shares of each industry in a total that was *not* reduced by deducting war incurred outlays – on the assumption that the losses involved are chargeable to the economy as a whole rather than to the industry called 'government'.[1]

(*b*) Whatever the concept of the industrial distribution, we are interested in levels of shifts in it free from the effects of changing price levels. Changes in price levels of resources engaged in different industries are not necessarily of the same magnitude, and sometimes even not in the same direction – partly because of differences in response of the prices of marketable products of these industries and partly because of differences in productivity of the complexes of resources when expressed in identifiable goods at constant prices.

[1] This emphasis on an industry as a complex of productive resources that may engage not only in turning out final products but may devote a large part of its energies to offsetting costs generated elsewhere in the economic system is, of course, of direct bearing upon interpretations of changing industrial distributions in economic growth. Some recent discussions, emphasizing differences among industries in 'product' per worker, have either implied or overtly argued the desirability of shifting to the higher 'product per worker' industries. The danger of identifying an industry with a complex directly producing final goods is clearly suggested by the comments in the text.

The need for some specific price adjustment is obvious; and I quote in this connection an earlier discussion:

> . . . two types of adjustment are significant. First, we may wish to know for income produced (i.e., originating) the variations in the volume of commodities and services contributed by each branch to the total of economic goods produced by the nation. Second, for both income produced and income paid out [i.e., sum of income payments, excluding undistributed gains and losses. – S.K.] we may wish to know the purchasing power, to the individuals and business establishments attached to each industrial branch, of the income for whose creation they are responsible and which was made available to them in compensation for their activity. In the first case, income produced would be adjusted for changes in the prices of commodities and services *produced* by the industry. In the second, both income produced and income paid out would be adjusted for changes in the prices of commodities and services *purchased* by the individuals and business establishments in a given industry with the net income available to them. The first type might be designated the adjustment for the price changes of the product; the second, the adjustment for changes in the purchasing power.[1]

We are obviously interested here in the first type of adjustment. And the difficulties involved in it are commented upon as follows:

> That for price changes of the product requires not the usually available prices of the commodities and services produced in the industry but prices of that part of the product which constitutes the net income. Thus, in adjusting net income produced in agriculture or in mining, we cannot use directly prices of agricultural or mineral products, since a substantial part of the price of each is accounted for not by the net income of agriculture or mining but by payments made by these industries to other industries. What is needed is some price index derived from a comparison of the prices of agricultural or mineral products with the prices of those economic goods which agriculture or mining purchases from other industries and consumes in its productive processes. (*Ibid.*, p. 5.)

An attempt to adjust for price changes along the lines quoted is presented in Table 15; with the available data it is feasible only for agriculture back to 1909. Column 1 contains an index

[1] 'Income Originating in Nine Basic Industries, 1919–1934', National Bureau of Economic Research, *Bulletin No. 59, May 4, 1936*, p. 5.

of prices of net income originating in agriculture derived by the following steps. (i) An index of prices paid by farmers for goods bought for production purposes, and indexes of interest and taxes paid by farmers (assumed here to be fully chargeable to costs of production), appropriately weighted, were combined into a single index of prices of goods and services purchased by farmers from other industries. (ii) The index of prices received by farmers for goods sold by them we took to represent movements of prices of total gross income from farming including income in kind. (iii) For 1919-38 the ratio of net income originating in agriculture to gross income was about 60 percent (see *National Income and Its Composition*, NBER, 1941, Vol. II, Table A-1, p. 543). We assumed that the same ratio persisted through the decades back to 1909, multiplied the index under (ii) by 100, the index under (i) by 40, subtracted the latter from the former, and divided by 60. Since the indexes under (i) and (ii) were to the base of 1910-14 as 100, the resulting price index of net income originating in farming was also to that base. (iv) We converted the index under (iii) to 1929=100 by division, averaged it for overlapping decades, and secured the entries shown.

The index just obtained could be applied to the dollar volume of net income originating in agriculture, in current prices, to yield a similar total in 1929 prices; and the latter could then be divided by national income or net national product in 1929 prices to yield the share of agriculture based on values in 1929 prices. A simpler procedure was followed in Table 15. We calculated the ratio of the price index for income originating in agriculture to the price index, 1929=100, implicit in net national product (column 3) and applied it, as an adjustment, to the share of agriculture in national income based on values in current prices and derived from Table 14 by linking our estimates with Martin's (column 4). The result is the estimated share of agriculture in national income or national product, based on 1929 prices (column 5).

The procedure is deficient in several respects. Since the indexes are available annually, the price adjustment could have been carried out year by year, and decade averages of adjusted annual totals could have been derived. The indexes of prices paid and received by farmers should, and possibly could, have been shifted from the 1910–14 to the 1929 base by detailed re-weighting

TABLE 15

Adjustment for Price Changes of the Share of Agriculture in Net National Product, U.S.A., 1909-1948

(Annual averages for overlapping decades)

Decade	Price Index for Net Income Originating (1929=100) (1)	Price Index Net National Product (1929=100) (2)	Ratio of (1) to (2) (3)	Percentage Share of Agriculture in N.N.P. Current Prices (4)	Percentage Share adjusted to Constant Prices (4) : (3) (5)	(5) as Index 1919–28=100 (6)	Index of Share of Agriculture in G.N.P. based on Production Indexes (7)
1909–18 . .	93	72	1.29	15.2	11.8	118	125
1914–23 . .	114	97	1.18	13.1	11.1	111	113
1919–28 . .	109	104	1.05	10.5	10.0	100	100
1924–33 . .	76	96	0.79	8.7	11.0	110	100
1929–38 . .	59	85	0.69	8.5	12.3	123	96 (100)
1934–43 . .	82	91	0.90	9.2	10.2	102	81 (90)
1939–48 . .	150	118	1.27	9.4	7.4	74	71 (82)

Figures in brackets in col. 7 represent share in gross national product. The other entries in col. 7 for 1929–38 and later decades are based on shares in gross national expenditures.

Col. 1: For explanation see text. Data on indexes of prices paid and received by farmers are from *Agricultural Statistics*, 1950, Tables 677 and 678 (U.S.D.A., Washington).
Col. 2: From data underlying Table 1.
Col. 4: Derived from Table 14. For the earlier years by simple extrapolation of the shares for 1919–48.
Col. 7: For derivation see Tables 16 and 17.

rather than by simple division. Most important, if annual dollar volumes of expenditures and receipts had been used, we could have dispensed with the assumption that the proportion of payments to other industries to total value product was constant throughout the period at 40 percent. But the elaborate calculations called for by these refinements were not possible, and we were largely concerned with broad results of such a procedure and deemed the methods employed here to be adequate for this.

The movements of the share of agriculture thus derived differ significantly from those in shares based on values in current prices. The decline in column 5 from 1909–18 to 1919–28 is much smaller than the decline over the same decade in column 4. In the decades affected by the depression of the 1930's the share of agriculture in constant prices rises, whereas the share in current prices declines sharply; and there is a contrasting difference in movements in the last two decades of the war and postwar price rises. Indeed, the only similarity in the movements of shares of agriculture in totals based on constant and on current prices is the downward trend over the period as a whole – quite marked in both columns 4 and 5, and, on a relative basis, of about the same magnitude in the two.

The divergence in the shorter-term movements of the shares in columns 4 and 5 reflects the greater sensitivity of prices received than of prices paid by farmers. This difference in sensitivity may well have been exaggerated in column 5 by our assumption of constancy of weight of payments to other industries to gross value product. One would expect that in periods when the ratio of prices paid to prices received is in favor of agriculture, farmers would be less resistant to expanding purchases from other industries – so that the effect on the price index in column 1 would be to raise it less than it is raised now. Likewise, when, as in business depressions, the ratio of prices paid to prices received moves against agriculture, there is pressure to contract purchases from other industries relative to value product; and this shift in weights would result in a lesser decline in the price index for net income originating in farming than we show in column 1. If so, the shorter-term movements in column 5 have been exaggerated – in the sense that with an allowance for shifting weights, they would have shown more of a decline from 1909–18 to 1919–28 and less of a rise from 1919–28 to 1929–38.

For present purposes the most important point in Table 15 is brought out by comparison between columns 6 and 7. In column 6 we have the percentage of agriculture in national income, based on values in constant prices (column 5) converted to an index, with 1919–28=100. For column 7 we used the index of gross agricultural production (adjusted only for intra-industry duplication of products, e.g. of corn and hogs, or hay and dairy products), a volume derived from physical quantities by an appropriate set of constant price weights, and gross national product (to 1929–38) or gross national expenditures (for 1929–38 onward). *Gross* nationwide totals are used since the gross output of agriculture includes capital consumption; and, for recent decades, gross national expenditures since, for reasons indicated above, net income originating in government is not reduced to correspond to our final product concept. However, using gross national expenditures somewhat exaggerates the appropriate total, although perhaps not too much for the purposes at hand. By dividing the index of physical volume of agriculture by that of the constant price volume of the appropriate national product, both to a 1919–28 base, we get the entries in column 7 (the figures in brackets for recent decades are based on gross national product, rather than gross national expenditures).

The rationale for this comparison is stated in NBER *Bulletin* 59:

> . . . upon the assumption that if price relations of all commodities and services and the technical conditions of production are held fixed, the proportion of the industry's *gross* product (when computed so as to exclude intra-industry duplication) that goes into *net* income is constant. (*Ibid.*, p. 5).

In other words, if our constant prices also mean constant price relations, and if no major technical changes occur to affect the secular ratio of gross to net output in constant prices, movements of gross physical volume of production represent movements of net income originating in constant prices. In Table 15 this assumption was modified to apply to a comparison in which both numerator and denominator include durable capital consumption, but the implication is that this inclusion would not affect appreciably the movements of the ratio.

The results of the comparison are rather mixed. The share of agriculture in national product in constant prices, derived by relating indexes of gross agricultural output to those of national

product in 1929 prices, shows, like those in column 6, a substantial decline from 1909–18 to 1919–28; there is only a slight decline (or stability when gross national product rather than gross national expenditures is used) from 1919–28 to 1929–38; and a sharp drop again to 1939–48. The directions of movements are thus quite similar to those in column 6. But the index based on comparison of gross agricultural output with g.n.p. or g.n.e. does not display the sharp rise during the depression decades observed in column 6; and it declines more from 1909–18 to 1919–28 than the latter.

However, it is encouraging that the decline over the whole period is about the same in columns 6 and 7, if the comparison should properly utilize figures for column 7 somewhere between the bracketed and unbracketed. The over-all decline in the share of agriculture in column 6 is somewhat less than 40 percent of the initial figure; in column 7, somewhat over 40 percent (using g.n.e. as base) or 34 percent (using g.n.p. as base). I would be inclined to argue that the erratic behavior of the shares in column 6 is due partly to the crudities of our procedure; and that, on the basis of the comparison as it stands, the errors possible in the longer-term trends in shares derived by the procedure underlying column 7 are not so great as to preclude its use.[1]

[1] After our calculations were completed, John W. Kendrick presented a more elaborate estimate in his paper, 'National Productivity and Its Long Term Projection', for the May 1951 meeting of the Conference on Research in Income and Wealth. In this paper Mr. Kendrick estimates the part of gross national product originating in agriculture, in 1939 prices (using the g.n.p. concept of the Department of Commerce), by adjusting annually both the value product of agriculture and the payments made to other industries for price changes back to 1909. He also estimates *private* gross national product (i.e. gross national expenditures minus employee compensation by governments) in 1939 prices. (Mr. Kendrick's estimates relating to gross farm product in constant prices were published in the *Survey of Current Business*, September 1951, pp. 13–19.)

Using his data, I calculated the proportions originating in agriculture for the overlapping decades; then converted them to indexes for comparison with those shown in columns 6 and 7 of Table 15.

	Kendrick: Percentage share of agriculture in private g.n.e. at 1939 prices	Col. 6	Col. 7
1909–18	128	118	125
1914–23	115	111	113
1919–28	100	100	100
1924–33	99	110	100
1929–38	100	123	96
1934–43	72	102	81
1939–48	68	74	71

2. *Shares based on values in constant prices*

Table 16 presents indexes of physical volume of output in the broad industrial sectors for which such indexes can be calculated. For most industries for most of the period the series at hand are those presented by Messrs. Fabricant, Barger, Stigler, and their associates in the productivity studies of the National Bureau of Economic Research. They have been pieced out for earlier and more recent years by the work of other investigators. In general, the indexes are composites of series on physical units weighted by constant sets of values (either prices or value added).

Even slight experience in this field reveals the numerous difficulties in the way of securing continuous, comprehensive, and reliable measures of volume of output measured at constant prices – for the variety of industries included in Table 16. It is not possible to detail them here, or discuss at length the methods used to obtain the estimates. One major qualification is noted: the indexes for recent decades for manufacturing fully reflect the extent of over-pricing of war production, even though they purport to be, and literally speaking are, measures of physical volume of output, i.e. of volume components weighted by constant prices. But even this qualification is not serious enough to upset the major trends and the differences among them that emerge in the table.

The two sectors whose rate of growth we would expect to be distinctly lower than in the rest of the economy – agriculture and construction (the latter dominated by residential and related housing) are among the laggards. The contrasting picture for transportation and public utilities – railroads and other commercial transportation agencies, electric light and power and gas utilities, and communications (telephone and telegraph) – is not unexpected; but the rate of growth is strikingly high. The apparent equality in the rate of growth of mining and manufacturing is to some extent misleading – the recent inflation

Since Mr. Kendrick's data allow for a possible secular increase in the share of payments to other industries in total value product for agriculture (a point which he stresses in his discussion), his estimates yield a somewhat more pronounced downward trend in the share of agriculture than we have in column 7 of Table 15. But the difference between a decline of about 47 (Kendrick data) and 43 percent (column 7) over the period is too small to be significant. Kendrick's results seem to me to justify the use of the procedure underlying column 7, and indicate that the erratic aspects of the results in column 6 are due largely to the crudities of our procedure.

TABLE 16

Indexes of Physical Volume of Output, Selected Industries, U.S.A. 1869-1948

Indexes, 1919–28 = 100

Decades	Agriculture (1)	Mining (2)	Manufact. (3)	Constructn. (4)	Transp. and Public Utilities (5)	G.N.P. (6)	G.N.E. (7)
1869–78	35	7.3	10.9	18.0		13.4	
1874–83	43	10.2	16.0	23.1		19.2	
1879–84	51	14.4	20.8	32		25.1	
1884–93	55	19.5	25.1	47		30	
1889–98	61	24.5	30.1	56	17.3	34	
1894–03	71	33	37	60	25.3	43	
1899–08	79	46	48	70	39	53	
1904–13	85	60	59	83	54	64	
1909–18	90	74	75	80	69	72	74
1914–23	94	85	87	74	85	83	85
1919–28	100	100	100	100	100	100	100
1924–33	107	106	106	102	105	106	107
1929–38	105	105	108	70	104	105	109
1934–43	115	125	167	81	137	128	142
1939–48	135	152	238	88	200	165	190
Average Percentage Rate of Increase per Decade[1]							
1869–78 to 1939–48	21.3	54.3	55.3	25.4		46.1[2]	
1889–98 to 1939–48	17.2	44.1	51.2	9.5	63.2	41.1[3]	

[1] Calculated from the first to last decade, to the value of the initial decade as base.

[2] Based on col. 6 through 1919–28; col. 7 beginning 1924–33.

Notes to Table 16:

In general all entries are averages of annual indexes, shifted to the 1919–28 base by simple division. Most of the underlying annual indexes are to the 1929 base.

Col. 1: For 1897–1938 from Harold Barger and Hans H. Landsberg, *American Agriculture, 1899–1939* (NBER, 1942), p. 404. Extrapolated to 1869 by the index in Frederick Strauss and Louis H. Bean, *Gross Farm Income and Indices of Farm Production and Prices in the United States, 1869–1937* (Department of Agriculture, Washington, 1940), Table 61, p. 126. Carried forward by Department of Agriculture index of farm output in the *Economic Report of the President, January 1951*, Table A-16, p. 186.

Col. 2: For 1899–1938 from Harold Barger and Sam H. Schurr, *The Mining Industries, 1899–1939* (NBER, 1944), Table A-5, p. 343. Extrapolated to 1869 by Warren and Pearson, *Cornell Agric. Exp. Station, Memoir No. 144*, Table 1,

being more appreciable in manufacturing than in mining, the former showing a greater rate of growth up to the pre-war years.

But the purpose of these indexes of physical volume of output is to derive shares of industries in net national product at constant prices. The procedure followed is that discussed in connection with column 7 of Table 15. (i) The index of output for a given industry is divided by the index of gross national product in 1929 prices (to 1919–28) or by the index of gross national expenditure for the more recent decades. (ii) The resulting index is applied to the share of the given industry in national income in 1919–28 (given in Table 14), the implicit assumption being

p. 5. Carried forward by the FRB index of output of minerals shown in *The Economic Report of the President, January 1951*, Table A-17, p. 187.

Col. 3: For 1899–1938 from Solomon Fabricant, *The Output of Manufacturing Industries, 1899–1937* and *Employment in Manufacturing, 1899–1939* (NBER, 1940 and 1942), pp. 602 and 331 respectively. Extrapolated to 1869 by Shaw's output of finished manufactured products and construction materials in 1913 prices, available annually since 1889 and for 1869 and 1879 (see W. H. Shaw, *Value of Commodity Output since 1869* (NBER, 1947), particularly Tables I-1 to I-3). For annual interpolation between 1869, 1879, and 1889 we used Warren M. Persons' index (see his *Forecasting Business Cycles*, New York, Wiley, 1931, Table 12, pp. 170–1).

Col. 4: The index is based on the Department of Commerce estimates of value of new construction deflated by an index of construction costs (shown since 1929 in *The Economic Report of the President, January 1951*, Table A-16, p. 186). Carried back of 1929 by the estimates of construction, in 1929 prices, shown in *National Product since 1869* (NBER, 1946), p. 99.

Col. 5: A combination of indexes for (a) transportation, (b) gas and electric utilities, (c) communications.

(*a*) The basic indexes are those of Harold Barger, *The Transportation Industries, 1889–1946* (NBER, 1951). The indexes shown are for 1889, and annually from 1920 through 1939 (see Table 5, p. 26). Annual interpolation between 1889 and 1920 was based on the index for steam railroads (*ibid.*, Table 17, p. 70). The figures were carried forward by the Department of Commerce index of all transportation, shown in *The Economic Report of the President, January 1951*, Table A-16, p. 186.

(*b*) The basic index is from J. M. Gould, *Output and Productivity in the Electric and Gas Utilities, 1899–1942* (NBER, 1946), Table 40, p. 131, weighted index. It was interpolated between 1902, 1907, and 1912 along a straight line to the logs; and projected to 1899 by a straight line interpolation (to the assumed initial point of 0 in 1879). Carried forward by an index of production in electric and gas utilities shown in *The Economic Report of the President, January 1951*, Table A-16, p. 186.

(*c*) For years prior to 1930, an index based on data from the Bell Telephone Co. and shown in Solomon Fabricant, Labor Savings in American Industry, 1899–1939, *Oc. Paper No. 23* (NBER, 1945), p. 49. Carried forward by an index of output for telephone and telegraph in *The Economic Report of the President, January 1951*, Table A-16, p. 186.

The three indexes, converted to 1919–28=100, were weighted by net income originating in 1919–38 as percentages of national income (see *National Income and Its Composition*, Vol. I (NBER, 1941), Table 13, pp. 166–7). The weights (constant throughout the period) were 7.1 for transportation, 1.6 for electric and gas utilities, 1.1. for communications.

Cols. 6 and 7: Based on Tables 1 and 2.

that the movement of the shares over time, based on values in constant prices, is revealed by the *difference* in movement between physical volume of output for the industry and the price adjusted volume of gross national product (or expenditure). The shares obtained by step (ii) are shown in Table 17.

The basic premise of Table 17 is that the structure of each major industrial sector, with respect to the proportion of income (gross of its consumption of durable capital) to the value of its product (underlying the output indexes) has not changed markedly. If it has, if, e.g., income originating in manufacturing or transportation was a markedly declining proportion of the value product reflected in its output index, the trends shown in Table 17 would be wrong.

TABLE 17

Estimated Shares of Selected Industries in Net National Product, based on Indexes of Physical Volume of Output, U.S.A. 1869-1948

Decade	Agriculture (1)	Mining (2)	Manufact. (3)	Contract Constructn. (4)	Total 1–4 (5)	Transp. and Public Utilities (6)	Total 5+6 (7)
1869–78	27.4	1.4	17.7	5.9	52.4		
1874–83	23.5	1.3	18.2	5.3	48.3		
1879–88	21.3	1.4	18.2	5.6	46.5		
1884–93	19.4	1.65	18.6	7.0	46.6		
1889–98	18.8	1.8	19.5	7.3	47.4	5.0	52.4
1894–03	17.3	1.9	19.1	6.2	44.5	5.8	50.3
1899–08	15.6	2.2	19.9	5.8	43.5	7.3	50.8
1904–13	14.0	2.4	20.1	5.7	42.7	8.2	50.9
1909–18	13.1	2.6	22.8	4.9	43.4	9.4	52.8
1914–23	11.9	2.6	23.0	3.9	41.4	10.0	51.4
1919–28	10.5	2.5	21.9	4.4	39.3	9.8	49.1
1924–33	10.5	2.5	21.7	4.2	38.9	9.6	48.5
1929–38	10.1	2.4	21.7	2.8	37.0	9.3	46.3
1934–43	8.5	2.2	25.8	2.5	39.0	9.4	48.4
1939–48	7.5	2.0	27.4	2.0	38.9	10.3	49.2

For method of derivation see Table 16 and text.

The comparison with Kendrick's figures in footnote on p. 98 is pertinent here. The trends in Kendrick's estimates of the share of agriculture, which take into account changing ratios of product originating to total output, are only slightly different from those shown in column 1 here. For manufacturing a rough

check is provided by ratios of value added to value of product, both in current prices. These can be calculated easily from summary tables (see *Historical Statistics of the United States*, series J 9–10, p. 179). With allowance for some differences in coverage and sensitivity of the ratios to price movements (they tend to rise in depressions and decline in expansions because the prices of materials consumed are more responsive than the prices of factors involved in value added), one gets the impression of persistent stability. As they stand, without any adjustment, the ratios vary from 37 to 47 percent (from 1869 to 1939, by Census years) with most years within a narrow range of about 40 to 43 percent. No trend over the period as a whole is apparent, the discernible movements being a slight decline from about 42 to 44 percent in the early decades to about 40 percent around World War I and then a rise to higher levels in the 1920's and the 1930's. If the current value figures and the value added concept can be used, one finds no significant trend in the ratio of net income originating to total value of product in manufacturing. The basic premise of Table 17 is thus at least not denied when we consider two major industrial sectors – agriculture and manufacturing.

Some of the conclusions suggested by Table 17 are familiar. The marked decline in the share of agriculture, to less than a third of its magnitude in the first decade, was to be expected, although the extent of the decline is perhaps somewhat of a surprise. The rise in the share of mining, small absolutely but quite large relatively, and its subsequent decline are also fairly familiar trends. So also is the downward trend in the share of construction, disturbed as it is by the long cycles that are much more prominent in at least the residential and related sector of this industry than in other sectors of the industrial system. The steady and striking climb in the share of transportation and public utilities also accords with our expectations.

However, the trend in the share of manufacturing industries is puzzling. It rises only moderately to 1899–1908, whereas Martin's estimates in Table 14 based on current values, for whatever they are worth, suggest that the share of manufacturing industries rises at twice the rate during the period from 1869–79 to 1899–1908. W. I. King's estimates for shares of manufacturing plus light and power rise from about 24 percent of national income for 1870–80 to 28 percent for 1880–90 and

remain at about that level through 1910 (see *The Wealth and Income of the People of the United States*, N.Y., 1915, p. 140, values in current prices). One would, offhand, expect the share of manufacturing to rise more in the early decades than is indicated in Table 17; and the fault may lie in our use of the Shaw estimates, rather than of some *netter* figure, particularly since these underlie and dominate our totals of net national product. It is, therefore, possible that we are underestimating the extent of the rise in the share of manufacturing from 1870 to about 1900.

Regardless of this qualification, the surprising aspect of the evidence in Table 17 is that the share of commodity producing industries in total national income declines only moderately (column 5); and this decline would have been even milder had we allowed for a lower share of manufacturing in the earlier decades. As the figures stand, the drop in the share of commodity producing activities is from about 50 to about 40 percent. Furthermore, if we added transportation and other public utilities, the downward trend would disappear almost completely: with an allowance of about 2 or 3 percent in column 6 for the first decade, and a downward adjustment for a possible exaggeration in the share of manufacturing, the total share of the commodity producing, transportation, and communication sectors would not be much in excess of 50 percent in 1869-78 and only slightly below that value at the end of the period. It follows that the share of the remaining sector of the productive system – a combination of trade, service industries of various description, finance, and government – would also fail to show a significant trend.[1]

Thus, contrary to prevailing impressions, the share of the combined service industries, particularly if the capital-intensive transportation and other utility industries are excluded, failed to increase significantly – on the basis of values in either current or constant prices. True, within this service sector, the share of government increased markedly, at least so far as current value figures can be used. But the common generalizations concerning

[1] This conclusion could be denied only if it could be assumed that in all industries in columns 1–6, the ratio of net income to value of product showed a marked downward trend over the period. While such a trend may have characterized agriculture, it is unlikely to have characterized the other industries. In the public utilities sector particularly, the trend in the ratio of net income to value of product may have been upward (also in manufacturing since 1919).

the fall in the share of extractive or primary industries should be reformulated to read the share of agriculture; and that concerning the presumptive rise of tertiary industries should be reformulated to read the public utility and government sectors and, at least in the United States, should not be applied to the share of trade, or of the conglomerate of service industries proper.

The percentages in Table 17 can be compared with those in Table 14: the former are shares of selected industries, based on values in constant prices, the latter are shares based on values in current prices. Hence the division of one share by the other yields the prices of factors in a given industry compared with prices of factors in the economy at large; and movements of the ratio reveal movements in the cost of factors in the given industry, relative to that of factors in the economy.

The comparison, given in Table 18, is limited to decades back to 1899–1908, because Martin's estimates are on an annual basis only back to that date; and are probably much more reliable since that year than for the Census years prior to it. The results are of some interest, and most of them are consistent with knowledge that we have of related phenomena. For example, the fluctuations in the relative indexes for agriculture are an obvious consequence of the much greater sensitivity of prices of agricultural commodities than of costs of agricultural production (i.e. prices paid to other industries). For this reason the index rises in decades marked by high and rising price levels (World War I and II decades) and declines during the depression decades. The upward trend in the relative prices of resources in the construction sector presumably reflects the lag of its productivity behind that in the economy at large. Since resources or factors compete with each other on interrelated markets and tend to be priced at comparable levels, taking into account differences in training, working life span, etc., a factor that yields a small proportion of national product would be costlier per unit of the latter than an equally priced factor yielding a larger proportion of the product. Hence, a lag in productivity of a given factor, measured in shares of national product, would mean, other conditions being equal, a rise in its price relative to prices of all factors. By the same reasoning, the downward trend in the index for transportation and public utilities reflects the greater advance in productivity in that sector. The same may

TABLE 18

Indexes of Ratios of Prices Applicable to Net Income Originating, Selected Industries, to Prices Implicit in Total Net National Product, U.S.A., 1899-1948

Decade	Agriculture (1)	Mining (2)	Manufacturing (3)	Contract Construction (4)	Transp. and Public Utilities (5)	All Other (6)
1899–08	92	114	91	86	127	103
1904–13	104	112	93	86	116	101
1909–18	116	104	90	73	99	103
1914–23	110	104	95	87	95	102
1919–28	100	100	100	100	100	100
1924–33	83	76	90	100	108	107
1929–38	84	71	89	104	108	107
1934–43	108	77	94	116	90	104
1939–48	125	80	99	170	71	101

Derived by division from Tables 17 and 14. The shares in Table 14 were made continuous by using the Martin estimates to extrapolate the NBER estimates.

be true of mining, particularly under the impact of new mineral products (e.g. petroleum), although the magnitude of the decline is surprising. The general stability in the index for manufacturing and particularly in the index for the rest of the economy is to be expected because of the great variety of resources involved; and since residual and manufacturing together account for almost seven-tenths of the countrywide total, the relative price cannot be much different from the prices of all factors in the economy. One should note, however, that the rise in the index for manufacturing from 1929–38 to 1939–48 and in the index for 'all other' from 1919–28 to 1929–38 (and the decline thereafter) fully accord with our knowledge of the shifts in relative pricing of resources in these major sectors.

3. *Industrial distribution of labor*

Table 19 presents a convenient summary of the data available on the industrial distribution of labor for the period covered here. As is almost inevitable, the data are not fully consistent or reliable. Daniel Carson's estimates for Census years relate to gainfully occupied workers, i.e. employees and entrepreneurs whether or not employed at the time. The NBER and Department of Commerce data relate only to persons employed, and

TABLE 19

Percentage Distribution of Engaged among Industries, U.S.A., 1870 to date

Year	Agriculture (1)	Mining (2)	Manufacturing (3)	Construction (4)	Transp. and Public Utilities (5)	Trade (6)	Finance, Insurance, Real Estate (7)	Government (8)	Service, Miscell. (9)	Unallocated (10)
					GAINFULLY OCCUPIED					
1870 . .	49.7	1.5	17.4	5.8	4.0	6.1	0.3	1.9	12.0	1.2
1880 . .	49.5	1.8	18.2	4.8	3.7	6.6	0.4	2.3	11.6	1.1
1890 . .	42.1	2.0	20.0	6.1	4.7	7.7	0.7	2.5	13.6	0.7
1900 . .	36.8	2.6	21.8	5.7	5.3	8.5	1.0	2.8	14.3	1.2
1910 . .	30.8	2.9	22.3	6.2	6.7	9.1	1.4	3.5	15.1	2.0
1920 . .	26.7	3.0	26.1	5.2	7.4	9.8	1.9	4.5	14.5	0.9
1930 . .	21.5	2.4	22.5	6.2	6.8	12.4	2.9	4.9	17.8	2.7
1940 . .	17.4	2.1	22.7	6.6	4.8	13.2	2.8	5.5	18.9	6.2
Decade					ENGAGED, NBER					
1919–28 .	20.6	2.6	22.8	4.0	8.0	14.0	2.7	7.2	18.1	
1924–33 .	20.2	2.3	20.9	3.9	7.2	14.6	3.1	7.6	20.1	
1929–38 .	20.6	2.2	20.6	2.9	6.1	14.4	3.2	8.5	21.5	
Period					ENGAGED, D. OF C.					
1929–38 .	20.3	2.1	21.0	4.2	7.6	17.1	3.5	10.5	13.8	
1934–43 .	16.7	1.9	23.5	3.9	6.5	16.6	3.2	14.8	12.8	
1939–48 .	13.3	1.7	25.6	4.1	6.6	16.4	3.0	17.7	11.7	
1939–41 .	16.2	1.9	23.4	4.2	6.6	17.7	3.3	13.4	13.3	
1947–49 .	12.8	1.7	26.0	5.6	7.4	19.1	3.4	11.8	12.4	

1870–1940: Estimates by Daniel Carson, 'Changes in the Industrial Composition of Manpower since the Civil War', *Studies in Income and Wealth, Volume Eleven* (NBER, 1949), p. 47. The figures are carried from 1930 to 1940 on the basis of change in labor force.
1919–28 to 1929–38: See *National Income: A Summary of Findings* (NBER, 1946), Table 12, p. 41.
1929–38 to 1947–49: *Survey of Current Business*, July 1947 Supplement and July 1950, Table 28.

adjust for partial employment by conversion to 'full-time equivalents' whenever data permit (largely in agriculture, retail trade, and some of the service industries). Nor are the industrial classifications fully consistent: the gainfully occupied series has a small unallocated group and its construction sector is wider than that in the National Bureau-Department of Commerce estimates in which it is limited to *contract* construction; the transportation and public utility sector in the NBER estimates is appreciably narrower than in the Department of Commerce series, since it excludes some minor groups for which no separate estimates back to 1919 were possible; correspondingly the service plus miscellaneous sector in the NBER series is wider in scope than that in the Department of Commerce totals. However, all these qualifications mean only that we should not attribute significance to minor differences and changes.

The distribution of the engaged labor force, and it is estimates for the engaged that must be emphasized in the present connection (with those for gainfully occupied used as extrapolators for decades prior to 1919), show some similarity to the distribution of national product in constant prices (Table 17). But it is the differences between the two that are of most interest.

In general, agriculture's share in the number engaged is larger than its share in national product: the former declines from somewhat below 50 percent to about 13 percent; the latter from about 27 percent to 7.5 percent. In contrast, the share of the transportation and public utility sector in number engaged is, in most decades, significantly lower than its share in national product.

The comparison of the trends is even more significant. The share of agriculture in the engaged labor force declines, and almost as appreciably as its share in national product. The upward trend in the share of mining and manufacturing in the numbers engaged is again fairly, if not closely, similar to the trend in their shares in national product. But the share of construction in numbers engaged declines very much less than its share in national product; and the share of the transportation and public utilities sector in the engaged labor force (from 1890 on) shows no rise, whereas the rise in its share in national product is among the most conspicuous. Finally, as is brought out more clearly in Table 20, the share of commodity producing industries in the numbers engaged, either including or excluding

transportation and public utilities, declined markedly over the period; whereas their share in national product declined very much less, and if the transportation and public utility sectors are included, showed no significant decline. This means that the residual, i.e. all service industries, including or excluding the transportation and public utility sector, must have accounted for an increased proportion of numbers engaged; but not for a similarly increased share of national product.

This comparison of the industrial distribution of the engaged labor force and of national product can be made more explicit. If we divide the share of a given industry in national product (in constant prices) by its share in the total engaged, we get the ratio of product per engaged person in the given industry to product per engaged person for the whole economy. If this ratio is more than 1, product per engaged person in that industry is greater than the countrywide product per engaged person. If it rises, the relative change in product per engaged person in the given industry is algebraically greater than the change in countrywide product per engaged person (in our case, the change would presumably be upward both in countrywide product and in the given industry product per engaged person, since our comparison relates to long-term changes alone).

The percentage shares in the engaged labor force, taken from Table 19, were put on a comparable basis by extrapolating the percentages in the NBER estimates for the decades from 1919–38 onward by those in the Department of Commerce estimates; and back to 1870 by the Carson estimates of gainfully occupied population (averaging the two Census years ending on 0 to get a percentage corresponding to a 9–8 decade of our estimates). The division of the percentage shares in national product in Table 17 by these continuous percentage shares in engaged labor force yielded the ratios in Table 20.

(i) For all decades, product per person engaged in agriculture is appreciably smaller than countrywide product per person engaged; or 0.5–0.6 of the latter. (ii) For most decades, product per person engaged in transportation and public utilities is significantly larger than the countrywide product per person engaged. (iii) For most decades, product per person engaged in construction is larger than countrywide product per person engaged. (iv) Product per person engaged in mining and manufacturing, which were combined to yield more reliable results,

is in most decades close to the level of the countrywide product per engaged person. (v) Product per person engaged in the 'all other' sector, whether or not it includes the transportation and public utilities group, is in most decades larger than product per person engaged for the economy as a whole.

Although these industrial differences in levels of product per person engaged are fairly familiar, they cannot be explained easily – as will be indicated below. But before dealing with differences in levels, we consider the *trends* in the ratios in Table 20. (i) Neither the ratio for agriculture, nor that for mining and manufacturing shows any consistent trend, except for some tendency in the latter toward a slight rise from 1919–28 onward – which means that in these industrial sectors the product per person engaged rose at about the same rate as did the countrywide product per person engaged. (ii) The ratio for construction dropped consistently and significantly, suggesting that product per person engaged in that industry rose much less than the countrywide product per person engaged. (iii) The ratio for the commodity producing sector as a whole is more or less

TABLE 20

Ratio of Product per Engaged in Selected Industrial Sectors to Countrywide Product per Engaged, U.S.A., 1869-1948
(Based on averages for decades)

A. COMMODITY PRODUCING AND OTHER INDUSTRIES

Decade	Agriculture	Mining and Manufact.	Contract Constructn.	Commodity Producing		All Other Industries	
				Pct. Share of Engaged	Ratio of Product per Worker	Pct. Share of Engaged	Ratio of Product per Worker
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1869–78	0.65	1.04	1.6	64.4	0.81	35.6	1.34
1879–88	0.54	0.99	1.4	62.9	0.74	37.1	1.44
1889–98	0.56	0.98	1.8	59.6	0.80	40.4	1.30
1899–1908	0.54	0.95	1.4	56.3	0.77	43.7	1.29
1909–18	0.53	0.99	1.2	54.2	0.80	45.8	1.24
1919–28	0.51	0.96	1.1	50.0	0.79	50.0	1.21
1924–33	0.52	1.04	1.1	47.3	0.82	52.7	1.16
1929–38	0.49	1.06	1.0	46.3	0.80	53.7	1.17
1934–43	0.50	1.12	0.9	44.8	0.87	55.2	1.11
1939–48	0.56	1.09	0.7	43.2	0.90	56.8	1.08

B. COMMODITY PRODUCING INCLUDING TRANSPORTATION AND PUBLIC UTILITIES, AND OTHER INDUSTRIES

Decade	Transportation and Public Utilities	Commodity Producing incl. Public Utilities		Other Industries	
		Pct. Share of Engaged	Ratio of Product per Worker	Pct. Share of Engaged	Ratio of Product per Worker
	(1)	(2)	(3)	(4)	(5)
1889–98	0.89	65.2	0.80	34.8	1.37
1899–08	1.07	63.1	0.81	36.9	1.33
1908–18	1.18	62.2	0.85	37.8	1.25
1919–28	1.22	58.0	0.85	42.0	1.21
1924–33	1.33	54.5	0.89	45.5	1.13
1929–38	1.52	52.4	0.88	47.6	1.13
1934–43	1.81	50.0	0.97	50.0	1.03
1939–48	1.94	48.5	1.01	51.5	0.99

Derived from Tables 17 and 19 (see text).

stable, except for a slight rise since 1919–28 – indicating that the product per engaged person in commodity production rose at about the same rate as the countrywide product per engaged person. (iv) The ratio for transportation and public utilities rose quite sharply over the period, indicating that the rise in product per engaged person in that sector was materially greater than that in the countrywide product per engaged person. (v) The ratio for the 'all other' sector – whether or not in addition to trade, finance, services and government it includes transportation and the public utilities – declines markedly and fairly consistently, indicating that the increase in product per engaged person in this sector is significantly smaller than the increase in the countrywide product per engaged person.

It is impossible, for lack of both space here and knowledge on my part, to provide an adequate explanation of the inter-industrial differences in level and trend in product per engaged person. Some seem plausible in the light of the knowledge (often untested) that we have. For example, the lag in productivity of workers engaged in construction and the rapid rise in productivity in the transportation and public utilities sector are well known and have been noted. But it may be of some interest to comment briefly on two aspects of the evidence in Table 20:

(a) the persistently low level of product per engaged person in agriculture and (b) the marked downward trend in the ratio for the 'all other' sector.

(*a*) Why should the level of product per person engaged in agriculture, a major sector of the economy, be *persistently* low relative to levels in the rest of the economy? The differentials just noted extend over a long period and cannot be due to the inadequate adjustment to short-term discrepancies in real product. Nor do persons engaged in other pursuits, e.g. mining, manufacturing, or trade, require, on the average, more intensive education and preparation – so that differences in the level of returns cannot be explained as compensation for additional investment in training, etc. Nor, as will be shown below, is the supply of capital per worker in agriculture smaller than in many urban pursuits which, again over the long period, have been characterized by higher levels of product per engaged person than the countrywide.

It is true that, viewed as differential returns to persons attached to agriculture, the ratios in Table 20 are on the low side. Agriculture happens to be a pursuit that allows more time than others for auxiliary work in other industries; and estimates for decades since 1910 reveal that total income received by farm residents is from 10 to 20 percent more than income received by them from farming. Such income from outside is largely earnings for off-the-farm work and can, therefore, be treated as compensation for the short-term character of agriculture (true even for farm entrepreneurs, and hence not reflected in our conversion of employees to full-time equivalents). Furthermore, as already mentioned, price levels are lower in the countryside than on urban markets. But even if we allow a 20 percent margin for this price factor and a 10 percent margin for extra earnings, yielding in combination a multiplier of 1.32, the ratios in column 1 of Table 20 would rise only to about 0.7 in most decades – still leaving a substantial and persistent inferiority in real return per engaged person in agriculture compared either with the rest of the economy or with such major sectors as manufacturing and trade.

That such a differential in return did exist can be inferred from the steady movement of population from the farm to the non-farm areas: in conditions of a free economy, such a movement could hardly have occurred unless there were sufficient

economic attraction. The *rationale* of the income differential can be clearly seen as the inducement to move from the countryside to the cities to staff the growing non-agricultural industries. But why, under these conditions, was the flow of population from agriculture (in the United States, both from native agriculture and from abroad) not sufficiently great to bring about greater equalization rather than leave the persistent differential?

A variety of reasons can be given. It is possible that agricultural population, once it passes a certain age and maturity of family status, is quite settled and the apparent economic attractions may not loom so large to a potential migrant who would probably have to enter industrial employment at the bottom of the ladder. Furthermore, in the United States, racial discrimination in the South and the whole organization of Southern farming (which accounts for a substantial proportion of total agriculture) tended to impede (except under extraordinary conditions of a major war) the free movement of population from farming to the more attractive urban industries (i.e. outside of domestic service and lower types of urban pursuits). The competitive and speculative character of agriculture, contrasted, particularly since the turn of the century, with the more monopolistic organization of many sectors of urban industry, may also be relevant. This organization of urban industry permitted its *employed* workers relatively high rates of pay, and also limited their numbers and chose them from a large present and potential supply – a potential supply part of which was still on farms but which could be induced by greater attractions to move to the cities when conditions warranted. In this sense, some of the people recorded by our series as engaged or attached to agriculture may be considered, at least partly, engaged or attached to non-agricultural industries.

Indeed, the reasons for the persistent differential shown in column 1 of Table 20 can easily be multiplied. But it does seem to me that the analysis of the processes by which this differential was maintained, and particularly a thorough search for and weighing of factors that accounted for a persistent failure to reduce it, would shed a flood of light on the processes by which population adjusts itself to changing economic opportunities in the process of an economy's long-term growth. In that sense, the question is at the heart of the analysis of the process of economic growth – to which the measures of product and

factors, their industrial components, and their distribution in space, can contribute a great deal.

(*b*) The marked decline in the ratio for 'all other' industries (column 7 of Panel A and column 5 of Panel B, Table 20) raises a different question. In this residual sector, which can be treated most easily if we exclude transportation and public utilities, the major subgroups are trade; finance, insurance, and real estate; services, within which professional and related services should be distinguished from others – largely personal and domestic; and government. Shifts among the subgroups of this sector over the period *raised* product per engaged person: Daniel Carson's estimates show that from 1870 to 1940 the proportion among gainfully occupied of such high product-per-worker sectors as finance, etc., rose from 0.3 to 2.8; of the professional and amusement group – from 1.5 to 5.6; and of government – from 1.9 to 5.5. Over the same period, shares of the lower product-per-worker sectors rose much less: of trade, from 6.1 to 13.2 percent; of non-professional services – from 9.2 to 10.2.[1] Thus, inter-industry shifts within the 'all other' sector should have contributed to an upward movement of the ratio in Table 20, rather than to the decline now observed.

The puzzle is explained in large part when we consider the effects of shifts in industry proportions of the engaged labor force. The following example, which uses figures close to those in Panel A of Table 20 (with industry I corresponding to all commodity producing industries, and industry II to others), illustrates the point (see p. 115).

The example shows that: (i) with intra-industry product per engaged person constant or rising at the same rate (Cases 1 and 2), a shift of shares in favor of the higher product-per-worker industries will mean a *decline* in the product *ratios* for all industries; (ii) with a shift toward the higher product-per-worker industries, stability in the product ratio of one industry will necessarily mean decline in the product ratio of the others (Cases 3 and 4).

The facts described in Panel A of Table 20 obviously correspond to Case 3 of the illustration, and those in Panel B to a modification of Case 3, where the share in column 1 would drop from 65 to 50 and the product ratio in column 2 would rise from 0.80 to 1.0.

[1] See *Studies in Income and Wealth, Volume Eleven* (NBER, 1949), Table 1, p. 47.

	Industry I			Industry II		
	Pct. Share of Engaged Workers (1)	Product per Worker Engaged (2)	Total Product (1 × 2) (3)	Pct. Share of Engaged Workers (4)	Product per Worker Engaged (5)	Total Product (4 × 5) (6)
Initial Case						
Absolute quantities	65	80	5,200	35	140	4,900
Product ratios (nnp = 10,100; nnp per capita = 101)		0.79			1.39	
Case 1: Shift in shares – Constant product per engaged						
Absolute quantities	45	80	3,600	55	140	7,700
Product ratios (nnp = 11,300; nnp per capita = 113)		0.71			1.24	
Case 2: Shift in shares – Same % rise in prod. per engaged						
Absolute quantities	45	240	10,800	55	420	23,100
Product ratios		0.71			1.24	
Case 3: Shift in shares – Prod. ratio of Ind. I constant						
Relative quantities (bracketed figures derived)	45	0.79	3,555	55	(1.17)	(6,445)
Case 4: Same as 3 – Prod. ratio of Ind. II constant						
Relative quantities	45	(0.52)	(2,355)	55	1.39	7,645

It follows that a large proportion of the decline in the product ratio of the service industries, in Panels A and B of Table 20, is due to a shift in the industrial distribution of the engaged labor force toward a greater weight in the total labor force of the industrial groups with higher than average product per worker.

This explanation does not exclude, even if it severely limits, the possibility that product per person engaged in such industries as trade, service, or government may not have increased as rapidly as in commodity producing industries, or in public utilities: technical progress appears to have had a much greater impact upon the productivity of a worker in steel than upon

that of a priest, university professor, or government bureaucrat. But this comment naturally raises the question whether product per person engaged is measurable, in any sense of the word, for many occupations in this 'all other' sector. If one can agree that, say, the product of trade is distribution of the physical volume of national product, the constancy of the share of trade in national product combined with the rise of the share of trade in numbers gainfully occupied would naturally yield a declining ratio in Table 20. We can also argue that it was in this 'all other' sector that the greatest and most significant increase in the proportion of women among the gainfully occupied has occurred. Regardless of the potential productivity of women, their role as secondary earners kept compensation of resources in the industries employing women at levels lower than elsewhere in the economy; and thus may have contributed to a declining ratio in Table 20. Finally, there are some service pursuits in which a substantial lag in productivity behind that of the economy at large can perhaps be safely diagnosed: e.g. it is doubtful that the productivity of barbers has risen as much as productivity in most sectors of the economy. But when we come to occupations requiring a relatively high level of intellectual performance, whether in education, government service, or elsewhere, is it at all possible to assign quantitative weights to their product and diagnose trends with any meaning? Can we say that the productivity of physicians has not increased proportionately to or even more than that of workers in commodity producing industries? To use an extreme illustration, if a professor of economics fifty years ago taught doctrines that were wrong and is today teaching doctrines that are right, is not the relative increase in productivity infinitely large?

Obviously, the measurement in real terms of product per person engaged is most tenuous in many sectors of the economy. In a way we are confronted with the same difficulty that arose at the very beginning of our discussion in Part IV – the incongruity between the industrial classification and national product as a complex of final goods. The product of many groups in the industrial classification is nebulous because the goods which they turn out are complementary to others and cannot be properly evaluated and measured except as part of others. The good yielded by the professor of economics in his capacity as an educator of men and society enters the fabric of

social organization and through it the tonnage of steel and the weight of bread produced; and in that sense the latter are as much a product of the professor's toil as they are of the work of persons engaged in the steel or the baking industry. The complementarity of industries in turning out a final product sets obvious limits to which the analysis of industrial differences in product per unit of resources can be pushed. In carrying this analysis to the 'all other' sector, as well as in attributing the net output even of commodity producing industries to the resources directly engaged in them, we may well be overstepping these limits.

4. *Industrial distribution of fixed capital*

A study of long-term movements in the industrial distribution of material wealth in the United States is hampered by four difficulties. First, at the time of writing, an industrial distribution for a period of any length is available for fixed capital alone (viz. structures and durable equipment), and not for inventories or the net balance of foreign claims. Thus a quarter to a fifth of the total of reproducible wealth, and about a seventh of wealth including land, is omitted from the industrial distribution of fixed capital. Second, the industries for which fixed capital can be distinguished are few. Estimates could be given for subgroups in the transportation and public utilities sector, but such detail is not of great interest when more important distinctions in the industrial classification cannot be made. Third, the industrial distributions of capital and wealth come from the Census of Wealth, not from commodity flow data; they are, consequently, available at somewhat distant intervals, and are not consistent from date to date. Finally, if land is to be included, as it must for certain purposes, only estimates in reported valuation, rather than in comparable constant valuation, can be used.

These qualifications must be borne in mind in viewing the levels and trends suggested by the percentages in Table 21. The first impression is that the distribution in current and in constant valuations (Panels B and C), both of which are available for fixed capital excluding land, are similar enough as to levels and long-term trends for the results of one to stand for the results of the other. We can therefore assume that the distribution in Panel A is roughly equivalent to one in constant valuation – a statistical license that is not likely to lead to any fatal

TABLE 21

Percentage Distribution of Fixed Capital among Industrial Sectors, U.S.A., 1880-1938

Date	Agriculture (1)	Mining and Manufact. (2)	Transp. and Public Utilities (3)	Other Business (4)	Residential (5)	Tax Exempt (6)	Total (7)
	A. INCLUDING LAND, CURRENT VALUATION						
1880	35.0	6.4	18.8	11.7	21.5	6.6	100
1890	25.8	8.3	18.4	13.3	27.0	7.2	100
1900	23.6	9.4	19.4	12.1	27·2	8.3	100
1912	26.8	10.1	18.3	10.2	26.3	8.4	100
1922	22.9	14.8	15.5	9.8	28.3	8.7	100
	B. EXCLUDING LAND, CURRENT VALUATION						
1880	16.5	8.5	31.2	15.3	22.7	5.7	100
1890	11.8	10.7	30.2	15.9	25.2	6.3	100
1900	11.1	12.2	31.0	13.9	24.6	7.2	100
1912	10.5	14.1	29.6	12.4	26.1	7.3	100
1922	10.4	21.5	25.0	11.0	24.6	7.5	100
	C. EXCLUDING LAND, 1929 VALUATION						
1880	17.0	7.1	31.4	14.5	24.6	5.5	100
1890	12.1	10.0	29.6	15.9	26.3	6.1	100
1900	11.2	12.0	30.8	13.7	25.1	7.2	100
1912	10.4	13.9	30.0	12.2	26.1	7.4	100
1922	10.0	20.2	27.0	10.1	24.4	8.3	100
1938	6.1	13.7	30.6	15.0	21.4	13.2	100

Derived from *National Product since 1869* (NBER, 1946), Tables IV-1, IV-2, IV-3, and IV-12, B. Capital data for 1880, 1890, and 1900 are as of 1st June; for 1912, 1922, and 1938 as of 31st December.

errors and that permits us to relate distribution of fixed capital, including land, to measures of national product or factors in constant prices.

In general, the three major sectors in the distribution of fixed capital including land (major in that they account for large proportions of the countrywide total) are agriculture, transportation and public utilities, and residential real estate. Even when we exclude land, they account for almost six-tenths of the national total in recent decades, and seven-tenths at the earlier dates. The distribution of fixed capital is thus quite unlike that of either national product or the labor force: the three sectors account for much less than a half (in recent decades less than a third) of the former, and in most decades for less than a half of the latter.

The conspicuous trends in the distribution of fixed capital are the decline in the share of agriculture, and the rise in those of mining and manufacturing and of the tax exempt sectors (the latter includes governments and non-profit institutions such as churches, educational bodies, etc.). These trends are observed whether or not we include land, although they are more conspicuous for fixed capital excluding land. The share of the transportation and public utilities sector is surprisingly constant; and, with some minor fluctuations, so is the share of residential real estate.

A comparison of the level and trends in the industrial distribution of fixed capital with those in the industrial distribution of the engaged labor force may explain the industrial differences in product per person engaged, or in the long-term changes in such product discussed in Section IV-3. The ratios obtained by dividing the percentages in Table 21 by the appropriate percentages in Table 19 show the extent to which fixed capital per engaged person in a given industry is larger or smaller than the countrywide supply of fixed capital per person engaged. Presumably, all other conditions being equal, a high ratio of fixed capital per engaged person would lead to a high ratio of net product per engaged person, and an upward trend in the ratio of fixed capital should lead to an upward trend in the ratio of net product.

The crudity of the industrial classification permits only a rough comparison (Table 22). The ratio of fixed capital per person engaged (including land) to the countrywide supply of fixed capital per person engaged is fairly high for agriculture, and shows if anything an upward trend. But the ratio of net product per person engaged in agriculture to countrywide product per person engaged is quite low; and failed to show any upward trend over the period (Table 20). It is only when we exclude land, and limit the comparison to construction and equipment, that the low ratios in Table 22 and the absence of any distinct trend in them suggest agreement with the ratios of net product per person engaged.

There is likewise only partial consistency between relative supply of fixed capital and relative net product per person engaged in the mining and manufacturing sector. The ratios for fixed capital are all far below 1, whereas those for net product are close to 1: apparently labor engaged in mining and manu-

facturing is associated with a much higher net product per head than would be suggested by the supply of fixed capital per head. The trend in the ratio of fixed capital per worker engaged in this sector to the countrywide supply of fixed capital is distinctly upward – for capital including or excluding land. There is only a slight tendency toward such a rise in the ratios of net product per worker engaged for mining and manufacturing.

TABLE 22

Ratio of Fixed Capital per Engaged in Selected Industrial Sectors to Countrywide Fixed Capital per Engaged Worker, U.S.A. 1880-1938

Date	Agriculture (1)	Mining and Manufact. (2)	Transp. and Public Utilities (3)	Total (1)+(2)+(3) (4)	All Other (5)	All Other, excluding Residential (6)
			A. INCLUDING LAND, CURRENT VALUATION			
1880	0.83	0.34	4.48	0.92	1.15	0.53
1890	0.72	0.40	3.47	0.85	1.25	0.54
1900	0.75	0.41	3.23	0.87	1.21	0.52
1912	1.02	0.43	2.38	0.96	1.06	0.44
1922	1.11	0.58	1.94	0.99	1.02	0.40
			B. EXCLUDING LAND, 1929 VALUATION			
1880	0.40	0.38	7.48	0.85	1.29	0.58
1890	0.34	0.48	5.58	0.83	1.27	0.58
1900	0.36	0.52	5.13	0.89	1.16	0.53
1912	0.40	0.59	3.95	0.94	1.08	0.46
1922	0.49	0.80	3.38	1.06	0.93	0.40
1938	0.36	0.55	5.88	1.07	0.94	0.54

Ratio of percentages in Table 21 (Panels A and C) to percentages of persons engaged from Table 19. (See also note to Table 20.) The capital data for 1912 are compared with labor engaged data for 1910; those for the former for 1922 and 1938 are compared with the latter for 1919–28 and 1934–43.

The relatively large supply of fixed capital per engaged person in the transportation and public utilities sector is conspicuous and would lead us to expect net product per person engaged in this sector to be appreciably higher than the countrywide level –an expectation confirmed by the ratios in Panel B of Table 20 – although the excess over 1 is much smaller than one might infer from the fixed capital ratios. But the major disagreement in the transportation and public utilities sector is between the *trends* in the ratios for fixed capital and for net product per person

engaged: those for fixed capital show a marked decline, whereas those for net product show a marked rise.

An inconsistency in the relation of levels is observed for the 'all other' sector (excluding transportation and public utilities), if we make allowance for the residential component of fixed capital which bears a direct relation to only an insignificantly minor proportion of all persons engaged in this sector. With this allowance the fixed capital ratio (column 6 of Table 22) is well below 1, whether or not we include land; whereas the ratio for net product per person engaged in this sector is well above 1 in most decades. However, the downward trend in the ratio of fixed capital per person engaged is consistent with the downward trend in the ratio for net product.

The general conclusion suggested by the comparison is that even for major industrial components, relative differences in the supply of fixed capital per person engaged are not of direct and unequivocal importance in determining relative differences in net product per person engaged. If differences in level agree, the differences in trend are not consistent; and if the differences in trend are consistent, those in level are not. Indeed, only for the broad dichotomy between all commodity producing industries inclusive of transportation and public utilities, and 'all other', are the industrial distributions of fixed capital per person engaged and of net product per person engaged consistent: in the commodity producing sector the ratios for both fixed capital and net product range from 0.8 to slightly above 1, and show a distinct upward trend in both distributions.[1] In any more detailed analysis of inter-industry differences in product per person engaged, differences in supply of fixed capital play, at least according to the figures as they stand, only a limited role.

It is also of interest to compare the industrial distribution of fixed capital with that of net national product, in constant prices. Here, too, we divide the share of a given industry in the countrywide total of fixed capital by its share in the countrywide total of national product: if the ratio is above 1, the given industry requires more units of fixed capital per unit of net product than does the entire economy; if the ratio rises, requirements of fixed capital per unit of net product in the given

[1] This broad commodity producing sector in Table 20 includes the contract construction industry, which cannot be segregated in Table 22 (it is included in columns 5 and 6 of the latter table). But the weight of this industry is so small that it cannot have much effect on the comparison.

industry rise more (or decline less) than do fixed capital requirements for the economy at large. These ratios are presented in Table 23; and even though the distribution of fixed capital including land (Panel A) is based on current valuation, it is taken as indicative of the distribution of fixed capital in constant values.

TABLE 23

Ratio of Fixed Capital per Unit of Net Product in Selected Industrial Sectors to Countrywide Fixed Capital per Unit of Net Product, U.S.A., 1880-1938

Date	Agriculture (1)	Mining and Manufact. (2)	Transp. and Public Utilities (3)	Total (1)+(2)+(3) (4)	All Other (5)
	A. INCLUDING LAND, CURRENT VALUATION				
1880	1.49	0.33	4.59	1.28	0.75
1890	1.33	0.41	3.54	1.17	0.86
1900	1.36	0.45	3.34	1.19	0.85
1912	2.05	0.40	1.95	1.15	0.86
1922	2.18	0.61	1.58	1.19	0.85
	B. EXCLUDING LAND, 1929 VALUATION				
1880	0.72	0.36	7.66	1.18	0.84
1890	0.63	0.50	5.69	1.15	0.88
1900	0.65	0.57	5.31	1.22	0.82
1912	0.79	0.55	3.19	1.13	0.88
1922	0.95	0.83	2.76	1.28	0.77
1938	0.72	0.49	3.26	1.10	0.92

Ratio of percentages in Table 21 (Panels A and C) to percentages in Table 17. In the latter, percentage shares of the transportation plus public utilities sector were extrapolated from 1889–98 by the percentages of gainfully occupied persons in Table 19. The capital data for the years ending on 0 were compared with product data for the corresponding 4–3 decade (e.g. 1880 with 1874–83); the data for the former for 1912 and 1922 were compared with product data for 1909–18 and 1919–28, and those for 1938 with the product data for 1934–43.

If land is included, the supply of fixed capital per unit of net product is appreciably higher in agriculture than in the country at large. When land is excluded, the ratio for agriculture declines to well below 1. In mining and manufacturing fixed capital per unit of net product is much lower than for the country at large – whether or not land is included. Most conspicuous is the large ratio for the transportation and public utilities sector: here the supply of fixed capital per unit of net product is extremely high compared to the rest of the economy. The ratio for the total

commodity producing sector (inclusive of transportation and public utilities) is somewhat above 1, and consistently so; accordingly the supply of fixed capital per unit of net product for the 'all other' sector is distinctly below 1, but not by wide margins.

The long-term trends are of more interest. In mining and manufacturing particularly, and to some extent also in agriculture (although not decisively so), the ratio rises – indicating that the supply of fixed capital per unit of product rose more than the relative supply per unit of net product for the country at large. The showing for the transportation and the public utilities sector is quite the opposite: here the ratio shows a marked, and on the whole consistent, decline[1] – indicating that the supply of fixed capital per unit of net product in this sector rose much less than did the supply for the country. For the broad conglomerate of commodity producing industries, including transportation and public utilities, no trend in the ratio is apparent; nor can any be observed for the 'all other' sector.

In concluding the discussion of Tables 21–23 one comment is appropriate. The results of our comparisons with the distributions of engaged persons and of national product would not be affected materially if we were to exclude the residential component. Since its share in total fixed capital (whether including or excluding land) does not display any significant long-term trend, the *trends* in the shares of other components of fixed capital would remain relatively unaffected by its exclusion. The *levels* of the shares of other sectors in total fixed wealth would be raised about a quarter to a third if we exclude residential real estate. But the *differences* in levels observed would not be affected significantly – certainly not enough to disturb the general tenor of our conclusions.

5. *Effects of inter-industry shifts*

Since industries are characterized by different ratios of factors to output, shifts in their relative weight in the economy would, in and of themselves, produce changes in the countrywide ratio

[1] The ratios calculated in Table 23 are naturally affected by fluctuations in the decade totals of national product when these are of different amplitude in the several sectors. For example, the decline in the ratio from 1922 to 1938 in column 2 is clearly due to the effects of the depression on the numerator and of the war expansion on the denominator; and likewise with the change in column 3. For purposes of observing long-term trends, it is best to average the showing for 1922 and 1938 in Panel B.

of factors to output. For example, if agriculture is characterized by a low level of net product per person engaged, a downward trend in the share of agriculture in the countrywide total of labor force engaged would, other conditions being equal, produce an upward trend in the countrywide level of net product per person engaged. In other words, the movements of countrywide ratios can be broken down into parts: the part associated with inter-industry shifts alone, i.e. those that would have occurred if each industry's characteristics remained constant and only the relative weights of the several industries had changed; and the part associated with intra-industry shifts, i.e. those that would have occurred if the relative weights of the several industries remained constant and only the characteristics of each of these industries had changed. The present section distinguishes between the effects of inter- and intra-industry shifts on two countrywide ratios: net national product per worker and fixed capital per unit of net national product.

(a) *Effects on net product per worker*

This calculation uses the industrial distribution of gainfully occupied or engaged labor force in Table 19 as one of the basic series; and pushes the analysis somewhat further than the classification in that table by distinguishing within the service plus miscellaneous sector two groups – professional service and all other service (largely personal and domestic) plus miscellaneous. We have, therefore, ten industrial sectors, for which, by extrapolation, we derive continuous shares in the countrywide total of persons engaged. These shares are assumed to be identical with shares in the labor force – since in considering long-term movements, the industrial attachment of the labor force should not differ significantly from the industrial distribution of the engaged labor force.

The next step in deriving column 1 of Table 24 – the key column in the analysis – is to obtain net product per worker for each of these ten industrial sectors, figures that can be used as constant weights to be applied to changing proportions of the industries in the total labor force. The most logical set of weights would have been net product per worker, at 1929 prices, at the average level for the whole period. But such estimates for each industrial sector are not available prior to 1919; nor are they available for product in constant prices. We therefore took as

TABLE 24

Rise in Net National Product per Worker associated with Inter- and Intra-Industry Shifts, U.S.A., 1869-1948

Decade	Index of N.N.P. per Worker, Inter-Ind. Shifts (1)	Index of N.N.P. per Worker, Total (2)	Index of N.N.P. per Worker, Intra-Ind. Shifts (3)	Percent Change over Two-decade Intervals* in (1) (4)	in (2) (5)	in (3) (6)	(4) as Ratio of (4)÷(5) (7)
1869–78	72.9	41.9	57.5				
1879–88	76.6	58.8	76.8				
1889–98	81.6	60.8	74.5	11.9	29.6	45.1	0.29
1899–1908	87.2	74.2	85.1	13.8	10.8	26.2	0.56
1909–1918	93.7	81.6	87.1	14.8	16.9	34.2	0.47
1919–28	100.0	100.0	100.0	14.7	17.5	34.8	0.46
1924–33	101.2	97.4	96.2				
1929–38	101.3	88.8	87.7	8.1	0.7	8.8	0.92
1934–43	102.7	100.4	97.8				
1939–48	103.9	114.5	110.2	3.9	10.2	14.5	0.28

* Percentage change calculated to the base of the initial decade in the interval.

Col. 1: For derivation see text.
Col. 2: Based on Table 9, col. 3.
Col. 3: Col. 2 divided by col. 1 and multiplied by 100.

weights the relative measures of net product per person engaged for the two decades 1919–38, based on estimates in current prices. This expedient is not as arbitrary as it may seem since our analysis in Section IV-3 suggests fair stability in the relative levels of product per worker for major industrial sectors (e.g. agriculture, manufacturing). The relative net product measures used are in the form of ratios to the countrywide, and range from 0.5 for agriculture to 1.5 for government.[1]

The shares of each of the ten industrial sectors in the country-wide total of the labor force were multiplied by the constant set of weights thus derived; the products added; and the sums converted to indexes with 1919–28=100 (column 1).

Had we data on net product per worker in 1929 prices in each of the industrial sectors going back to 1869–78, we could also have calculated an independent index of intra-industry shifts alone – by multiplying the changing net product per

[1] They are given in *National Income: A Summary of Findings*, Table 2, p. 6. A supplementary calculation was made to break down the service component between professional and other services. This was done on the basis of figures in *National Income and Its Composition* (NBER, 1941), Vol. II, pp. 762–3.

worker for each industry by a constant set of weights representing the average share of each industry in the countrywide total of the labor force, summing the products, and converting the total to an index with 1919–28=100. But no such data are available, and we must therefore derive the index reflecting intra-industry shifts indirectly.

Column 2, an index of net product per worker for the economy as a whole, calculated from the dollar figures (in 1929 prices) in Table 9, represents the *combined* effects of both inter- and intra-industry shifts. Dividing it by the index in column 1, which reflects inter-industry shifts alone, and multiplying the results by 100, we derive an index presumably reflecting intra-industry shifts alone (column 3). The presumption is not quite correct since, in addition to the effects of inter- and intra-industry shifts, there are effects of some inter-correlation of the shifts – which are included in column 2 and are, by our procedure, thrown in with the intra-industry shifts in the index in column 3. But these effects of inter-correlation are ordinarily quite minor, and we can use the index in column 3 as an acceptable approximation to the effects of intra-industry changes on changes in net product per worker.

Given the distribution into ten industrial sectors and the set of weights derived for 1919–38, both inter-industry and intra-industry changes contributed to the rise in the countrywide net product per worker. For the period as a whole the total rise is about 70 points, that due to inter-industry shifts about 30 points, and that due to intra-industry shifts about 50 points (the latter two do not add to the total because the relation between the three columns is geometric, not arithmetic). The inter-industry shifts thus account for about four-tenths of the total rise, an impression confirmed by the calculations in column 7.[1] One may note, in passing, that the long swings in national product, total or per worker, which were commented upon in Parts I–III, reflect the movement of the intra- rather than the inter-industry component of total change – but this may be due in part to the procedure used here.

[1] This conclusion agrees with a similar analysis carried through in much less detail in *National Income: A Summary of Findings* (NBER, 1946), pp. 42–49. The share of the inter-industry shift component in the movement from 1875 to 1925 was shown to be 41 percent (p. 46).

(b) *Effects on ratio of fixed capital to net product*

It is possible, by a similar technique, to distinguish between the effects of inter- and intra-industry shifts on the countrywide ratio of fixed capital to net national product. Such analysis is of interest because of the widespread use of the latter ratio in discussions of investment problems, acceleration relations, and multipliers.

We begin here by relating the estimate of fixed capital in constant valuation to national product, to get the basic countrywide ratio. Since capital data in constant values are required, and since the analysis is of interest in connection with capital formation, we exclude land. The data for construction and equipment, at successive points of time, were then compared with the annual average level of net national product for the corresponding decade (Table 25, columns 1–3).

TABLE 25

Change in Fixed Capital (ex. Land) per Unit of Net National Product associated with Inter- and Intra-Industry Shifts

Date of Capital Stock (end of year) (1)	Decade, N.N.P. (2)	Ratio, Capital Stock to Annual N.N.P. (3)	Index of (3) 1914–23 = 100 (4)	Index of Ratio, Inter-Industry Shifts (5)	Index of Ratio, Intra-Industry Shifts (6)
1878	1874–83	2.19	71	81	88
1888	1884–93	2.44	79	85	93
1898	1894–03	2.87	93	87	107
1908	1904–13	2.95	95	95	100
1918	1914–23	3.10	100	100	100
1928	1924–33	3.11	100	99	101
1938	1934–43	2.69	87	98	89

Col. 3: For data on capital stock at dates given in col. 1 see *National Product since 1869* (NBER, 1946), Table IV-10, Part B, p. 228; for data on net national product in 1929 prices see Table 1, col. 2.
Col. 5: For derivation see text.
Col. 6: Col. 4 divided by col. 5 and multiplied by 100.

The ratio of fixed capital to net product rises fairly steadily from 2.2 to 3.1 – but, as was suggested in Part III, the rise stops in the 1920's, and the ratio drops materially as soon as the denominator, viz. output, is affected by World War II. One can perhaps conclude that, in general, the fixed capital-net output ratio for the country rose from the 1870–80's to about the end

of the 1910's – and that no significant secular increase occurred during the last two to three decades. Indeed, the major rise in the capital output ratio ceases after the 1890's.

The index in column 5 uses the fourfold industrial classification given in Table 23: agriculture; mining and manufacturing; transportation and public utilities; all other. For each we can calculate the average capital-output ratio for a long period, by taking arithmetic means of the ratios from Table 23 and multiplying each of the four by the average countrywide ratio of capital per unit of product in column 3 of Table 25. This yields a rough set of constant weights that can be applied to the changing shares of these four industrial sectors in net national product (available for values in constant prices, in Table 17, with those for the transportation and public utilities sector roughly approximated for the first two decades by the use of shares in gainfully occupied). The sum of the products, converted to an index with the entries for 1914–23=100, yields the entries in column 5; and dividing the index in column 4 by that in column 5 (and multiplying by 100) gives us a derived index of the effects of intra-industry shifts.

Despite the crude industrial classification, the shifts among the industries account almost wholly for the rise over the period in the ratio of fixed capital to net national product in the economy at large. Even from the 1870–80's to the 1920's the ratio increased by four-tenths of its initial level, or 29 points; the inter-industry shifts (column 5) produced a rise of about 19 points; the intra-industry shifts (column 6) one of only 12 points. What, in fact, happened was that the rise in the intra-industry ratios in agriculture and the mining-manufacturing sectors was largely offset by the decline in the ratio in the transportation and the public utility sector. Hence, whatever rise occurred in the countrywide ratio could have been due largely to the effects of inter-industry shifts in the distribution of national product – away from agriculture and in favor of the transportation and public utilities sector.

(c) *Limitations of inter-intra-industry analysis*

Analysis of the type illustrated in Tables 24 and 25 resolves a complex, synthetic phenomenon into its constituent parts: and thus promises a better understanding of the process for the economy as a whole, a greater chance of establishing the vari-

ance and invariance that exist in the economic process over the long run, and a better judgment of the relevance of the past for any projection into the future. But the analysis is also subject to limitations that must be clearly recognized to avoid misuse and misinterpretation.

(i) The appointment of a total change between the inter- and intra-industry components is affected by the detail of industrial classification used; and to a lesser extent by the choice of weights. The former is particularly important: up to a certain point, the greater the detail of industrial classification, the larger the proportion of total change assigned to inter-industry shifts. An interesting illustration occurred in our calculations in connection with Table 24: an earlier calculation distinguished only agriculture (with a weight of 0.5); a combination of transportation and public utilities and government (with a weight of 1.4); and the finance sector (with a weight of 4.0). The weights were almost identical with those used in the present version of the table, but the industrial classification was cruder. As a result the index in column 1 moved only from 80 in the first decade to 100 for 1919–28 and to 104 in 1939–48, rather than from 73 to 100 to 104; and the proportion of the inter-industry shift component in total change was about one-third, not four-tenths.

Indeed, one could argue that, in the abstract, the industrial classification could be carried down to the level of the individual firm. In that case, since very few firms would exist throughout the long period and those that did would account for a very limited proportion of total output in recent decades, practically *all* of the change in the countrywide ratio would have to be assigned to *inter*-industry shifts – and only an insignificant fraction to the intra-industry component.[1] The limits of the fraction describing the proportion of the inter- (and correspondingly the intra-) industry shift component would thus be 0 and 1 – from maximum aggregation to maximum disaggregation. It follows that the specific proportion shown in any given analysis is a function of the specific form of the industrial distribution – a point that must always be taken into account in interpreting the results.

[1] The analysis could, theoretically, be brought down to levels below that of an individual business firm (separate plants, departments, etc.); so that the conclusion suggested in the text stands regardless of its validity for the analysis at the level of individual firms. This does not mean that, as we multiply *institutionally* given industrial divisions, the relative weight of inter-industry shifts must necessarily increase.

(ii) Perhaps a more important limitation is that industries are in fact interrelated, and shifts in their weight, whether relative or absolute, are not independent; nor are they independent of the changes that occur *within* the industries themselves. In other words, the inter-intra-industry analysis may be useful, but should not be misinterpreted to the point of tearing asunder elements that are in fact closely interrelated in the economic process – a danger because of the ease with which the calculations can be made.

An example of such a danger is suggested by recent statistical discussions of the process of industrialization. In reading these (particularly the paper by Louis H. Bean in *Studies in Income and Wealth, Volume Eight*, NBER, 1946, and the statistical analyses of Colin Clark) one gets the impression that, with lower relative net product per worker in agriculture and the high relative net product per worker in the service industries, the key to economic progress is a mere transfer of the labor force from the primary to the tertiary industries. It may be an injustice to the authors to ascribe such an interpretation to them, and to point out that, at least as indicated by the estimates discussed here, the relations of inter- and intra-industry elements may be quite complex. The decline in the relative weight of agriculture in the labor force in this country – an inter-industry shift – was due to the rise in the net product per worker in agriculture – an intra-industry change that was not inferior to the rise in net product per worker in the rest of the economy. It was the increased productivity in agriculture, combined with the persistent structure of human wants, that produced a situation in which needs for agricultural products were satisfied with a smaller proportion of the total labor force in agriculture. And this labor force was lured away from agriculture partly by higher returns in non-farm industries, which were made possible because under conditions of over-all increase in productivity, wants of consumers were directed toward products of non-agricultural industries. The variety of inter- and intra-industry shifts impinging upon growth in the countrywide product per worker is sufficiently great and their interrelation sufficiently close to warrant the greatest attention, in the inter-intra-industry analysis, not only to the parts but to the way the parts recombine into the whole.

The same is obviously true of the analysis of the capital-output ratios. The striking movements of these ratios within

industries, as exemplified by the decline of the ratio for the transportation and public utilities sector and by the changes that occurred during the World War II decades, are evidence of the difficulties of assuming constant inter-industry differentials and placing too much emphasis on mere shifts or difference in industry weights. They also suggest sufficient variability even in the countrywide capital-output ratios over time, to inhibit any easy inference from the experience of one country to another or for the same country from one period to the next.

V. DISTRIBUTION BY TYPE AND SIZE OF INCOME

1. *National income and aggregate payments*

The nation's net output, whose origin in the several industries was discussed in Part IV, is secured largely by the efforts of individuals who contribute the services of their labor or property. Of the current value of such net output by far the largest part is paid out in wages and salaries, entrepreneurial income, and various kinds of property income. However, in any one year, part may be retained by business corporations in the form of undistributed net profits, and by governments, in the form of additions to assets made out of current revenues. We first consider the allocation of national income or net national product between aggregate income flow to individuals and the other items that represent savings by business corporations and governments.[1]

Since our estimates, which are based on tracing the income flows from the several industrial sectors, begin with 1919, and since the treatment of the conceptually difficult items of corporate and government savings for years prior to 1919 and after 1938 differs in some respects from that in the basic estimates for 1919-38, the allocation cannot be made for a substantially long period. It covers four decades only – the second half of the 80 years covered in most of our discussion. Even for this short period the record has to be considered in segments, since the

[1] Individual entrepreneurs may save in the course of their business operations; and entrepreneurial savings are sometimes distinguished from entrepreneurial withdrawals, which implicitly suggests a distinction between savings of an individual entrepreneur as an ultimate consumer and the savings of his firm. But the distinction is tenuous, and in the present discussion all entrepreneurial income, comprising any profits that may have been made and retained in the firm, is included under aggregate income flow to individuals.

corporate and government savings items are too sensitive and variable to be estimated by simple extrapolation.

Nevertheless, certain broad conclusions stand out with sufficient clarity to permit inferences, some with respect not only to the period covered but even to the longer period back to the 1870's. First, the total of aggregate payments, or income flows to individuals, approaches close to that of national income. In all decades but the last the payments total is within 5 percent of national income; and we may legitimately infer that the same relation held over the decades back to 1870. For obvious reasons the amounts which business corporations can withhold from current earnings, or the extent to which their payments can exceed current earnings (resulting in dissavings), are quite small, relative to the net output of the nation.[1] Likewise, the restricted extent to which governments are allowed, by a society anxious to minimize the tax load, to undertake capital investment out of current revenues is also likely to mean that only a relatively small share of national income or product is diverted into government savings (Table 26).

Undistributed corporate profits or savings are not only small relatively, but are also sensitively responsive to changing business conditions. Even decade averages are not likely to remove the effect of the more violent cyclical fluctuations, as may be seen in the swing from an annual average of $1 billion of savings in 1919–28 to an average of almost $2 billion of dissavings in 1929–38. This characteristic and their small size relative to national product make it difficult to establish any significant trends in the proportion of corporate savings. True, corporations have become more important in the economy, and we should, therefore, expect that, by and large, the average share of their savings was smaller in the 1870's than in the present century. But while this is probable, it is not certain; and at any rate the movements in the share could have no significant effects on the allocation shown in Table 26, since even in recent decades

[1] For analysis consistent with the definition of national income or net national product, the undistributed net profits or losses of corporations should be calculated from their total net profit (or loss) adjusted for effects of accounting practices in the treatment of inventories and depreciation charges. For 1919–38 adjustments were made for effects of both inventory valuation and the difference between replacement and original cost of the depreciation allowance. The Department of Commerce estimates used for the last two decades in Table 26 are adjusted for the effects of inventory valuation alone. We did, however, deduct depletion from the Department of Commerce totals, which are reported *gross* of that item.

TABLE 26

National Income and Aggregate Payments, Current Prices, U.S.A. Averages for Overlapping Decades, 1909-1948

(Billions of dollars)

Decade	Aggregate Payments including Entrepreneurial Savings (1)	National Income (N.N.P.) (2)	Corporate and Government Savings (2–1) (3)	Corporate Savings (4)	Government Savings (3–4) (5)
1. 1909–18	38.2	36.3	−1.9		
2. 1918–23	54.4	55.3	0.9		
3. 1919–28	69.8	72.2	+2.4	+1.0	+1.4
4. 1924–33	69.4	70.1	+0.7	−0.6	+1.3
5. 1929–38	63.2	61.3	−1.9	−1.9	0
6. 1934–43	83.9	80.4	−3.5	0.6	−4.1
7. 1939–48	142.6	128.5	−14.1	3.6	−17.7

Col. 1: For 1919–38 from *National Income and Its Composition* (NBER, 1941), Table 1, p. 137. Carried back on the basis of W. I. King's estimates adjusted for comparability (for 1914–21 from *National Product in Wartime* (NBER, 1945), App. Table III-9 and adjusted to include imputed rent; for 1909–13 and 1922–23 from underlying worksheets). Carried forward on the basis of the sum of Department of Commerce estimates of compensation of employees, income of unincorporated enterprises, rental income of persons, dividends, and personal interest income (see *National Income, 1951 Edition*, Supplement to the *Survey of Current Business*, Washington, 1951, Tables 1 and 3, pp. 150–51). We used the 1919–23 overlap for the earlier years, and the 1929–38 overlap for the later years.

Col. 2: From Table 1, col. 4.

Col. 4: For lines 3-5 from *National Income and Its Composition*, Table 39, p. 276. For lines 6 and 7 from *National Income, 1951 Edition*, Table 1, p. 150, adjusted for depletion from *ibid.*, Table 38, p. 202.

the share of corporate savings, over longer periods, did not exceed 1 to 2 percent of national income.

The case of government savings is different. In times free of emergency, governments in this country managed to do a fair amount of capital investment out of current revenues – although relative to total national income it was not large. But in times of a major conflict, e.g. World War II, the government spends a large proportion of national income on uses that, at least according to our definition of national product, represent current costs; and finances such expenditures out of borrowing, not out of current taxes. In such conditions aggregate income flows to individuals may well exceed by significant proportions

total national income. Since corporations also accumulate undistributed profits under war conditions, the compensating offset is dissavings by government, i.e. excess of outlays on current purposes over current revenues.

The magnitude of such government dissavings, and implicitly the magnitude of the entries in column 3 of Table 26, depends, of course, upon conceptual decisions concerning treatment of government outlays. In the definition followed here all government war expenditures on 'soft' items (food, clothing, etc., for the armed services) were treated as current costs; and expenditures on 'hard' items (military construction and munitions) were subjected to a heavy depreciation charge (implicit in a five-year life in war years and a ten-year life in nonwar years). Hence a large proportion of war outlay was treated as current costs, and only a limited part as capital accumulation. For this reason government dissavings, shown in column 5, amount to about $177 billion for the ten years 1939–48, roughly equal to the total increase in *net* public debt. If we had classified government outlays on war and other purposes as final product, national income, or net national product, would have been correspondingly larger, and the minus entry in column 5 might have disappeared.

Huge government dissavings of the relative magnitude indicated for 1939–48 were a phenomenon unparalleled in the period for which we have a record. Little confidence can be placed in the entries in column 3 for 1909–18 and 1914–23 because small errors in our extrapolation of column 1 might have produced fatally large errors in the residual difference. But Raymond Goldsmith's savings estimates indicate that government dissavings in World War I were moderate and almost completely offset by corporate savings. One can infer that for most decades prior to 1914 both government and corporate savings were positive. Hence, for the earlier period it is reasonable to assume that national income exceeded aggregate payments by a few percent of the former, and this minor fraction showed some tendency to grow – partly because of growth in the importance of the corporate sector, partly because of growth in the relative proportion of municipal and local government – the branch of government that is most prone to make capital investment and that is likely to finance it in part out of current revenues.

2. *Distribution by type of income*

The available data permit a distinction of various types of income flows to individuals: compensation to employees (wages, salaries, etc., in money or kind); entrepreneurial income (the net returns to individual business men or independent professional entrepreneurs); and various forms of property income – dividends, interest, and rents (including royalties). The distinction is crude in that each category is much too wide: compensation of employees ranges from the low payments to hired hands on farms to the emoluments of highly placed corporation executives; entrepreneurial income ranges from the miserable returns of some subsistence farmers to the incomes of private investment bankers; dividends range from millions received by holders of large blocks of corporate stock to the few dollars received by those holding a few shares; and so on. The classification is, therefore, a blunt instrument; but it is still true that compensation of employees is dominated by returns to people whom we would classify as wage earners true and simple, and that property incomes accrue most preponderantly to the upper income groups. It is also true that service incomes represent an approximation to returns to labor, and property incomes, returns on invested capital.

Table 27 assembles the information available on this distribution of aggregate payments by type for the period under consideration. W. I. King's figures are of somewhat doubtful usefulness in this connection, since the treatment of corporate and government savings is not clear from his analysis, and the statistical basis for the estimates is quite thin. Although Martin's figures are on a somewhat more secure basis, the differences in level between lines 7 and 8 indicate lack of comparability with the more acceptable estimates for recent decades. One must, therefore, pick one's way with caution in any attempt to infer long-term changes in the distribution of income payments by type.

The first conclusion suggested by Table 27 is the relative constancy of the distribution between service and property incomes until the very recent decade. As already noted in connection with Table 13, the share of property incomes in total income flow to individuals shows no particular trend in the four decades covered by King's early series, or in the two decades

covered by Martin's series; nor is there any significant trend in its share from 1909 to 1938 – for which period our estimates are far better. It is only in the decades that reflect World War II and its aftermath that the share of property incomes declines drastically, with a corresponding rise in the share of service incomes.

The reasons for this relative stability of the service and property income shares over some seven decades are somewhat puzzling. Part of the mechanism by which such secular stability

TABLE 27

Distribution of Aggregate Payments by Type, U.S.A. Current Prices, 1870-1948

Period	Employee Compensation (1)	Entrepr. Income (2)	Service Income (3)	Dividends (4)	Interest (5)	Rent (6)	Property Income (7)
Average of	*Based on W. I. King's Estimates of Value of Product*						
1. 1870 & 1880	50.0	26.4	76.5		15.8	7.8	23.6
2. 1880 & 1890	52.5	23.0	75.4		16.5	8.2	24.6
3. 1890 & 1900	50.4	27.3	77.7		14.7	7.7	22.4
4. 1900 & 1910	47.1	28.8	75.8		15.9	8.3	24.2
	Based on R. F. Martin's Estimates of Aggregate Payments (excluding Entrepreneurial Savings)						
Decade							
5. 1899–1908	59.5	23.8	83.3	5.3	5.1	6.4	16.7
6. 1904–13	59.6	23.3	82.9	5.7	5.1	6.3	17.1
7. 1909–18	59.7	23.3	83.0	6.5	4.9	5.7	17.0
	Based on NBER Estimates of Aggregate Payments						
8. 1909–18	56.2	24.6	80.8	6.1	5.4	7.6	19.2
9. 1914–23	59.2	22.5	81.7	5.6	5.6	7.2	18.3
10. 1919–28	61.7	19.5	81.2	5.6	6.1	7.1	18.8
11. 1924–33	63.1	16.6	79.7	6.5	7.8	5.9	20.3
12. 1929–38	64.9	15.9	80.8	6.6	8.4	4.3	19.2
	Based on Department of Commerce Estimates						
13. 1929–38	64.1	14.7	78.8	6.1	10.0	5.1	21.2
14. 1934–43	67.6	16.7	84.3	4.7	6.6	4.4	15.7
15. 1939–48	69.6	18.4	88.0	3.5	4.5	4.0	12.0

Lines 1–4: From W. I. King, *The Wealth and Income of the People of the United States* (Macmillan, New York, 1919), Table XXXI, p. 160.

Lines 5–7: Based on estimates in *National Income in the United States, 1799–1938* (Nat. Ind. Conference Board, 1938), Tables 4, 41–4, and 46.

Lines 8–12: For 1919–38 from *National Income and Its Composition*, Table 22, p. 216; carried back to 1909 by King's estimates for 1909–23 (see notes to col. 1 of Table 26).

Lines 13–15: See notes to col. 1 of Table 26.

was attained has been noted in the discussion of Table 13: from the 1870's to the end of the nineteenth century, when the ratio of capital or income yielding property to total national product was rising, the average return per unit of capital, the prevailing interest rate, was falling, thus offsetting the rise in the proportional share of property incomes that would otherwise have occurred. Beginning with the twentieth century the ratio of capital to national product was, on the whole, stationary, at least until the 1930's depression, with a slight tendency to fall; and the rate of yield, as reflected in the interest rate which was rising slightly, again acted as an offset. But what lay behind that mechanism? One could speculate that during the last three decades of the nineteenth century the general decline in price levels was accompanied by increasing inequality in the distribution of income by size, and that the over-all savings rate in the economy increased slightly. This increase, resulting in a higher rate of capital accumulation and in a rise in the nationwide capital-product ratio, was accompanied by a decline in the interest rate, associated with the general decline in price levels. By contrast, the rise in price levels after the 1890's may have been accompanied by a decline in the inequality in the distribution of income, a lower rate of capital accumulation, a constant or slightly declining ratio of capital to product, and a rising interest rate associated with the general rise in price levels. However, these speculations must remain conjectures until further analysis is possible, although some corroboration for them will be found in the analysis of the ratio of net capital formation to national product in Part VI.

Against this background the drastic decline in the share of property incomes from 1929–38 to 1939–48 can be traced to two immediate determinants: a decline in the ratio of capital to product, caused largely by the tremendous expansion of output during the war years without a corresponding increase in capital stock; and the maintenance of low interest rates, and hence yields on capital, by government policy in connection with cost and marketability of government securities issued to finance the war. If there had been no such government policy, interest rates and yields on property (including a free market for rentals) would have risen, at least to compensate partly for the effect of the decline in the capital-product ratio. If there had been no pressure to utilize existing capital stock more fully, the ratio of

capital to product might have remained stable or risen and, in itself, have affected the share of property income, regardless of the movement in the average yield on capital. It is the combination, without parallel in the earlier record, of a decline in the capital-product ratio with one in the average interest rate that produced the recent sharp drop in the share of property income in total flow of incomes to individuals.

Other long-term trends are discernible within each of the two major categories. Within service incomes, the share of compensation of employees rises distinctly, even in proportion to the total flow of incomes to individuals. According to the more reliable set of estimates, available since 1909, it climbs from about 56 to almost 70 percent of aggregate payments. Even the Martin figures for 1899–1909 show a slight tendency toward a rise. But strangely enough, King's figures reveal no such trend although the shift from individual firms to corporations has been going on since 1870, and one would have expected the share of compensation of employees to rise from the very beginning of our period.

By contrast, the share of entrepreneurial income declines, both in Martin's and our estimates through 1938, although again not in King's figures. This downward trend is presumably due to the already noted decline in relative importance of unincorporated firms in the economy – due in turn to decline in relative importance of industries dominated by individual firms (e.g. agriculture), and to the spread of corporate firms in industries previously dominated by individual firms (e.g. manufacturing, construction, trade, and some service categories). The perceptible rise in the share of entrepreneurial income from 1929–38 to 1939–48 is due probably to the effect of the marked rise in prices on incomes of individual entrepreneurs, particularly farmers. Since this rise in prices during war and postwar years especially benefited the commodity handling entrepreneurs, the share of entrepreneurial income in aggregate payments increases.

The trends in the shares of compensation of employees and of entrepreneurial incomes within service incomes (and hence also within aggregate flow of incomes to individuals) reflect similar trends in the relative proportions of numbers. The National Bureau of Economic Research and the Department of Commerce have both estimated the number of individual entre-

preneurs and the latter can be compared with the total number of gainfully occupied persons or the labor force (Table 28).

While the estimates of number of entrepreneurs are necessarily crude because of easy mobility into and out of this group in certain industries (e.g. retail trade, some service branches, and even construction), the indication of comparative constancy in absolute number and of a steady decline in their proportion of the labor force can hardly be gainsaid. Almost a quarter of the labor force in 1909–18, entrepreneurs decline to about a seventh in 1939–48. True, some of this decline may be nominal, in the sense that some individual business firms may have been reorganized into one-man corporations. But the total number of corporations in the United States is only about half a million (including inactive); and about one-half of these have assets over $100,000 each (see *Statistics of Income for* 1945, Part 2,

TABLE 28

Distribution of the Labor Force between Employees and Entrepreneurs, Compared with Distribution of Service Incomes, U.S.A., Averages for Overlapping Decades, 1909-1948

Decade	Total Labor Force, Millions	Entrepren'rs, Millions	Employees (1)–(2), Millions	Percentage Share in Labor Force		Ratio of Percent in Service Incomes to Percent in Labor Force	
				Entrepren'rs	Employees	Entrepren'rs	Employees
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1909–18	39.5	9.3	30.2	23.5	76.5	1.29	0.91
1914–23	41.4	9.4	32.0	22.7	77.3	1.21	0.94
1919–28	44.3	9.5	34.8	21.4	78.6	1.12	0.97
1924–33	48.2	9.8	38.4	20.3	79.7	1.02	0.99
1929–38	52.0	10.2	41.8	19.6	80.4	1.01	1.00
1934–43	56.1	9.9	46.2	17.6	82.4	1.19	0.96
1939–48	61.0	9.8	51.2	16.1	83.9	1.37	0.93

Col. 1: From Table 9, col. 1.
Col. 2: For 1919–38 from *National Income and Its Composition,* Table 66, p. 340; carried back by estimates in W. I. King, *National Income and Its Purchasing Power* (NBER, 1930), Table VI, p. 62, using a 1919–23 overlap; and forward by estimates of the Department of Commerce, *National Income, 1951 Edition,* Table 27, pp. 186–7, using a 1929–38 overlap.
Cols. 6 and 7: Derived from cols. 4 and 5 and Table 27, cols. 1–3. The percentage shares in service incomes for 1919–38 were extrapolated forward by the Department of Commerce percentages, using the shares for the 1929–38 decade as an overlap.

U.S. Bureau of Internal Revenue, Washington, 1950). This factor could, therefore, have contributed little to the decline in the percentage of entrepreneurs in the labor force.

When we compare the percentage shares of entrepreneurs and employees in service incomes with their shares in the labor force (columns 6 and 7) two conclusions are apparent. First, while the per capita incomes of entrepreneurs are somewhat higher than those of employees, the excess is not very large on the average; and in 1924–33 and 1929–38, when low prices and other consequences of acute depression hit the entrepreneurs particularly hard, the excess is practically wiped out. This conclusion is indicated despite the fact that the comparison uses all members of the labor force with employee status, whether or not currently employed. Second, while there are the major swings in the ratio in column 6 (and corresponding, but much narrower, swings in column 7) associated with the impact of price movements on entrepreneurial income, no clear trend over the period is discernible. We may conclude therefore that, by and large, the decline in the share of entrepreneurs in service income and the rise in the share of employees, observed in Table 27, paralleled the movements in the shares of numbers in total labor force.

Table 27 also reveals a significant long-term trend in the apportionment of property incomes: a decline in the share of rent and a rise in the share of dividends and interest combined (the latter until the recent decades). If we exclude King's figures, which again reveal no such movement, the share of rent in aggregate payments and hence also in property incomes, declines from 1899–1908 to 1909–18 in Martin's estimates; from 1909–18 to 1929–38 in the NBER estimates; and from 1929–38 to 1939–48 in the Department of Commerce estimates. This decline presumably reflects the long-term recession in importance of two sectors that dominate the rent item – agriculture and residential housing; a decline accelerated during the recent decades by urban rent control. By contrast, the share of dividends and interest increased from 10.4 percent in line 5 to 11.4 in line 7 and from 11.5 percent in line 8 to 15.0 in line 12. This rise is, however, succeeded by a drastic decline – from 16.1 percent in 1929–38 to 8.0 percent in 1939–48 – which is associated with effects of World War II. Obviously the increase in the share of dividends and interest in total flow of payments prior to the recent decades reflects the growing importance of cor-

porations and governments as agencies under whose auspices long-term stock and bond issues could be floated. This shift in the internal structure of property incomes is thus an oblique reflection of the major shifts that occurred over the period in the financial and business structure of the economy.

3. *Distribution by size of income*

The distribution of aggregate income flow to individuals by size of income is one of the most important statistics, providing the link between income production and income use. Unfortunately, data on the size distribution of income for the United States are of recent origin; and only by dint of laborious calculations and manipulations can we examine one aspect of this distribution over any length of time. The scarcity of data would seem to be due to lack of attention to the problem in the past, reflecting lack of public concern – which in turn may have been due to the belief that the key economic problem was production, and that with assurance of rapid growth in the nation's output there was no need for concern with the distribution of income, i.e. of claims to output. Be the cause what it may, the fact is that only beginning with World War I, when the federal income tax on individuals' incomes was firmly established, do we have a basis for approximating the shares of the upper income groups in the distribution of income by size. Data on the full range of the size distribution are not available until the mid-1930's and even thereafter are not continuous. Whatever secular changes we can glimpse must, therefore, be limited largely to the period since 1919; and apply only to the shares of a small upper group in the income pyramid.

While the derivation of these estimates is explained in detail elsewhere[1] and cannot be discussed at length here, a bird's-eye view of the procedure is indispensable for a proper understanding of the results. The procedure is essentially a comparison of income reported by individuals on federal income tax returns with a countrywide total of all income receipts by individuals. The data on the income tax returns are selected so that the income total agrees, as far as possible, with the concept underlying the countrywide totals of income payments; and for

[1] See 'Shares of Upper Income Groups in Income and Savings', *Occasional Paper 35* (NBER, 1950); and, for greater detail, the report under the same title now in the press.

each published class of tax returns the population represented (including dependents) is calculated. For these published groups of tax returns (classified ordinarily by net income, tax definition, per return), a per capita *economic* income is then calculated; the groups are arrayed in decreasing size of economic income per capita; both population and income are cumulated downward; and these cumulative totals are expressed as percentages of total population and aggregate income payments respectively. Logarithmic interpolation in this cumulative series at 1 percent of population at the very top yields an estimated percentage share of total income received by the top 1 percent group; a similar interpolation at the 3 percent line from the top yields the total income received by the top 3 percent; by subtraction we can get the percentage of countrywide income received by the second and third percentage band from the top. We stop the analysis at the line setting off the top 5 percent of the population, because in some years of the period the coverage of all federal income tax returns does not extend much below that line (before 1918 it does not extend much below the top 1 percent line). The shares are estimated for each year, and the decade averages are arithmetic means of the annual percentage shares.

TABLE 29

Percentage Shares of Upper Income Groups in Aggregate Income Flow to Individuals, U.S.A., Averages for Overlapping Decades, 1914-1948

Decade	Top Percentage Bands			
	1st	2nd and 3rd	4th and 5th	Top 5
	INCOME BEFORE FEDERAL INCOME TAX			
1914–23	13.4	n.a.	n.a.	n.a.
1919–28	13.4	6.5	4.6	24.6
1924–33	13.7	6.8	5.1	25.6
1929–38	12.9	6.7	5.2	24.8
1934–43	11.7	6.3	4.5	22.6
1939–48	9.9	5.8	3.8	19.4
	INCOME AFTER FEDERAL INCOME TAX			
1914–23	12.5	n.a.	n.a.	n.a.
1919–28	12.4	6.5	4.7	23.6
1924–33	12.9	6.9	5.2	25.0
1929–38	12.0	6.8	5.3	24.1
1934–43	10.0	6.2	4.5	20.7
1939–48	7.3	5.4	3.7	16.4

All shares here are arithmetic means of shares for each year of the decade.
n.a.=Not available.

This sketch of the procedure explains not only the brevity of the period and the limited tail of the size distribution of income that can be studied, but also two important characteristics of the results as they now appear in Table 29. First, the estimates *understate* the true shares of the upper income groups. This understatement is not due to tax evasion, which, judging by recent checks, is relatively limited at the upper income levels, but rather lies in the fact that we have to use the published distributions of tax returns, classified (for most years) by net income, tax definition, per return; not, as we would wish, by economic income per capita. Although we have tried to adjust for this inappropriate unit and basis of classification, some effects remain; and they serve to *damp* the range of the true distribution by size of economic income per capita, particularly in the simple variant of our estimates which is used here because it permits most detailed analysis. The magnitude of the understatement arising from this source is suggested by the estimates that are further adjusted for the inappropriate unit and basis of classification: with such further adjustments the average share of the upper 5 percent for 1919–38 is about 30 percent of total income, compared with 25 percent for the variant shown in Table 29.[1] The major trends over time for the several variants are, however, similar.

The second characteristic to be borne in mind is that since the upper income groups are selected each year on the basis of that year's returns, the composition of the group shifts from year to year; the distribution is by annual income incidence rather than by income status for a longer period. One must, therefore, resist the rather natural tendency to think the upper income groups in one decade are the same as the upper income groups in another, although it is true that a substantial core remains at the upper income levels through a longer period, or moves from one upper income level to a neighboring one.

Table 29 gives the impression of substantial inequality in distribution by size: the per capita income of the top 5 percent is five times (in the more accurate approximation, six times) the average for total population; the level of the upper income shares changes comparatively little from 1919–28 to 1929–38, and for the top 1 percent back to 1914–23; and beginning with the 1934–43 decade which reflects World War II these shares

[1] See *Occasional Paper 35*, Table 1, p. 6, the economic income variant.

decline sharply – the 1939–48 averages are between an eighth and a quarter lower than the pre-World War II levels. This decline is even more pronounced when we subtract federal income taxes: net of such taxes, the level of the share of the top 1 percent in 1939–48 is four-tenths below the pre-World War II levels and that of the share of the top 5 percent about three-tenths lower.

Whether the relative constancy of upper income shares suggested for the first two-decade interval in Table 29 also characterized the size distribution of income in the decades back to 1870 is a moot question. The parallelism of the recent decline in these shares with those in the shares of property incomes, observed in Table 27, is significant. If the latter could be taken as a complete explanation of the former, and if the long-term stability of the shares of property incomes suggested in Table 27 were accepted, the inference would be that the size distribution of income, at least as reflected in the shares of upper income groups, showed fair secular stability over the period from 1869 through 1938. But as will be seen presently, the shifts in the distribution of income by type account for only part of the shifts in the distribution of income by size; and therefore we have no basis for assuming that stability of the former distribution means stability of the latter. Hence, the question of secular changes in the shares of upper income groups prior to World War I must remain unanswered.[1]

The recent decline in the shares, associated partly with changes

[1] Rufus S. Tucker's use in this connection of data from income tax returns for the few years connected with the Civil War (1866–71) is quite inconclusive (see his 'The Distribution of Income among Income Taxpayers in the United States, 1863–1935', *Quarterly Journal of Economics*, August 1938, pp. 547–87). If one accepts these tax data as adjusted by Tucker and makes a further assumption for the number of people covered by the tax returns, a tentative calculation is possible for the years 1869–71 for which we have rough annual estimates of national income. The latter suggest a per capita income (without correction for the probably minor undistributed items) of roughly $117 to $136 in current prices. If we assume 5 persons per tax return, perhaps too large a number, the per capita income of the upper group distinguished in Table V of Tucker's paper (see p. 568) is about 11 times the average in 1869, when the coverage is 1.25 percent of total population, 15 times the average in 1870 when the coverage is 0.95 percent of population, and 20 times the average in 1871 when the coverage is 0.90 percent of population (we use the midpoint of Tucker's adjusted range). Thus a rough estimate of the share of the top 1 percent band in total income in the early 1870's would be somewhat less than 15 percent. While higher than that shown for first few decades in Table 29, the difference can hardly be considered significant in view of the crudities of the data. Thus, this calculation so far as it goes, suggests that the level of the share of at least the top 1 percent in the early 1870's was not much different from its level during the 1920's. But this tells us nothing of what might have occurred during the period.

in distribution by type, is due partly to other factors. The drastic reduction in unemployment which was still quite large by the end of the 1930's; the rise in the income of farmers relative to the urban population, the former always at a lower than average level of per capita income; and shifts during World War II and its immediate aftermath within the distribution of wages and salaries from the more fixed upper group salaries, all contributed to an increase in the shares of the lower income groups, and *pari passu* to a decline in those of the upper income groups.

More light is shed on the immediate determinants of the stability of upper income shares during the first few decades and the recent decline to 1939–48 when we distinguish the effects of shifts in the distribution by type from those of shifts within the total of each type. This analysis is possible since we have the distribution by type, and can also determine from income tax return data the shares of the top groups in the countrywide totals of the several types of income (Table 30).

The standard procedure, already applied in the analysis of changes in the distribution by industrial origin in Part IV, is followed here. For each year we have the percentage shares of, say, the top 1 percent in the countrywide totals of each of the five types of income distinguished. By using the 1919–38 averages of these shares as constant weights by which to multiply the annual percentage shares of each of the five income types in aggregate income payments we obtain a total that is an index of changes in the share of the top 1 percent due to shifts in distribution by type alone – *inter-type* changes. If, on the other hand, we use the 1919–38 averages of the shares of the income types in aggregate income payments as constant weights to apply to the annual shares of the top 1 percent in the countrywide totals of compensation of employees, entrepreneurial income, etc., we obtain a total that is an index of changes in the share of the upper 1 percent due to changes of its shares within each income type – *intra-type* changes. From these two series of sums, each divided by its appropriate combined weight, we derive decade averages, and then the changes from one decade to the next, entered in Table 30. Except for the inter-correlation of inter- and intra-changes, the sum of the two should yield the change derived directly from the original series; and the results do check, although in a few instances there are perceptible discrepancies.

TABLE 30

Effects of Inter- and Intra-Type Shifts on Changes in Shares of Upper Income Groups, U.S.A., Overlapping Decades, 1919-1948

Upper Income Groups and Two Classes of Effects	Intervals				
	1919–28 to 1924–33 (1)	1924–33 to 1929–38 (2)	1929–38 to 1934–43 (3)	1934–43 to 1939–48 (4)	1919–28 to 1939–48 (5)
Top 1 Percent					
1. Effects of inter-type shifts	+0.5	−0.1	−1.0	−1.1	−1.7
2. Effects of intra-type shifts	−0.3	−0.7	−0.3	−1.1	−2.4
3. Combined (5+6)	+0.2	−0.8	−1.3	−2.2	−4.1
4. Derived directly (from Table 29)	+0.3	−0.8	−1.2	−1.8	−3.5
2nd and 3rd Percentage Band					
5. Effects of inter-type shifts	−0.1	−0.1	−0.1	−0.1	−0.3
6. Effects of intra-type shifts	+0.4	0.0	−0.4	−0.4	−0.4
7. Combined (5+6)	+0.3	−0.1	−0.4	−0.5	−0.7
8. Derived directly (from Table 29)	+0.3	−0.1	−0.4	−0.5	−0.7
4th and 5th Percentage Band					
9. Effects of inter-type shifts	−0.1	0.0	0.0	0.0	−0.1
10. Effects of intra-type shifts	+0.5	+0.1	−0.7	−0.8	−0.8
11. Combined (9+10)	+0.5	+0.1	−0.7	−0.8	−0.9
12. Derived directly (from Table 29)	+0.5	+0.1	−0.7	−0.7	−0.8
Top 5 Percent					
13. Effects of inter-type shifts	+0.4	−0.2	−1.1	−1.2	−2.1
14. Effects of intra-type shifts	+0.6	−0.6	−1.4	−2.3	−3.7
15. Combined (13+14)	+1.0	−0.8	−2.5	−3.5	−5.8
16. Derived directly (from Table 29)	+1.0	−0.8	−2.2	−3.2	−5.2

For explanation of derivation see text.

Shifts in distribution by type (inter-type shifts) contribute sizable changes in the shares of the top 1 percent group alone; by the time we are down to the fourth and fifth percentage band

their effects are nil. Since, as illustrated below, the income structure of the top 1 percent alone is materially different from that of total population, shifts in the latter would have a large effect primarily on the income share of the top 1 percent. However, because the 1 percent group receives so large a share that it dominates the top 5 percent group, inter-type shifts contribute also to the changes in income shares of the top 5 percent.

The most important conclusion suggested by Table 30 is that the recent decline in the shares of upper groups was due only in part to the shifts in distribution of income by type: of the 6 point total decline from 1929–38 to 1939–48 in the share of the top 5 percent when we add inter- and intra-type changes, only 2.3 points, or four-tenths, were associated with inter-type shifts; 3.7 points were due to changes in the share of the top 5 percent group within the countrywide total of each of the five types of income. The relative contributions of inter- and intra-type shifts are about the same for changes in the shares of the upper 1 or upper 5 percent from 1919–28 to 1939–48. The shares of upper income groups, and the size distribution of income in general, can therefore change materially without any corresponding changes taking place in distribution by type – unless, of course, the forces that make for one invariably involve the forces making for the other.

Obviously changes in shares of upper income groups within the countrywide totals of the types must have been marked; and we now turn to a direct examination of these changes. When we compare the shares of upper income groups in the countrywide totals of the several income types (Table 31) with their shares in total income (Table 29), significant similarities and differences appear in both structure and changes over the period. Whereas the share of the top 1 percent in total income ranges from over 13 to 10 percent, its share in the countrywide total of compensation of employees is appreciably lower – from about 5 to 7 percent – and its share in the countrywide total of dividends is very much larger – from 50 to 70 percent. For the second to fifth percentage bands from top, the share in total income ranges from 10 to 12 percent; their shares in the several types of income, unlike those of the top 1 percent, are not much different, except that their share in the countrywide total of rent is somewhat larger and that in the countrywide total of employee compensation somewhat smaller.

TABLE 31

Percentage Shares of Upper Income Groups in Countrywide Totals of Income of Various Types, Overlapping Decades, 1919-1948

Upper Income Groups and Period	Shares in						
	Employee Compensation (1)	Entrepr. Income (2)	Service Income (3)	Dividends (4)	Interest (5)	Rent (6)	Property Income (7)
Top 1 Percent							
1919–28	6.2	14.8	8.2	70.2	31.0	15.8	41.8
1924–33	6.6	14.3	8.2	65.4	27.3	17.8	40.6
1929–38	6.8	12.5	8.0	59.2	23.9	20.1	38.4
1934–43	6.2	14.3	7.9	56.4	23.4	20.4	37.4
1939–48	4.7	17.0	7.4	51.5	20.4	18.9	33.3
2nd to 5th Percentage Band							
1919–28	9.1	14.4	10.4	12.6	16.1	18.2	15.2
1924–33	10.4	14.7	11.4	11.3	15.6	22.0	14.8
1929–38	11.7	12.1	11.7	11.1	12.1	22.5	13.0
1934–43	10.6	10.6	10.7	11.9	10.8	19.3	12.2
1939–48	8.2	12.3	9.2	13.8	11.1	16.0	12.7
Top 5 Percent							
1919–28	15.3	29.2	18.6	82.8	47.1	34.0	57.0
1924–33	17.0	29.0	19.6	76.7	42.9	39.8	55.4
1929–38	18.5	24.6	19.7	70.3	36.0	42.6	51.4
1934–43	16.8	24.9	18.6	68.3	34.2	39.7	49.6
1939–48	12.9	29.3	16.6	65.3	31.5	34.9	46.0

All shares here are arithmetic means of shares for each year of the decade.

There are also some interesting differences with respect to changes over time. As noted before, the share of the top 5 percent in total income is fairly stable through 1929–38, and declines sharply only thereafter. This pattern is not true of the shares of the top 5 percent in the countrywide totals of various types. Its shares in compensation of employees and rent rise through 1929–38 and then decline, but the latter is still larger in 1939–48 than in 1919–28 (Table 31, columns 1 and 6). The shares of the top 1 percent in the countrywide totals of dividends and interest decline consistently throughout the period, whereas its share in the countrywide total of entrepreneurial income shows no consistent trend over the period and is larger in 1939–48 than in

1919–28. The share of the second through fifth percentage band in the countrywide total of interest declines consistently throughout the period; but its share in the countrywide total of dividends shows no consistent movement and its share in the countrywide total of entrepreneurial income declines after 1924–33 and rises in 1939–48.

One must recall in this connection that the composition of the top groups is shifting. An increase in the share of say the countrywide total of entrepreneurial incomes may mean not that the given units received a greater share of such income, but that in the reshuffling from year to year the proportion of entrepreneurs in the top income groups has increased. Hence the downward trend in the shares of dividends and interest received by the top income groups may mean not only a more equal distribution of these incomes, but also a decrease in importance among the upper brackets of those groups that derive large proportions of their income from dividends and interest. Likewise, the increase in the share of the top 5 percent in the countrywide total of entrepreneurial income after 1929–38 may have been due to the effect of the price rise and high level of business expansion on entrepreneurial incomes – thus producing both a rise in the entrepreneurial income of people already at the top levels, and a greater influx of entrepreneurs into these ordinarily high income groups.

If the shares of a given income group in the countrywide totals of the several income types differ from its share in total income, it necessarily follows that the type structure of total income for that group must differ from the type structure of total income for the entire population. For example, if the share of an income group in total income is 20 percent, and its share in the countrywide total of employee compensation is 10 percent, it follows that the share of employee compensation in total income of that group is only one-half that of the share of employee compensation in the total income of the entire population. It is clear, therefore, from the comparison of Tables 29 and 31 that the type structure of total income for the upper income groups must be different, and may have changed differently, from the type structure of total income for the entire population. The relevant percentage shares, assembled in Table 32, can be compared with the type structure of income for the entire population in Table 27.

TABLE 32

Percentage Shares of each Income Type in Total Income of Upper and Lower Income Groups, U.S.A., Overlapping Decades, 1919-1948

Income Group and Decade	Percentage Share in Total Income of						
	Employee Compensation (1)	Entrepr. Income (2)	Service Income (1+2) (3)	Dividends (4)	Interest (5)	Rent (6)	Property Income (4+5+6) (7)
Top 1 Percent							
1919–28	29.8	22.0	51.8	30.4	13.2	4.7	48.3
1924–33	32.0	18.0	50.0	32.5	13.5	4.0	50.0
1929–38	36.2	16.0	52.2	31.5	13.2	3.2	47.9
1934–43	36.3	23.6	59.9	27.2	9.9	3.1	40.2
1939–48	32.8	35.8	68.6	21.9	6.3	3.1	31.3
2nd and 3rd Percentage Band							
1919–28	49.2	27.6	76.8	8.0	8.7	6.6	23.3
1924–33	55.0	22.7	77.7	7.8	9.1	5.5	22.4
1929–38	63.5	17.5	81.0	7.6	7.7	3.7	19.0
1934–43	62.6	21.1	83.7	7.5	5.4	3.3	16.2
1939–48	53.5	31.9	85.4	7.4	4.1	3.1	14.6
4th and 5th Percentage Band							
1919–28	58.2	23.3	81.5	4.5	7.6	6.5	18.6
1924–33	60.7	20.1	80.8	4.8	8.3	6.1	19.2
1929–38	69.5	15.0	84.5	4.7	6.7	4.0	15.4
1934–43	74.4	14.4	88.8	4.2	4.2	2.8	11.2
1939–48	71.4	19.8	91.2	3.8	2.8	2.2	8.8
Top 5 Percent							
1919–28	40.2	23.7	63.9	19.6	10.9	5.5	36.0
1924–33	43.9	19.7	63.6	20.4	11.3	4.8	36.5
1929–38	50.6	16.2	66.8	19.4	10.3	3.5	33.2
1934–43	51.2	21.1	72.3	17.1	7.5	3.1	27.7
1939–48	46.4	31.6	78.0	14.1	5.0	2.9	22.0
Lower 95 Percentage Band							
1919–28	72.3	18.8	91.1	1.3	4.0	3.5	8.8
1924–33	73.6	16.2	89.8	2.1	5.5	2.6	10.2
1929–38	73.2	16.4	89.6	2.7	6.2	1.6	10.5
1934–43	74.3	17.7	92.0	2.3	4.3	1.4	8.0
1939–48	76.7	17.4	94.1	1.9	2.7	1.3	5.9

All shares here are arithmetic means of shares for each year of the decade.

The distinctive characteristics of the type structure of income at upper levels emerge clearly when we compare the shares for the top 1 and the lower 95 percent (Table 32). Of the total income of the top 1 percent group, only about a third is employee compensation, and roughly a fifth is entrepreneurial income. Service incomes thus account on the average for only slightly more than a half of total income. Of the total income of the lower 95 percent of the population, well over seven-tenths is employee compensation, and another sixth is entrepreneurial income. Service incomes thus account on the average for nine-tenths of total income here and property incomes for less than a tenth. This, of course, confirms the familiar notion that total income, at the upper levels, comprises a much greater proportion of property incomes; and that it is the latter that swell the income excess at the upper levels.

It will be recalled that the type structure of income for the entire population revealed a steady increase in the share of compensation of employees, a decline in the share of entrepreneurial income (but an upswing from 1929–38 to 1939–48), a rise (up to the World War II decades) in the share of dividends and interest combined, and a fairly consistent decline in the share of rent (Table 27). The trends shown in the type structure of income at the upper income levels in Table 32 are somewhat different. True, here also there is an upward trend in the share of employee compensation and a downward trend in the share of rent: yet the former stops in 1934–43, and is not accelerated beyond this decade as is the case in Table 27. The share of entrepreneurial income reflects the swing observed in Table 27, and shows, on the whole, a rise from 1919–28 to 1939–48; and the share of dividends and interest combined declines after 1924–33 rather than after 1929–38. In general, then, the trends in the type structure confirm the suggestion that at the upper income levels the property incomes are becoming less important and entrepreneurial incomes more so.

In concluding this brief discussion one must note that the possible stability or limited range of the secular changes in the size distribution of income (until the recent decade) may have been associated with a variety of shifts below the surface. Changes in the shares of the top, or for that matter of any, income group in total income flow to individuals are caused by shifts not only in relative importance of various types of income,

but also in the proportion of the countrywide total of each income type received by the income group. The effects of both inter- and intra-type shifts may be offsetting, and each in itself may be a net result of conflicting and offsetting movements; and the apparent stability, or slight changes, in the upper group shares in total income may, therefore, conceal a variety of underlying shifts, and be due partly to their offsetting character.

VI. DISTRIBUTION BY TYPE OF USE

The present part deals with levels and broad trends in: (1) apportionment of national product between flow of goods to consumers and capital formation; (2) structure of the flow of goods to consumers; (3) distribution of capital formation among its components. In addition, it treats briefly and selectively (4) shorter-term changes in the decade averages in all three.

1. *The shares of flow of goods to consumers and capital formation*

The relevant totals are given in Table 33. As already indicated, flow of goods to consumers includes the value of all final goods (commodities and services) either purchased by consumers or retained by them for own consumption (e.g. foodstuffs retained by farmers). For the basic period, 1919–38, the total includes direct taxes paid by individuals, an item implicitly extrapolated to other decades by movements in consumer expenditures on final goods. The flow of goods to consumers is a measure of purchases rather than consumption and excludes the purchase of residences, even for own use. The latter, so far as it applies to new houses, is included in capital formation.

Capital formation includes new construction as well as substantial repairs and alteration, whether done on own account or for sale; the sales of producers' durable equipment, including munitions and other durable military materiel; changes in inventories in the hands of business enterprises (but excluding, for lack of data, changes in stocks in hands of governments); and net changes in claims against foreign countries. Gross capital formation does not allow for current consumption of construction and durable equipment, which is subtracted to yield net capital formation. In both capital formation totals, the inventories and claims against foreign countries are on a net basis, i.e., only their net changes are recorded.

TABLE 33

Flow of Goods to Consumers and Capital Formation, Current and 1929 Prices, U.S.A., 1869-1948

(All figures in billions of dollars: averages for overlapping decades)

Decade	Totals in Current Prices			Totals in 1929 Prices		
	Flow of Goods to Consumers (1)	Gross Capital Formation (2)	Net Capital Formation (3)	Flow of Goods to Consumers (4)	Gross Capital Formation (5)	Net Capital Formation (6)
1869–78	5.71	1.35	0.81	8.06	2.34	1.35
1874–83	7.23	1.76	1.15	11.6	3.29	2.05
1879–88	8.63	2.06	1.31	15.3	4.21	2.62
1884–93	9.41	2.44	1.51	17.7	5.42	3.32
1889–98	10.02	2.72	1.66	20.2	6.53	3.95
1894–03	12.4	3.48	2.12	25.4	7.88	4.70
1899–08	17.3	4.40	2.56	32.3	9.06	5.19
1904–13	23.1	5.54	3.03	39.1	10.5	5.68
1909–18	31.8	8.32	4.54	44.0	12.3	6.30
1914–23	48.3	13.6	7.01	50.6	13.9	6.59
1919–28	63.9	17.3	8.22	61.7	16.1	7.32
1924–33	65.2	13.9	4.93	68.7	14.1	4.58
1929–38	59.9	10.1	1.38	70.8	10.9	1.21
1934–43	70.1	22.1	10.3	81.2	18.0	6.76
1939–48	111.2	43.7	17.3	100.3	28.1	8.63

The basic data are in *National Product since 1869* (NBER, 1946), Table II-16, p. 119. The averages here differ in minor detail from those published due to minor revisions in net changes in foreign claims.

They have been carried beyond 1938 on the basis of Department of Commerce estimates for the several components (see various *National Income* issues of the *Survey of Current Business* and the discussion in Part I, Sections 2 and 3).

In estimating these two major divisions of national product, numerous difficulties are encountered and approximations made that impose qualifications on the accuracy of the results. The most important for the estimates of the flow of goods to consumers are: (i) the difficulty of distinguishing the part of 'mixed' goods that goes to ultimate consumers from that used by business enterprises and governments for intermediate consumption; (ii) the problem, mentioned in Part I, of measuring transportation and distribution costs to be added to output of finished commodities at producers' prices; (iii) the need to estimate the service category for decades prior to 1919 on the basis of scattered sample studies of consumer expenditures. The major qualifications on the estimates of capital formation are: (i) the difficulty, particularly for decades prior to 1919, of getting an

adequate estimate of the volume of new construction (our estimates extrapolated for the decades prior to 1919 by consumption of construction materials may, judging by Raymond Goldsmith's recent estimates, be on the short side because of the failure to include builders' profits); (ii) the possible shortages in the item of durable equipment during World War I because of omission of production of government arsenals (see relevant comment in Part I); (iii) the limitation of inventories to stocks held by business, and the rough approximations employed in estimating this component prior to 1919; (iv) the rough estimate of capital consumption based on constant life periods for construction and producers' durable equipment, and a straight-line basis of allocation. Furthermore, there are numerous problems and resulting limitations on the accuracy of results in converting totals in current to those in 1929 prices. These are particularly acute for producers' durable equipment, consumers' durable commodities, and the service category – groups in which price movements are especially difficult to measure either because of large and frequent quality changes or because of almost complete absence of data.

It is impossible to present a meaningful picture of the statistical framework underlying the estimates in Table 33, or to convey a correct impression of the varying soundness (or unsoundness) of the several parts, without a detailed description of sources and methods. The latter are provided in the several publications of the National Bureau repeatedly referred to, and the technical and critical reader will have to consult them. Here one can only suggest the general character of the estimates; and, in presenting the conclusions that they indicate, attempt to convey the shade of significance which the author attaches to them. But even if the description here accurately reflects my judgment of validity and significance, it is still a judgment subject to review by other, perhaps more critical students, and to change by the accumulation of more data and of better estimates.

The shares of flow of goods to consumers and capital formation in national product, in both current and 1929 prices, give the general impression of moderate changes until the recent decades affected by the major depression of the 1930's and the World War II upheaval and its consequences in the 1940's (Table 34). In the decades affected by the 1930 depression the

TABLE 34

Percentage Distribution of G.N.P. and N.N.P. between Flow of Goods to Consumers and Capital Formation, Current and 1929 Prices, U.S.A., 1869–1948

No.	Decade	Gross National Product				Net National Product			
		Current Prices		1929 Prices		Current Prices		1929 Prices	
		Flow of Goods to Consumers	Gross Capital Formation	Flow of Goods to Consumers	Gross Capital Formation	Flow of Goods to Consumers	Net Capital Formation	Flow of Goods to Consumers	Net Capital Formation
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1869–78	80.9	19.1	77.5	22.5	87.6	12.4	85.7	14.3
2	1874–83	80.4	19.6	78.0	22.0	86.3	13.7	85.0	15.0
3	1879–88	80.7	19.3	78.4	21.6	86.8	13.2	85.4	14.6
4	1884–93	79.4	20.6	76.5	23.5	86.2	13.8	84.2	15.8
5	1889–98	78.7	21.3	75.6	24.4	85.8	14.1	83.7	16.3
6	1894–03	78.1	21.9	76.3	23.7	85.4	14.6	84.4	15.6
7	1899–08	79.7	20.3	78.1	21.9	87.1	12.9	86.1	13.9
8	1904–13	80.7	19.3	78.8	21.2	88.4	11.6	87.3	12.7
9	1909–18	79.3	20.7	78.2	21.8	87.5	12.5	87.5	12.5
10	1914–23	78.0	22.0	78.5	21.5	87.3	12.7	88.5	11.5
11	1919–28	78.7	21.3	79.3	20.7	88.6	11.4	89.4	10.6
12	1924–33	82.4	17.6	82.9	17.1	93.0	7.0	93.7	6.3
13	1929–38	85.6	14.4	86.7	13.3	97.7	2.3	98.3	1.7
14	1934–43	76.0	24.0	81.8	18.2	87.2	12.8	92.3	7.7
15	1939–48	71.8	28.2	78.1	21.9	86.5	13.5	92.1	7.9
	Average of Percentages: Decades								
	1–5	80.0	20.0	77.2	22.8	86.5	13.5	84.8	15.2
	6–10	79.2	20.8	78.0	22.0	87.1	12.9	86.8	13.2
	11–15	78.9	21.1	81.8	18.2	90.6	9.4	93.2	6.8

Derived from Table 33

share of capital formation is small, and in those including World War II that of gross capital formation in current prices unusually large. But the movements in the shares even prior to 1924–33 are not insignificant: in general, the share of capital formation tends to rise from the beginning of the period to a peak around the end of the 1890's and then to decline, with minor interruptions, to 1919–28. Any attempt to secure either an average for the period or a reliable gauge of the long-term trends must contend with the limitations that these swings in the ratios in the early decades or their gyrations in the recent decades introduce.

Bearing these limitations in mind, we summarize the evidence in Table 34 as follows:

(i) On the average, gross capital formation accounts for about a fifth of gross national product, and flow of goods to consumers about four-fifths. When current consumption of durable capital is subtracted from capital formation and gross national product, the share of net capital formation is naturally lower, averaging somewhat over a tenth.

(ii) There are fairly consistent differences between the distributions in current and in 1929 prices. Through most of the period, and particularly prior to World War II (with its attendant adjustment for overpricing of war production), the share of capital formation in national product (gross or net) in current prices was lower than the share in totals in 1929 prices, indicating a difference in price levels implicit in flow of goods to consumers and in capital formation – a point discussed below.

(iii) The shares of flow of goods to consumers and of gross capital formation in gross national product do not display any marked long-term trend. In current prices, the arithmetic means of the share of gross capital formation for three groups of five decades rise slightly; but the rise is so small as to be insignificant. In 1929 prices there is some suggestion of a *decline* in the share of gross capital formation; but here also prior to 1924–33 the decline is so small as to be within the bounds of possible margins of error. Only during the 1930 depression decades is the decline sharp, and the recovery in the war decades is limited by the allowance for overpricing of war production (which does not affect the estimates in current prices in columns 1 and 2).

(iv) In the distribution of *net* national product between flow

of goods to consumers and *net* capital formation, longer-term trends are more apparent. In current prices the share of net capital formation drifts downward from 13.5 percent in the first to 12.9 in the second group of five decades; but the decline from the last quarter of the nineteenth century to the first of the twentieth is really much greater. The average share for decades 1–6 is 13.6 percent; for decades 7–11, *prior* to the depression of the 1930's, 12.2. The share of net capital formation in 1929 prices declines even more markedly: from 15.2 percent for decades 1–5 to 13.2 for decades 6–10; or from 15.3 for decades 1–6 to 12.2 for decades 7–11. The effect of the 1930 depression was to reduce further and drastically the share of net capital formation in both current and 1929 prices; and for the totals in 1929 prices, although it recovered during the recent decades, the share was far short of the levels prevailing prior to the 1930's – an effect largely of the correction for overpricing of war production.

We may now comment briefly upon the four observations first made.

(i) The rate of net capital formation to national income for the whole period averages between 11.5 and 12 percent. The components of the former will be discussed in Section VI-3; what we are interested in here is the significance of this rate as a rate of saving by individuals. Net capital formation falls short of total individuals' savings, at least by the part that individuals pay for their transactions in capital assets (brokers' fees and the like). On the other hand, net capital formation is too large by the amount financed out of undistributed profits of corporations and current revenues of governments. (During wartime huge savings by individuals can be absorbed in current expenditures by government on goods used in the armed conflict and not offset by any recorded accumulation of capital.)

Judging by the results of Raymond Goldsmith's study of savings since 1896, during periods other than those of war and acute depression (like the 1930's), individuals' savings constituted only seven-tenths of the total (equivalent to net capital formation), two-tenths being accounted for by corporate savings and one-tenth by government. Hence a rate of, say, 12.9 percent (Table 34, column 6) for 1899–1908 meant a rate of savings by individuals (out of their total income) of some 9 percent (or

slightly larger, because the denominator – individuals' incomes – is slightly smaller than total national income). Thus the average level of savings by individuals suggested by the figures in Table 34 is about 10 percent – higher in the last quarter of the nineteenth century, lower in the first quarter of the twentieth, and certainly lower during the first half of the twentieth.

The significance of such a level would be clearer if comparison could be made with data for other countries. Offhand, the savings proportion seems quite moderate, considering the high level of per capita income and its rapid rate of growth over the period. If this impression is confirmed by further study, it will provide an important clue in the analysis of the country's economic growth. For it immediately raises a question as to the forces and pressures that brought about the high level of consumption and such a moderate level of the savings proportion; and the effect of both on the product per capita.

(ii) The differences noted between the shares in current and 1929 prices, and between the longer-term trends in the distributions of gross and of net national product, imply differences in price movements as well as between capital *consumption* and other relevant totals (Table 35).

The price indexes in columns 1–3 are derived by dividing the dollar values of each major category in current prices by its dollar values in 1929 prices. Since in the process of estimation several components are distinguished within each category, and the price adjustment is made separately for each, the indexes are a combination of possibly divergent price trends; and their full explanation must await the distinction of components in Sections VI-2 and VI-3. But it is relevant to the results here that the price indexes implicit in capital formation show a greater rise, either from the 1870's to the 1920's or beyond them to date, than do the prices implicit in flow of goods to consumers; and that prior to 1909–18 the level of the former is lower. It is because of this difference that shares of capital formation in totals in 1929 prices are higher than its shares in totals in current prices, for all decades before the 1920's.

It *is* possible that the differences between the price levels and trends are due to the errors and crudities of our estimates, and that no significance should be attributed to them or to the differences between the shares in current and in 1929 prices. One is tempted to accept such a view after considering closely

the details of the procedure: the price adjustment of the service sector in the flow of goods to consumers was made on the assumption that the movement of prices of services was not as great as that of prices of commodities - by a ratio suggested in the light of data (scanty at that) for the 1920's and 1930's; and there is the perennial problem of changes in quality. Yet one cannot but assume that a substantial part of the difference in price levels and trends is genuine. Prices implicit in capital formation are dominated by costs of construction – a very large fraction of capital formation – whereas prices implicit in flow of goods to consumers are dominated by prices of manufactured

TABLE 35

Price Indexes implicit in Flow of Goods to Consumers and in Capital Formation, and the Ratio of Capital Consumption to G.N.P. and G.C.F., U.S.A., 1869-1948

(Based on averages for overlapping decades)

Number	Decade	Implicit Price Indexes 1929=100			Capital Consumption as Percent of			
					G.N.P.		G.C.F.	
		Flow of Goods to Consumers	G.C.F.	N.C.F.	Current Prices	1929 Prices	Current Prices	1929 Prices
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	1869–78	71	58	60	7.7	9.6	40.0	42.3
2	1874–83	62	53	56	6.8	8.3	34.7	37.7
3	1879–88	56	49	50	7.0	8.2	36.4	37.8
4	1884–93	53	45	45	7.8	9.1	38.1	38.7
5	1889–98	50	42	42	8.3	9.6	39.0	39.5
6	1894–03	49	44	45	8.6	9.6	39.1	40.4
7	1899–08	54	49	49	8.5	9.4	41.8	42.7
8	1904–13	59	53	53	8.8	9.8	45.3	45.9
9	1909–18	72	68	72	9.4	10.6	45.4	48.8
10	1914–23	95	98	106	10.6	11.3	48.5	52.6
11	1919–28	104	107	112	11.1	11.2	52.5	54.5
12	1924–33	95	99	108	11.4	11.5	64.5	67.5
13	1929–38	85	93	114	12.4	11.9	86.3	88.9
14	1934–43	86	123	152	12.8	11.4	53.4	62.4
15	1939–48	111	156	200	17.0	15.2	60.4	69.3
	Average of Percentages: Decades							
	1–5	58	49	51	7.5	9.0	37.6	39.2
	6–10	66	62	65	9.2	10.1	44.0	46.1
	11–15	96	116	137	12.9	12.2	63.4	68.5

Derived from Table 33.

perishable goods (foods, fuel, etc.). The latter may have risen much less than costs of construction. The conclusion suggested by columns 1–3 of Table 35 is therefore acceptable, at least as a tentative hypothesis. And its implication is important: a constancy in the shares of flow of goods to consumers (essentially consumer expenditures) and capital formation (essentially savings) in totals in *current* prices might have meant a downward drift of shares of capital formation in totals in constant prices – because of the lesser rise of productivity in the production of capital goods than in the production of consumer goods.[1]

(iii) One conclusion, bearing upon the comparative movement in the shares of gross and of net capital formation, implicit in Table 34 is brought out clearly in Table 35 – the rise in the proportion that capital consumption forms of both gross national product and gross capital formation. Concentrating our attention on estimates in 1929 prices, we observe that the share of capital consumption in gross national product rises from about 9 to about 11 percent – before the jump in the last decade. Its share in gross capital formation is naturally much larger, rising from about 40 percent in the early to about 50 in the later decades (prior to the marked effects of the depression in the 1930's and of World War II in the 1940's). The rise in the share of capital consumption in gross capital formation is relatively greater than the rise in its share in gross national product: the average for the former rises from 39.2 in the first group of five decades to 46.1 in the next, or about a sixth; the

[1] This conclusion flies in the face of common opinion that technical progress and productivity have been much more marked in the production of capital goods than in that of consumer goods – with usual reference to machinery and equipment. This impression may be correct when one compares machine tools and, say, such a consumer good as services of barbers – although even here our inability to have prices reflect quality changes in the former would lead to an underestimate of the difference in practical estimation. But it must be remembered that: (i) the rise in productivity in production of manufactured consumer goods and of mineral fuels has been quite great, apparently much greater than in construction; (ii) the rise in prices of services, a major component in flow of goods to consumers, may have been much milder than, say, in costs of construction, not because of a greater rise in productivity in the former but because of greater supply of services permitted by more education and training (in turn associated with the rising product per capita and standard of living); (iii) the net change in the inventory component in capital formation is heavily dominated by raw materials, whose price movements may reflect a lower rise in productivity than the prices of finished consumer goods. It is true, however, that if proper price indexes for producers' durable equipment could be derived, the levels in columns 2 and 3 would be higher in the early decades, and their rise in the 1920's less marked.

average for the latter rises from 9.0 to 10.1, or about an eighth. Because of this difference the share of net capital formation in net national product declines more than the share of gross capital formation in gross national product (in constant prices, see Table 34, columns 4 and 8).

For at least one component of capital formation, producers' machinery and equipment, quantities in constant prices, as we estimate them, may conceal a marked rise in capacity. For example, a total of such equipment, in 1929 prices, may have capacity for much greater productive performance when measured for 1920 than when measured for 1910. Hence, mere 'replacement' may signify increase in productive capacity; and in subtracting capital consumption from current flow of gross capital formation, with both subtrahend and diminuend in constant prices, the former is given too large a value and the difference, therefore, is in fact too small. This has an obvious bearing upon the increase in the ratio of capital consumption to gross national product. So far as the increase is caused by consumption of durable equipment, it means – other conditions being equal – that less additional *net* capital formation, as we measure it, is needed for an increased volume of total output. If total output, represented by gross national product, is expected to increase 5 percent, necessitating an increase in reproducible capital stock of 5 percent, *net* capital formation must amount to 15 percent of gross national product if the ratio of reproducible capital to g.n.p. is 3.0. But less net capital formation would be needed if we allow for the fact that, in *replacing* capital consumed during the period (i.e. with net capital formation=0), the productive power of the existing capital stock is raised so that it can help to turn out 1 of the 5 additional percent of g.n.p. expected. Under these conditions net capital formation required would be only 12 percent of gross national product. It follows that mere 'replacement' of capital stock means increase in its productivity, and a *rise* in the ratio of capital consumption to total output means, other conditions being equal, a declining need for *net additions* to capital stock – and thus provides a rationale for a declining ratio of net capital formation in total output. Indeed, it is easy to demonstrate that the ratio of net capital formation to *net* national product would decline under these conditions, since a change in the ratio of capital consumption to gross national product will produce a change in the ratio

of net capital formation to g.n.p. and hence a similar change in the ratio of net capital formation to n.n.p.[1]

(iv) The decline in the ratio of net capital formation to national product in current prices, observed even prior to the drastic reduction in the former caused by the great depression of the 1930's, means a downward trend in individuals' rate of savings. Since per capita income receipts, even when adjusted for price changes, have risen markedly over the period (i.e. from the last quarter of the nineteenth to the first quarter or first half of the twentieth century), this downward movement of the savings rate is significant and calls for explanation.

Although a full explanation of this trend is not attempted here, three general observations are in order. First, differences in the savings-income proportions of individuals at low and high income levels at a given point of time are not necessarily associated with the long-term movement of the average savings proportion. That in any cross-section analysis the savings proportion rises as income rises is no ground for assuming that with a secular rise in income levels the savings proportion will also rise. For secular changes mean changes in the whole complex of goods and services and in the pattern of life of the population; and they may cause a decline in the savings proportion as income per capita rises. The reversal of cross-section relationships between two variables when the latter are studied over time is quite common; and the stability (or more accurately the decline) of the savings proportion over time should not come as such a surprise.

Second, the secular decline in the net savings proportions, suggested by the figures, is traceable to the pressure exercised for a higher standard of living in an economy in which the consumer is sovereign and free, combined with the processes of

[1] This can be illustrated by the following arithmetical example. Assume capital at beginning of year is 300, g.n.p. 100 (for the year), expected increase in g.n.p. 5 percent, so that net capital formation is 15 percent of g.n.p.; if capital consumption is, say, 10 percent of g.n.p., the rate of net capital formation to n.n.p. is 15 out of 90 or 16.7 percent. Assume next that 'replacement' of capital permits the same 300 units of capital to produce 101 units of g.n.p. The capital-output ratio is then 2.97; the stock necessary to produce 105 units is 105×2.97, or 312. Net capital formation needed is then 312−300 or 12, and, therefore, 13.3 percent of n.n.p. of 90. If we assume a ratio of capital consumption to g.n.p. of 20 percent and the corresponding effect on the capital-output ratio, the share of net capital formation in gross national product would be $/(300 : 102) \times 105/-300$, the difference divided by 100, or 8.7 percent; and the share in net national product would be 10.9 percent, compared with 13.3 percent for a 10 percent ratio of capital consumption to g.n.p.

urbanization, shifts from entrepreneur toward employee status, and the numerous aspects of life connected with these major changes in modes of living. Data do not permit a satisfactory calculation of the effects of the shift from the countryside to the city, from large to small families, from pursuit of one's own business to work for large business units in which economic success is a matter of investing in oneself (not included in net capital formation) rather than of accumulating capital. But that all these factors have significantly affected the saving habits of the population and made for lower savings rates can hardly be doubted.

Third, what requires explanation and is in a sense most puzzling is the *rise* in the savings proportion suggested by the rise in the shares of net capital formation from the first decade to the 1890's. Even if we assume *stability* in the savings proportion for individuals – a likely inference since the proportion of net capital formation financed out of undistributed profits of corporations and current revenues of governments may have increased from 1870 to 1900 – one may still ask why such stability prevailed when the shifts in patterns of living were making for a decline in savings proportions of the type that became apparent in the twentieth century. The reasons may lie partly in changes in inequality in the distribution of income by size, partly in the very rapidity of growth of real income per capita.[1]

Some of the conclusions suggested by Tables 33–35 will become more meaningful as we observe the weight and movement of the components of flow of goods to consumers and of capital formation. But before turning to them we make one final comment on the preceding analysis. Capital formation has been defined to include new residential housing, but not the flow of consumers' durable commodities (furniture, heavy house-furnishings, long-lived household appliances, and most important in recent decades, passenger motor cars). It may be argued that purchases of such durable commodities represent investment just as much as purchase of a house, and that they should be included in capital formation rather than in flow of goods to consumers.

[1] For further discussion of this and related points see my paper, 'Proportion of Capital Formation to National Product', presented at the 1951 meeting of the American Economic Association, and published in the *American Economic Review*, Vol. XLII, No. 2, May 1952.

The validity of this argument is questionable, since individuals do not in fact seem to treat purchases of consumer durable commodities as investment similar to that involved in purchasing a house; nor do they, at least in the United States, have as much opportunity to choose between buying and renting consumer durable commodities as they have between renting and buying residences. But just to see the effects of including consumer durable in capital formation, we have made a simple illustrative calculation (Table 36).

We have assumed that: (i) the life period of consumers' durable commodities was constant at ten years, and that a straight-line basis for allocating depreciation over the ten years is permissible; and (ii) the yield on consumer durable commodities, which has to be entered under flow of goods to consumers if the commodities are consumer capital, is equal to that of prime grade bonds. Both assumptions are extremely crude. In fact, the life period for the total of consumers' durable commodities may have changed over the decades covered in our analysis, since introduction of the passenger automobile may have reduced the average life span; and almost certainly the curve descriptive of depreciation over the life is not a straight line, but drops markedly in the first year or two and then declines more moderately.[1] Also, the net return to the consumers owning these goods might have been better approximated at a somewhat higher and more stable level than that characteristic of bond yields. But refinements of the procedure did not seem warranted, since the major results of the calculation were not likely to be significantly affected.

The inclusion of consumer durable commodities in capital formation increases the latter, adds the net yield on the stock of consumer durables to national product, and replaces consumer durables in the flow of goods to consumers by the much smaller item of its net yield. The calculations were made for totals in 1929 prices alone, as a matter of simplicity: the results

[1] In *The Structure of the American Economy, Part I* (National Resources Committee, 1939, Washington, p. 376), the calculation of the stock of consumers' durable commodities assumes a life of 8 years for passenger automobiles and of 10 years for the rest of consumer durable commodities. In his study of savings in the American economy (in process) Raymond Goldsmith assigns life periods to various categories of consumers' durable commodities, ranging from 5 to 20 years; and allows for a curvilinear type of allocation for passenger cars. In recent decades the composite average would work out close to a 10-year life.

TABLE 36

Recalculation of Structure of National Product, by Type of Use, including Consumers' Durable Commodities in Capital Formation, U.S.A., 1879-1948

(All dollar figures in millions, 1929 prices: averages for overlapping decades)

A. ABSOLUTE FIGURES

Decade	Depreciation of Consumers' Durable (1)	Stock of Consumers' Durable, Middle of Decade (2)	Pct. Yield on (2) (3)	Yield of (2) in Dollars (2×3) (4)	Gross National Product (5)	Capital Consumption, including Consumers' Durable (6)	Net National Product (5—6) (7)	Gross Capital Formation (8)	Net Capital Formation (8—6) (9)	Flow of Goods to Consumers (7—9) (10)
1879–88 . .	1,027	5,000	4.4	220	19,685	2,614	17,071	5,580	2,966	14,105
1884–93 . .	1,401	6,918	4.0	277	23,361	3,502	19,859	7,171	3,669	16,190
1889–98 . .	1,743	8,395	3.8	319	27,097	4,320	22,777	8,510	4,190	18,587
1894–03 . .	2,042	9,309	3.5	326	33,562	5,220	28,342	10,243	5,023	23,319
1899–08 . .	2,440	11,522	3.5	403	41,729	6,313	35,416	11,939	5,626	29,790
1904–13 . .	2,920	13,553	3.8	515	50,160	7,775	42,385	13,912	6,137	36,248
1909–18 . .	3,406	15,859	4.1	651	56,886	9,372	47,514	16,108	6,736	40,778
1914–23 . .	3,970	18,432	4.6	848	65,283	11,244	54,039	18,512	7,268	46,771
1919–28 . .	5,022	22,600	4.7	1,062	78,853	13,766	65,087	22,621	8,855	56,232
1924–33 . .	6,435	33,755	4.5	1,519	84,339	15,990	68,349	21,120	5,130	63,219
1929–38 . .	6,774	28,074	4.0	1,123	82,868	16,474	66,394	16,986	512	65,882
1934–43 . .	6,370	26,813	3.1	831	100,028	17,654	82,374	24,717	7,063	75,311
1939–48 . .	6,782	31,070	2.7	839	129,209	26,242	102,967	36,420	10,178	92,789

Col. 1: Based on decade averages of flow of consumer durables in *National Product since 1869*, Table II-8, p. 106, and extrapolated to recent years by Department of Commerce estimates. A life period of 10 years is assumed.
Col. 2: Derived from flow of consumer durables and depreciation.
Col. 3: Data underlying Table 13, col. 5.
Col. 5: Sum of col. 4 and Table 33, cols. 4 and 5.
Col. 6: Sum of col. 1 and Table 33, col. 5 minus col. 6.
Col. 8: Flow of consumer durables (see notes to col. 1) plus Table 33, col. 5.

TABLE 36 (*Concluded*)

B. PERCENTAGE SHARES AND RATIOS

Number	Decade	Shares in G.N.P.		Shares in N.N.P.		Percentage Capital Consumption is of:	
		Flow of Goods to Consumers	G.C.F.	Flow of Goods to Consumers	N.C.F.	G.N.P.	G.C.F.
		(1)	(2)	(3)	(4)	(5)	(6)
1	1879–88	71.7	28.3	82.6	17.4	13.3	46.8
2	1884–93	69.3	30.7	81.5	18.5	15.0	48.8
3	1889–98	68.6	31.4	81.6	18.4	15.9	50.8
4	1894–03	69.5	30.5	82.3	17.7	15.6	51.0
5	1899–08	71.4	28.6	84.1	15.9	15.1	52.9
6	1904–13	72.3	27.7	85.5	14.5	15.5	55.9
7	1909–18	71.7	28.3	85.8	14.2	16.5	58.2
8	1914–23	71.6	28.4	86.6	13.4	17.2	60.7
9	1919–28	71.3	28.7	86.4	13.6	17.5	60.9
10	1924–33	75.0	25.0	92.5	7.5	19.0	75.7
11	1929–38	79.5	20.5	99.2	0.8	19.9	97.0
12	1934–43	75.3	24.7	91.4	8.6	17.6	71.4
13	1939–48	71.8	28.2	90.1	9.9	20.3	72.1
Average of Percentages: Decades							
1–5		70.1	29.9	82.4	17.6	15.0	50.1
5–9		71.7	28.3	85.7	14.3	16.4	57.7
9–13		74.6	25.4	91.9	8.1	18.9	75.4

for totals in current prices would not have been much different. Also, rather than extend the series of consumer durables back to 1859 (to get depreciation and stock figures for 1869–78), we limited the results to the decades beginning with 1879.

The effects of the change in definition can be briefly summarized.

First, the share of capital formation in the national product is inevitably larger and that of flow of goods to consumers smaller. Whereas in Table 34 the share of gross capital formation in gross national product averaged about a fifth, in Table 36 it is well over a quarter. The share of net capital formation averaged about 11 percent of net national product under the narrower definition, and was about 13 percent under the wider.

Second, widening the definition of capital formation does not affect significantly whatever trends are observed in the share of capital formation in national product. The downward drift, rather mild and somewhat doubtful, of the share of gross capital

formation in g.n.p., is also observed in Table 36 and is also quite mild. Indeed, the major change is in the war dominated decades (lines 12 and 13) where the inclusion of consumer durables, whose production was greatly restricted during the war, tends to damp the rise in the share of gross capital formation so conspicuous for these decades in Table 34.

Third, here too the share of net capital formation in net national product declines markedly, and more than the share of gross capital formation in gross national product. And the factors involved, the rise in the ratio of capital consumption to gross national product and to capital formation, and more specifically the greater rise in the latter ratio than in the former, are revealed here (columns 5 and 6) as they were in Table 35.

We infer that the inclusion of consumers' durable commodities in capital formation, while naturally affecting the *levels* of the shares of the two major categories of national product, does not affect their longer-term trends or the swings in them.

2. *Components of flow of goods to consumers*

In the original study of commodity flow and capital formation the guiding classification was, after distinguishing consumer from producer goods, by durability – by the length of the period in which the good is used by ultimate consumers. This criterion was stressed for two reasons. First, the study was directed at segregating capital formation, or investment, from flow of goods to consumers, and the durability of a commodity, e.g. the fact that it may continue to retain its physical form and usefulness for a long time after its use begins, might in and of itself be ground for treating it as an item of capital stock – as the discussion of Table 36 suggested. Second, the study was aimed at providing data for analysis of short-term fluctuations associated with business cycles; from this standpoint, differences in durability of goods in ultimate use are important because they spell differences in response of demand to short-term changes in the economic scene. Hence the classification of the flow of goods to consumers into four groups: perishable commodities; semi-durable commodities; durable commodities; services not embodied in commodities – with a segregation of rent from other services in the estimates in current prices (Table 37).

Perishables are commodities which in ultimate use do not last beyond six months: food, tobacco, drugs, paper and certain

types of paper products, fuel, and the like. Semidurables are commodities which, by and large, last in ultimate use well over six months but not more than three years: clothing; lighter housefurnishings; toys, games, etc.; and tires and tubes. Durable commodities last well over three years: furniture and heavy housefurnishings; jewelry and musical instruments; luggage and books; passenger cars; and the like. Services not embodied in commodities range from professional advice rendered to individuals by physicians and lawyers, through personal service either to individuals directly or to their possessions (barbers, cleaners, etc.), to domestic service. The classification is necessarily based upon the dominant characteristics of commodity groups, and does not take account of the fact that in the hands

TABLE 37

Percentage Distribution of Flow of Goods to Consumers, by Major Components, Current and 1929 *Prices, U.S.A.*, 1869-1948

A. CURRENT PRICES

Number	Decade	Commodities			Services		
		Perishable (1)	Semidurable (2)	Durable (3)	Rent (4)	Other (5)	Total (6)
1	1869–78	45.1	20.5	8.2	12.4	13.8	26.2
2	1874–83	46.5	19.1	7.6	12.6	14.2	26.8
3	1879–88	45.9	18.7	7.9	12.7	14.7	27.4
4	1884–93	44.8	18.6	8.5	12.9	15.2	28.1
5	1889–98	45.3	17.7	8.2	13.2	15.7	28.9
6	1894–03	45.6	16.5	7.8	13.8	16.3	30.1
7	1899–08	44.3	16.3	8.0	14.4	17.0	31.4
8	1904–13	43.4	15.9	8.1	15.1	17.5	32.6
9	1909–18	44.0	16.3	8.4	13.0	18.4	31.4
10	1914–23	41.7	17.7	9.4	13.3	17.9	31.2
11	1919–28	38.3	17.0	10.7	14.2	19.7	33.9
12	1924–33	36.6	15.5	10.3	14.6	23.0	37.6
13	1929–38	38.8	14.2	9.1	14.2	23.7	37.9
14	1934–43	42.3	14.3	9.0	12.1	22.3	34.4
15	1939–48	43.4	15.4	9.7	9.9	20.6	30.5
Average of Percentages: Decades							
1–5		45.5	18.9	8.1	12.8	14.7	27.5
6–10		43.8	16.7	8.3	13.9	17.4	31.3
11–13		37.9	15.6	10.0	14.3	22.1	36.5
11–15		39.9	15.3	9.8	13.0	21.9	34.9

TABLE 37 (*Concluded*)

B. 1929 PRICES

No.	Decade	Perishable (1)	Semidurable (2)	Durable (3)	Services (4)
1	1869–78	43.0	19.2	8.5	29.3
2	1874–83	45.0	18.3	8.3	28.4
3	1879–88	45.1	18.1	9.0	27.8
4	1884–93	44.0	18.4	9.9	27.7
5	1889–98	44.4	18.1	9.8	27.7
6	1894–03	44.7	17.4	9.3	28.6
7	1899–08	43.7	17.1	8.9	30.3
8	1904–13	42.5	16.8	8.6	32.1
9	1909–18	42.0	16.6	8.7	32.6
10	1914–23	40.6	15.7	9.2	34.6
11	1919–28	38.7	14.9	10.6	35.8
12	1924–33	38.5	14.9	10.2	36.4
13	1929–38	41.5	14.0	8.6	35.9
14	1934–43	58.0		8.2	33.8
15	1939–48	58.5		8.3	33.2
Average of Percentages:					
Decades					
1–5		44.3	18.4	9.1	28.2
6–10		42.7	16.7	8.9	31.6
11–13		39.6	14.6	9.8	36.0
11–15		55.8		9.2	35.0
Average of Implicit Price Indexes:					
Decades					
1–5		60	60	53	57
6–10		68	66	62	64
11–13		91	100	97	95
11–15		97		103	95

Derived from estimates of components in *National Product since 1869* (NBER, 1946), Tables II-8, p. 106, and III-10, p. 144, with minor revisions in lines 10–13 resulting from revision of changes in claims against foreign countries. For the last two decades the totals were derived by extrapolation of annual estimates by the Department of Commerce data published (for years since 1929) in the *Survey of Current Business* (particularly July 1947 Supplement, July 1950, and January 1951).

of some individuals a new passenger car may not last a year, and in the hands of other individuals a suit or pair of shoes may last well over three years. Also, the durability criterion is applied to the period of life of the good in question, not to the life of its results: the physician's service ends its life the moment the consultation is completed, but its results may last for years to come.

In considering the structure of flow of goods to consumers by these major components it should again be noted that only the commodity components are estimated directly. The service component is derived as a residual for the basic period 1919–38, from estimates of national income by type of payment, extrapolated for earlier decades on the basis of scattered budget studies yielding a ratio of consumer expenditures on services to their expenditures on commodities, and extrapolated forward on the basis of Department of Commerce direct estimates of the volume of services. Also, the adjustment for price changes is a particularly difficult problem for both the services and the consumers' durable commodities.

These qualifications do not affect significantly the broad levels and trends suggested by Table 37. Perishable commodities account for by far the largest share of flow of goods to consumers – somewhat over four-tenths on the average. Semidurable commodities account for about a seventh, and durables for somewhat less than a tenth. All commodities combined account, therefore, for about seven-tenths; services not embodied in commodities for about three-tenths.[1]

Even though the distinction among the components in Table 37 has been devised largely for the study of short-term changes, the distribution reveals fairly pronounced long-term trends. The shares of perishable and semidurable commodities decline, for the totals in both current and 1929 prices. If we disregard the last two decades affected by World War II and the restrictions on the production of consumer durables, the combined share of perishable and semidurable commodities declines from 63–66 percent at the beginning of the period to 53–55 percent at the end. The shares of durable commodities and services both rise; within the latter the share of services other than those represented by rent rises most conspicuously.

These long-term movements in the structure of flow of goods to consumers can be compared with differences in the structure of consumer demand among income classes in cross-section

[1] All direct services of public utilities to consumers are in the service component. The share of services in national income, allowing about 10 percent for net capital formation, is about 27 percent or a little more than half of the share of service *industries* in national income, according to the analysis in Part IV. The reason, of course, is that a large proportion of the activities of service industries is for other industries rather than ultimate consumers: e.g. major proportions of trade, the transportation and public utilities group, finance, government, and even the service industries proper (e.g. lawyers).

analysis. The distribution most suitable for this purpose is given in the Study of Consumer Expenditures in the United States for 1935–36.[1]

Family Income Group	Commodities			Services		
	Perishable	Semidurable	Durable	Total	Classified as such	Housing
Under $1,000	58.0	7.6	5.3	29.1	11.0	18.1
$1,000–$2,000	50.8	8.8	8.2	32.2	14.4	17.8
$2,000–$3,000	44.6	10.1	10.2	35.1	17.4	17.7
$3,000–$5,000	40.4	11.1	10.8	37.7	20.0	17.7
$5,000 and over	30.5	13.0	12.6	43.9	25.9	18.0
All families	47.4	9.6	8.8	34.2	16.3	17.9

There are some similarities and differences. The long-term decline in the share of perishable commodities and rise in the shares of durable commodities and total services are similar to the movements of the shares of these categories in total expenditures from the low to the high income groups, in the cross-section comparison. But, whereas the share of semidurable commodities declines over time, it rises, at a point of time, from the low to the high income groups; and, whereas the share of rent in the flow of goods to consumers rises slightly over time, the corresponding share in cross-section analysis is about the same at the different levels of the income distribution.

One explanation of both the similarities and differences is suggested when we look at the structure of expenditures for farm and for urban families in the cross-section analysis. For the same income range, say the rather typical one of $1,250 to $1,500 per family, the proportion spent on the major perishable commodity – food – is larger for farm than for urban families – 46.2 percent against 35.0; that spent on the major semidurable commodity – clothing – is also higher for a farm than for an urban family – 9.9 percent against 9.0; that spent on major durable commodities – automobiles and housefurnishings – is higher for a farm than for an urban family – 11.4 percent against 9.7; that spent on housing is lower for a farm than for an urban

[1] See *Family Expenditures in the United States* (National Resources Committee, June 1941, Washington, D.C.) particularly pp. 32–4 and 185–92. The figures cited are from Table 100, p. 34.

family – 12.0 percent against 19.9 percent; and that spent on other services (other transportation, medical care, recreation, education) is also lower for a farm than for an urban family – 7.5 percent against 9.0 percent.[1] These differences between the countryside and the city in the structure of consumer expenditures must be combined with what we know of the long-term responsiveness of demand for various types of consumer goods to increases in income to explain the trends that emerged in Table 37. The marked downward trend in the share of perishable commodities and the upward trend in that of services other than housing are due to the fact that both the general structure of human wants and the shift of population from the countryside to the city made for a reduction in the relative weight of foods and an increase in that of such services as transportation, medical care, recreation, education, and the like. The downward trend in the share of semidurable commodities and the upward trend in that of housing, despite the rise of the former and stability of the latter in the cross-section analysis, are due largely to the shift from the countryside to the city, and perhaps partly to the depressing effects of the rising demand for durable commodities. Only the long-term rise in the share of durables is in conflict with the difference in shares between the countryside and the city – an indication that the upward trend in this share is due to a real change in consumer preferences, associated with technological innovations that served to modify the structure of consumer demand.

Despite the differences, there is rough agreement between the trends in the shares in Table 37 and cross-section differences in the structure of flow of goods to consumers. This contrasts with the disagreement between longer-term trends and the cross-section differences in the distribution of total income between expenditures and savings: in cross-section analysis, the ratio of savings to income increases rapidly as we rise from lower to upper income brackets whereas, as was shown in Section VI-1, the share of capital formation (and presumably savings) failed to rise, and indeed declined somewhat, over a period during which the income per capita increased appreciably.

It is not difficult to reconcile these different relations between the results of the analysis of long-term changes over time and the results of cross-section analysis. The long-term rise in income

[1] See *ibid.*, Table 146, p. 51, and Table 180, p. 61.

is presumably accompanied by a rise in the demand schedules of consumers, by a shift to higher per capita consumption levels. It is, therefore, not only possible but extremely likely that a long-term rise in per capita income will *not* be accompanied by a long-term rise in the proportion of income saved. At the same time, the shift to higher consumption levels means that wider groups of consumers could satisfy wants in a way that was previously possible only for consumer groups at the higher levels of the income pyramid. In general, consumer needs for perishable foods and fuel are satiated most easily and, beyond a certain consumption level, so are the needs for clothing. In this respect the structure of needs reflects characteristics of human nature at large, common to all classes in the income distribution. It follows that the change in the structure of flow of goods to consumers, associated with a rise in income per capita over time, will reproduce in a rough way the differences in structure among income classes in cross-section analysis – qualified, as already indicated, by the effects of country-to-city shifts of population and of expenditure totals.

Table 37 reveals some disparities between the shares based on current and on 1929 prices. In general, the shares of perishable and semidurable commodities are lower and those of durable commodities and services higher in totals in 1929 prices. Also, the downward trend in the shares of perishable and semidurable commodities is less appreciable for the distribution in 1929 prices than for that in current prices. These differences are due to differences in the levels and trends in the implicit indexes, shown by averages at the bottom of columns 1–4. But the extremely rough character of the price indexes leaves little confidence in the reliability of the differences. The price index for consumer durable commodities fails to take proper account of the introduction of new commodities and of the marked decline in their cost: the fact that it rises more than the indexes for perishable and semidurable commodity prices is a strong indication that it fails to a much greater extent to allow for changes in quality and introduction of new items and that it reflects largely the price movements of the older and progressively less important commodity categories. And as already indicated, price movements estimated for the service component are the roughest of approximations. It would seem, therefore, safer not to assign much significance to the differences in either levels or

trends in the shares of the components between the distributions in current and in constant prices. The latter are needed if an adjustment for movements of prices is to be made, an adjustment that is better than none for some purposes. But its results cannot be relied upon for significant inferences here.

As already noted the components in Table 37 have not been distinguished with an eye to revealing differences in *long-term trends*. Each, therefore, includes subgroups that diverge widely with respect to rate of long-term growth. The perishable component includes the slowly growing non-manufactured foods and the rapidly growing liquid fuels (for use by passenger cars). The semidurable component includes the slowly growing dry goods and notions and the rapidly growing tires and tubes. The durable component includes the slowly growing items of furniture or china and household utensils and such rapidly growing items as electric household appliances, radios, and passenger automobiles. The other service component includes rapidly growing items such as the services of electric and other utilities and slowly growing items such as domestic service.

Estimates of flow of goods to consumers, *at cost to the latter*, are available, over a sufficiently long period, only for these wide groups and it would be a major undertaking to try to break them down into narrower subgroups, more revealing of long-term shifts in the internal structure of consumption. But we can take advantage of Shaw's estimates of flow of commodities into domestic consumption, *at producer prices*; and thus secure better insight into the nature of the long-term shifts (Table 38).

The comparison, which spans most of the period covered in Table 37, shows, like the latter, a decline in the shares of perishable and semidurable commodities and a rise in the share of durable commodities. Indeed, with the exclusion of the service component, inter-commodity differences in the rate of growth, particularly the more rapid growth of durable commodities, become more prominent. The percentage shares for the three major categories shown in columns 3 and 4 are similar to those in Table 37 recalculated to exclude services: the share of perishable commodities in Table 37 (current prices) becomes 63 percent in 1879–88 and 62 percent in 1929–38; that for semidurable, 26 and 23 percent respectively; that for durable, 11 and 15 percent. The failure of the share of perishable to decline and that of durable to rise in Table 37 as much as in Table 38 is due

to the effect of the depression years on the decade average, omitted when only 1929 and 1939 are included.

TABLE 38

Percentage Distribution of Output destined for Domestic Consumption, Consumer Commodities at Producers' Current Prices, U.S.A. 1879-89 *and* 1929-39

Commodity Group	Millions of Dollars		Percentage Shares	
	1879 and 1889 (1)	1929 and 1939 (2)	1879 and 1889 (3)	1929 and 1939 (4)
Perishable, Total	*2,450.9*	*17,419.8*	*63.94*	*58.48*
1a. Food and kindred prod., manuf.	1,198.6	9,279.8	31.27	31.15
1b. „ „ „ „ nonmfd.	836.6	3,770.6	21.82	12.66
2. Cigars, cigarettes and tobacco	161.1	1,283.8	4.20	4.31
3. Drug, toilet and household prepar.	61.0	934.0	1.59	3.14
4. Magazines, newspap., stationery, misc. paper products	77.7	641.2	2.03	2.15
5a. Fuel and lighting products, mfd.	49.6	1,219.6	1.29	4.09
5b. Fuel, nonmanufactured	66.4	290.8	1.73	0.98
Semidurable, Total	*980.6*	*6,662.9*	*25.58*	*22.37*
6. Dry goods and notions	272.4	766.2	7.11	2.57
7. Clothing and personal furnishings	459.5	3,993.4	11.99	13.41
8. Shoes and other footwear	204.9	929.2	5.35	3.12
9. Housefurnishings (semidurable)	24.2	403.0	0.63	1.35
10. Toys, games and sporting goods	19.6	216.4	0.51	0.73
11. Tires and tubes	0	354.6	0	1.19
Durable, Total	*401.8*	*5,704.0*	*10.48*	*19.15*
12. Household furniture	79.3	531.6	2.07	1.78
13a. Heating and cooking apparatus and household appliances, except electric	31.0	317.5	0.81	1.07
13b. Electric household appl. and supplies	0	255.2	0	0.86
13c. Radios	0	280.2	0	0.94
14. Housefurnishings (durable)	77.2	625.8	2.01	2.10
15. China and household utensils	38.8	255.5	1.01	0.86
16. Musical instruments	21.2	79.9	0.55	0.27
17. Jewelry, silverware, clocks, watches	58.9	332.8	1.54	1.12
18. Printing and publishing books	26.8	169.9	0.70	0.57
19. Luggage	8.9	55.2	0.23	0.19
20a. Passenger vehicles, motor	0	2,149.9	0	7.22
20b. Motor vehicle accessories	0	490.4	0	1.65
20c. Passenger vehicles, horse, and accessories	44.6	0	1.16	0
21. Motorcycles and bicycles	1.0	20.8	0.02	0.07
22. Pleasure craft	1.2	22.7	0.03	0.08
23. Ophthalmic products and artif. limbs	1.6	74.4	0.04	0.25
24. Monuments and tombstones	11.4	42.2	0.30	0.14

TABLE 38 (*Concluded*)

Commodity Group	Millions of Dollars		Percentage Shares	
	1879 and 1889	1929 and 1939	1879 and 1889	1929 and 1939
	(1)	(2)	(3)	(4)
OTHER MAJOR GROUPS:				
A. By Function				
I. Food and tobacco (1a, 1b, 2)			57.3	48.1
II. Heating, drugs, etc. (3, 5a (col. 1 only), 5b)			4.6	4.1
III. Clothing (6, 7, 8)			24.4	19.1
IV. Household furnish. and appl. (9, 12, 13a, 13b, 14, 15)			6.5	8.0
V. The car (5a (col. 2 only), 11, 20a, 20b, 20c)			1.2	14.2
VI. Reading, recreation, decoration (4, 10, 13c, 16, 17, 18, 19, 21, 22)			5.6	6.1
VII. Miscellaneous (23, 24)			0.3	0.4
B. By Indispensability				
I. Indispensable (1a, 1b, 5b, 6, 7, 8, 9, 12, 13a, 14, 15, 23)			85.8	71.3
II. Other			14.2	28.7
C. By Newness				
I. New (5a (col. 2 only), 11, 13b, 13c, 20a, 20b, 21)			00.3	16.0
II. Other			99.97	84.0

Derived from Table 3, p. 13, of W. H. Shaw, *Value of Commodity Output since 1869* (NBER, 1947).

But the interest in Table 38 lies in the detail. One can observe how drastically the share of commodities associated with country life and work at home – nonmanufactured foods and dry goods and notions – declines; and how much the share of relatively new commodities – passenger automobiles and electric appliances–rises. Obviously the share of perishable commodities did not decline more because it includes rapidly growing categories, such as drug, toilet and household preparations, and liquid fuels – the latter a complement of passenger cars; and the share of the semidurable component is similarly affected by the inclusion of tires and tubes.

With the greater detail in Table 38 it is possible to form components different from those distinguished in Table 37. These classifications are necessarily rough, but they clearly reveal how the emergence of the passenger car and its corollaries, and of the whole group of electric appliances and devices for

the home, has modified the structure of consumer commodities. These categories, which did not exist at the beginning of the period, accounted at the end for over a seventh of total commodity flow; and by a more precise calculation would probably account for about a fifth. Under the impact of these new categories, which naturally reduce the shares of all other commodities, only such semiluxury categories as tobacco, reading and recreation, and decoration managed to retain proportions in the total close to or slightly larger than those prevailing in the past.

3. *Components of capital formation*

In the estimates of capital formation that extend beyond the recent decades to the full period discussed here, four components are distinguished: construction of all kinds, whether residential, business, industrial plant, utilities, or government and public; producers' durable equipment – essentially machinery and tools of various description including military weapons and such items as ships, cars, etc.; changes in business inventories; changes in claims against foreign countries. The line of demarcation between construction and equipment is sometimes blurred – particularly in the estimates for recent decades, which are based on total *cost* of construction (rather than on construction materials consumed) and which may, in some recent years, include selected types of attached equipment (e.g. refrigerators provided in new residential units). As already indicated, producers' equipment for World War I years is underestimated because of exclusion of production of government arsenals; and estimates of changes in inventories throughout are limited to business inventories alone, excluding government stores. Finally, there may be a general bias toward undercoverage in the sense that capital investment, in the form of labor spent by farmers on fencing, drainage, and other types of improvement, is likely to be almost wholly omitted. As always, we deal here with rather imperfect measures that can suggest only broad trends and wide differences.

In studying the percentage distribution of capital formation it seemed best to combine the variable capital items, viz. net change in inventories and in claims against foreign countries: they are relatively small in most decades, and negative in quite a few, so that their separate treatment would only render the

percentage distributions erratic. Hence, the distribution here is a tripartite division among construction, equipment, and all other (Table 39).

In gross capital formation (Panel A) gross construction is by far the largest component, accounting, on the average, for between half to six-tenths of the total. The gross flow of producers' durable equipment accounts for about a quarter to a third, and changes in inventories and foreign claims for about a tenth to a sixth.

The underlying trends in the distribution are not easily discerned because shares of the three categories in total gross capital formation fluctuate widely, indicating that the long

TABLE 39

Percentage Distribution of Capital Formation among Major Components, U.S.A., 1869-1948

A. GROSS CAPITAL FORMATION

Number	Decade	In Totals in Current Prices			In Totals in 1929 Prices		
		Construct.	Prod. Durable Equip.	Invent. and For. Claims	Construct.	Prod. Durable Equip.	Invent. and For. Claims
		(1)	(2)	(3)	(4)	(5)	(6)
1	1869–78	52.0	26.8	21.2	63.9	20.5	15.7
2	1874–83	47.8	26.1	26.2	58.3	22.9	18.9
3	1879–88	56.4	26.8	16.8	63.7	24.4	11.8
4	1884–93	68.2	24.0	7.8	72.3	22.8	4.9
5	1889–98	68.5	22.7	8.9	71.8	21.8	6.4
6	1894–03	58.5	24.1	17.3	63.4	23.1	13.5
7	1899–08	61.5	29.2	9.3	64.5	28.5	7.0
8	1904–13	63.3	30.0	6.7	65.3	29.9	4.9
9	1909–18	45.5	33.3	21.2	53.9	31.6	14.5
10	1914–23	37.8	33.6	28.5	44.1	33.7	22.2
11	1919–28	49.4	32.7	17.9	51.7	34.1	14.2
12	1924–33	59.7	36.9	3.5	60.1	37.7	2.1
13	1929–38	52.4	43.3	4.3	53.2	43.8	3.1
14	1934–43	29.3	60.4	10.3	35.8	51.5	12.6
15	1939–48	21.5	67.5	10.9	25.4	62.0	12.6
Average of Percentages: Decades							
	1–5	58.6	25.3	16.2	66.0	22.5	11.5
	6–10	53.3	30.0	16.6	58.2	29.4	12.4
	11–13	53.8	37.6	8.6	55.0	38.5	6.5
	11–15	42.5	48.2	9.4	45.2	45.8	8.9

TABLE 39 (*Concluded*)

B. NET CAPITAL FORMATION

Number	Decade	In Totals in Current Prices			In Totals in 1929 Prices		
		Construct. (1)	Prod. Durable Equip. (2)	Invent. and For. Claims (3)	Construct. (4)	Prod. Durable Equip. (5)	Invent. and For. Claims (6)
1	1869–78	45.3	19.2	35.5	57.6	15.1	27.2
2	1874–83	41.2	18.7	40.1	52.7	17.1	30.3
3	1879–88	55.3	18.4	26.4	63.8	17.1	19.0
4	1884–93	73.9	13.5	12.5	79.1	12.9	8.0
5	1889–98	75.1	10.4	14.5	79.4	10.0	10.5
6	1894–03	58.6	12.9	28.4	64.7	12.6	22.7
7	1899–08	63.7	20.2	16.1	67.8	20.0	12.2
8	1904–13	68.0	19.8	12.2	71.0	20.0	9.0
9	1909–18	39.7	21.4	39.0	50.3	21.5	28.2
10	1914–23	23.4	21.3	55.3	30.1	23.2	46.8
11	1919–28	43.2	19.4	37.5	47.0	21.9	31.1
12	1924–33	71.3	18.9	9.8	75.2	18.3	6.5
13	1929–38	46.2	22.8	31.0	47.2	24.9	27.9
14	1934–43	77.9		22.1	66.3		33.7
15	1939–48	72.4		27.6	58.9		41.1
Average of Percentages:							
Decades							
1–5		58.2	16.0	25.8	66.5	14.4	19.0
6–10		50.7	19.1	30.2	56.8	19.5	23.8
11–13		53.6	20.4	26.1	56.5	21.7	21.8
11–15		74.4		25.6	71.9		28.1

Derived from absolute totals in *National Product since 1869* (NBER, 1946), Tables II-13 and II-15, pp. 115 and 118, extrapolated annually, by Department of Commerce data for recent years. Minor revisions in the data for the earlier decades result from revision of changes in claims against foreign countries.

swings that characterize their decade rates of change differ materially in either amplitude, timing, or both. But the averages for groups of five decades suggest that the share of construction in gross capital formation moves downward – declining, even prior to the World War II decades, from 59 to 54 percent in totals in current prices and from 66 to 55 percent in totals in 1929 prices. The share of change in inventories and in foreign claims declines even more strikingly (due exclusively to the former) by the 1920–30's to about half its level in the first five decades; and producers' durable equipment accounts for a rapidly rising share of gross capital formation – even prior to World War II decades when the rise was swollen first by the

burst in production of munitions and then by postwar refilling of industrial fixed capital. The trends are quite plausible in that the share of construction would decline as population growth slowed down and as the basic network of fixed capital was completed; and the share of inventories would also decline, as improved means of transportation and communication and reduction in the share of seasonal industries (such as agriculture) would permit a reduction in the ratio of inventories needed for a given volume of production, trade, and distribution.

The distribution of *net* capital formation is different (Panel B). Our estimates of capital consumption are based on a simple assumption of a constant life of 50 years for construction units and of 13 years for producers' durable equipment allocated on a straight-line basis; and on cumulation of past output, appropriately weighted. It is quite likely that our totals for capital consumption for the construction component are on the high side (Raymond Goldsmith's recent studies suggest a life period closer to 100 than to 50 years); and that the life period for producers' durable equipment should have been made progressively shorter as we moved from the earlier to the recent decades – in addition to the special allowance made for a short life of military durable equipment, which is set at 5 years. But the broad nature of the changes in the levels and trends in the distribution of capital formation introduced by the adjustment for capital consumption would remain roughly the same, even with the revision just suggested.

The share of net producers' durable equipment in net capital formation is much lower – between a seventh and a fifth – than its share in gross capital formation – between a quarter and a third. The share of construction remains unaffected – this, at first surprising, result being due to the fact that the ratio of capital consumption to gross flow for construction is about equal to the ratio of total capital consumption to total gross capital formation. The share of changes in inventories and in foreign claims is strikingly higher – a tenth to a seventh in gross capital formation, it ranges from a fifth to over a quarter in net.

Even more interesting is the effect of the allowance for capital consumption on long-term trends. The downward drift of the share of construction is again observed in net capital formation, and is about as large as that in the share of gross construction in gross. The upward drift in the share of producers' durable

equipment is still observed in the distribution of net capital formation; but is much smaller than in gross. Even if we exclude the World War II decade in which the allowance for capital consumption is raised sharply by the short life assumed for military equipment, the rise in the share of net producers' durable equipment is only from 16 to 20 percent (current prices) or 14 to 22 percent (1929 prices) compared with rises from 25 to 38 or 22 to 38 percent in gross. Finally, the constancy in the share of changes in inventories and claims against foreign countries in net capital formation contrasts with its sharp decline in gross capital formation: indeed, the share of this component in net capital formation shows a slight upward drift. Obviously the reduction in the need for inventories, alluded to above, was matched, on the one hand, by reduction in the need for *net* additions to fixed capital and, on the other, by the increase in the share of changes in claims against foreign countries. The latter, small and on the whole negative prior to World War I, became much larger and positive with the shift of the United States to a world creditor position; and the rise in its share tended to offset whatever declines may have characterized the share of changes in inventories alone.

The changing structure of capital formation revealed in Table 39 helps to explain the slight decline in the share of gross capital formation in gross national product and the much more marked decline in the share of net capital formation in net national product. Excluding the decades beginning with the depressed 1930's, the share of gross capital formation in gross national product, for volumes in 1929 prices, averaged 22.8 percent in 1869–98 and 21.4 percent in 1899–1928. But construction alone was responsible for that decline. Its share in gross national product averaged 15.0 percent for 1869–98 and 12.0 percent for 1899–1928; the share of producers' durable *rose* from 5.1 to 6.8 percent; that of the combined total of net changes in inventories and in foreign claims from 2.6 to 2.7 percent. For the same two periods of about 30 years each the share of net capital formation in net national product dropped from 15.1 to 12.2 percent; of net construction from 10.0 to 6.5 percent; of producers' durable *rose* from 2.2 to 2.6 percent; and of inventories and foreign claims from 2.9 to 3.1 percent. Thus, the decline in the share of capital formation in national product was associated with and accounted for by the decline in the share of construction in

national product; and, as will be seen presently, residential and closely related types form a large proportion of construction.

Further work is needed to distinguish within the major components of capital formation important subgroups, such as various types of construction and particularly the several industrial channels of destination. Such work is being carried on at present at the National Bureau of Economic Research as part of a broad study of capital formation and financing in the American economy. But its results are not yet available, and for the present we must use information either from the Censuses of Wealth, or from Shaw's detailed work on the flow of producers' durable commodities (Table 40).

The Census of Wealth data on construction and equipment check only roughly with the cumulated totals of net construction and net producers' durable. From 1880 to 1922 the total increase shown by the wealth data (reduced to 1929 prices) was $101 billion for real estate improvements (construction), whereas the cumulated total of net construction amounted to $115 billion; for the same period, according to the wealth data, producers' durable equipment increased $36 billion, compared with a cumulated total of net flow of such equipment of $38 billion. The discrepancies for shorter periods are even greater (see *National Product since 1869*, NBER, 1946, Table IVa, p. 194). But, by and large, the wealth and the capital formation data are sufficiently congruent to permit using the percentage distributions of the former as rough indications of the latter.

The distribution in Panel A of Table 40 is unfortunately not too detailed. Agriculture's share in the total increase of fixed capital is comparatively small and would probably be even smaller were we to include the period following 1922. Mining and manufacturing account for a small share in construction but for a larger share in producers' durable equipment; and their shares in both types of fixed capital increase markedly from the first half of the period to the second. Public utilities account for a large share of the rise in both construction and equipment, over a quarter of each – far larger than their share in national product. The decline in the shares of public utilities from the first to the second half of the period would not necessarily persist beyond 1922. Other business, a highly miscellaneous category that includes the construction industry, trade, finance and insurance, and various private service industries,

TABLE 40

Percentage Distribution of Capital Formation by Industry of Destination and of Producers' Equipment by Type, U.S.A., Selected Dates

A. PERCENTAGE DISTRIBUTION OF INCREASE IN REAL ESTATE IMPROVEMENT AND PRODUCERS' EQUIPMENT, WEALTH DATA, 1880–1922

Industry Divisions	Real Estate Improvement			Equipment		
	1880 to 1900 (1)	1900 to 1922 (2)	1880 to 1922 (3)	1880 to 1900 (4)	1900 to 1922 (5)	1880 to 1922 (6)
Agriculture	8.7	10.3	9.6	6.1	3.9	4.9
Mining and manfg.	7.4	19.4	14.6	34.1	58.2	47.6
Public utilities	30.4	21.6	25.2	30.4	26.1	28.0
Other business	10.3	5.7	7.6	21.2	7.0	13.2
Residential	35.2	31.7	33.1	0	0	0
Tax exempt	8.0	11.2	9.9	8.3	4.7	6.3

Derived from absolute data in *National Product since 1869* (NBER, 1946), Table IV-5, Part B, Table IV-6, Part B, pp. 218–19.

B. PERCENTAGE DISTRIBUTION OF PRODUCERS' DURABLE BY TYPE, PRODUCERS' PRICES, 1879–89 AND 1929–39 (SHAW'S DATA)

Group	Percentage Share in Total of Producers' Durable	
	1879+1889 (1)	1929+1939 (2)
Farm equipment	17.7	9.3
Industrial machinery (including tractors)	33.1	38.7
Electrical equipment, industrial and commercial	1.8	15.7
Office and store equipment	6.2	8.6
Locomotives and railroad cars	14.4	4.0
Ships and boats	5.1	3.2
Business vehicles, horse	5.4	–[1]
„ „ motor	0	9.4
Aircraft	0	1.5
Professional and scientific equipment	0.5	1.6
Carpenters' and mechanics' tools	4.0	2.0
Miscellaneous subsidiary durable equipment	11.7	6.2

Derived from W. H. Shaw, *Value of Commodity Output since 1869* (NBER, 1947), Table 3, p. 13.

[1] Negligible, included with farm equipment.

accounts for a relatively small share of the increase in either construction or equipment. The residential category looms large in construction, amounting to a third of the total. The effect of residential housing in total construction is, however, even larger since a fair part of both 'other' and public utility, and even mining and manufacturing construction, is oriented to residential housing – in the sense that an increase in the latter stimulates an increase in construction of shops, consumer serving public utilities, and labor and consumer oriented manufacturing plants. Finally, the tax exempt category, dominated by government, accounts for a small but increasing share of additions to construction; and this trend would continue were we to include the decades after 1922.[1]

The general impression is that the three major channels of fixed capital formation are public utilities, mining and manufacturing, and residential housing; with the public sector rising in importance during the recent decades.

The evidence in Panel A of Table 40 permits us to see somewhat further into the implications of the decline in the share of capital formation in national product. We inferred from Table 39 that it was due to a decline in the relative importance of net additions to construction. It may now be seen that this decline in the weight of net construction must have been accounted for largely by the residential and public utility sectors: they are the two large sectors of the real estate category whose shares in Panel A drop markedly from 1880–1900 to 1900–1922. These declines may have been partly made up by the high levels of construction in the 1920's; but the net result would most probably show that it is residential and public utility construction whose proportions to national product declined between the last quarter of the nineteenth and the first three decades of the twentieth century – to an extent which largely accounts for the decline in the share of capital formation in national income.

The distribution of producers' durable equipment, in gross terms and in current producers' prices, reveals effects of technological changes not unlike those observed in the structure of consumer commodities (Panel B). The rise in the share of electrical devices and equipment, of motor vehicles and aircraft,

[1] It is impossible to segregate net construction and equipment after 1922. The distribution of the increase in the combined total of construction and equipment among industrial categories is shown in *National Income: A Summary of Findings* (NBER, 1946), Table 18, p. 57.

and of professional and scientific equipment is striking: the combined share of these categories rises from 2.3 percent in 1879–89 to 28.2 percent in 1929–39. By contrast, the share of farm equipment (even though it includes tractors), locomotives and railroad cars, ships and boats, and carpenters' and mechanics' tools – older, but still existing, equipment – declines from a combined total of 41.2 percent at the earlier to 18.5 percent at the later date. The rise in the share of office and store equipment reflects the increasing penetration of machinery into office and trade establishments.

4. *Shorter-term changes*

The discussion in the preceding sections dealt with levels and the broader trends of the shares of flow of goods to consumers, capital formation, and their components. It paid little attention to the fluctuations in their rates of growth, or to the relation of changes in capital formation and flow of goods to consumers to those in national product. While a thorough analysis of these swings is impossible here, some selected aspects are considered. We discuss them under three heads: (a) marginal rates of investment or capital formation; (b) fluctuations in the rate of growth of components of capital formation; (c) rates of change in components of flow of goods to consumers in relation to changes in total flow.

(a) *Marginal rates of investment.* The estimates of capital formation are an approximation to the volume of investment and savings in the economy; and those of flow of goods to consumers, to consumption. But the percentage shares, presented in Table 34, measure *average* savings or investment proportions (or average consumption proportions); or, to use a common if somewhat misleading term, the average propensity to save (invest) or to consume.[1] The marginal rates may be quite different, and unlike the average, they may fluctuate violently.

[1] The term is misleading because it suggests an instinctive reaction, a biological drive similar to that, say, of heliotropism of plants. It *may* be that people are possessed of a saving or investing instinct, but it is doubtful that the technical term in its widespread usage among economists refers to such an instinct (which reminds one of Adam Smith's reference to mankind's innate instinct for trading). At any rate, all that actual measurement records is that for the economy at large, or for any subgroup of it, total income changes in a given way and the apportionment of income over the same period also changes (or does not change) in a specific fashion.

Since the rates for investment and consumption are complementary, changes in the former mean opposite changes in the latter. Our discussion can then deal with the former alone without loss in applicability of the conclusions.

How violent changes in the marginal rate of investment implicit in Table 34 are is demonstrated in Table 41 (columns 1 and 5). Here we express *changes* from decade to decade in gross and net capital formation, as percentages of changes in gross and net national product. The calculations are confined to totals in constant prices, on the premise that it is changes in *real* income that determine allocation between consumption and investment, or between expenditures and savings.

In some intervals this calculation cannot be made either because national product declines, or because with national product rising, capital formation declines. The latter situation in itself reveals a type of extreme variation in marginal rate of investment. But even if we disregard these intervals, variations in the rates in columns 1 and 5 are much wider than in columns 4 and 8 of Table 34. Prior to 1924–33 the share of gross capital formation in national product varies from 21 to somewhat over 24; the ratio of *change* in gross capital formation to *change* in gross national product varies from 15 to 34. Likewise, the range of variation in the average rate of net investment (i.e. share of net capital formation in net national product) is, again disregarding recent decades, from 10.6 to 16.3 percent whereas the marginal rate ranges from 4 to 23 percent.

This contrast increases when we measure changes in per capita national product and capital formation, calculate the marginal rates of investment on that basis (columns 2 and 6 of Table 41), and compare them with the average rates in Table 34 (which are unaffected by conversion to a per capita basis). The rationale for this step is that national product is largely a sum of incomes of individuals, and it is presumably a single individual's income, related to number of dependents, that determines allocation between expenditures and savings, or consumption and investment. In that sense the marginal rate of investment should be calculated for changes in *per capita* income and investment, not for changes in totals.

Conversion to a per capita basis accentuates the violence of fluctuations (compare column 2 with column 1, and column 6 with column 5). For the rate relating to gross capital formation,

TABLE 41

Change in Capital Formation as Proportion of Change in National Product, Total and Per Capita; and Percentage Change in Categories of National Product by Type of Use, based on Values in 1929 *Prices, U.S.A.*, 1869-1948

No.	Interval	Change in G.C.F. as Pct. of Change in G.N.P.		Pct. Change per Decade in G.N.P.		Change in N.C.F. as Pct. of Change in N.N.P.		Pct. Change per Decade in N.N.P.		Percent Change per Decade		
		Totals	Per Capita	Total	Per Capita	Totals	Per Capita	Total	Per Capita	Flow of Goods to Consumer	G.C.F.	N.C.F.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	1869–78 to 1874–83	21	19	43	28	16	17	46	30	45	41	52
2	1874–83 to 1879–88	20	20	31	16	14	13	31	16	31	28	28
3	1879–88 to 1884–93	34	55	19	6	23	35	17	5	16	29	27
4	1884–93 to 1889–98	30	42	16	5	20	27	15	4	15	20	19
5	1889–98 to 1894–03	21	17	24	13	13	12	24	13	25	21	19
6	1894–03 to 1899–08	15	8	24	13	7	0	25	14	27	15	10
7	1899–08 to 1904–13	18	15	20	9	7	–	20	8	21	16	9
8	1904–13 to 1909–18	26	36	13	4	11	13	12	3	12	16	11
9	1909–18 to 1914–23	19	16	15	7	4	–	14	6	15	13	5
10	1914–23 to 1919–28	16	13	21	12	6	3	21	12	22	16	11
11	1919–28 to 1924–33	–	–	6	−0	–	–	6	−1	11	−12	−37
12	1924–33 to 1929–38	–	–	−1	−6	–	–	−2	−6	3	−23	−74
13	1929–38 to 1934–43	41	47	21	17	35	42	22	17	15	66	461
14	1934–43 to 1939–48	34	38	29	23	9	9	24	18	24	56	28

Derived from Table 33. The per capita figures are by division by population data given in Table 4, col. 1.
Dash indicates either that national product is declining or, if national product is rising, that capital formation is declining.

or gross investment, the range on a per capita basis is from 8 to 55, whereas that on a total basis is from 15 to 34. In the case of net capital formation, reduction to a per capita basis yields the interesting result that in three intervals (all preceding the recent decades) net national product per capita increases whereas net capital formation or net savings per capita either decreases (two intervals) or is unchanged (one interval); and even if we disregard these three intervals, the range (again excluding decades after 1919–28) is from 3 to 35, compared with one from 4 to 23 on a total basis. It follows that the marginal rate of investment, on a per capita basis, fluctuates far more violently than the average rate of investment, either gross or net, shown in Table 34.[1]

What factors have determined the marked changes in the marginal rate of investment per capita? This question can hardly be answered here, but we do test one plausible hypothesis – that the larger the relative increase in income, the greater the proportion of the additional income devoted to investment (i.e. the greater the marginal rate of investment). For this purpose percentage changes in total and per capita gross and net national product are shown in Table 41 (columns 3–4 and 7–8).

If we again disregard the gyrations of the entries after 1919–28 the result seems to be the opposite of that indicated in the hypothesis. The marginal rates of gross and net investment per capita are at peak in lines 3 and 8; but the percentage rise in gross or net national product per capita is at the *trough* of its long cycle in lines 3 to 4 and 8. The marginal rate of investment per capita is at trough in lines 1 or 2 (tentative), 6, and 9 or 10; the percentage change in national product per capita is at peak in lines 1 (tentative), 6 and 10. This suggests that changes in flow of goods to consumers are the factor initiating changes in national product; and that when, for one reason or another, flow of goods per capita surges upward, a smaller share of the

[1] The analysis in terms of current prices, on the assumption that individuals are guided by changes in incomes without allowance for changes in purchasing power, would show about as great a contrast between the variability of the marginal rates of investment per capita and the comparative stability of the average rates. One should also note that the range of variations in the marginal rate would be reduced if we extended the interval over which changes are taken: e.g. for an interval of a full decade rather than a quinquennium (used now in Table 41), the entries in columns 1–2 and 5–6 would be weighted means for each successive pair of present entries. It follows that for a shorter period, say a year, variations in the marginal rate of investment may be even wider than those shown in Table 41.

increase in national product is left for increase in capital formation. The latter then is in a sense a residual rather than a strategic element. It is also possible, although there are no data upon which to base conjectures, that large increases in national income and flow of goods to consumers are accompanied by shifts in the distribution of income by size that tend to reduce the countrywide savings-income ratio; and that small (but not negative) changes in income and flow of consumer goods per capita have the opposite effect.

The last three columns of Table 41 illustrate differently the source of large variations in the marginal rate of investment – the differences in rate of change per decade between capital formation and either flow of goods to consumers or national product. As already noted, rates of change in both national product and flow of consumer goods, either total or per capita, reveal three long swings (with peaks in lines 1, 6, and 10, and troughs in lines 3 to 4, 8, and 12). In capital formation, by contrast, there seems to be a fairly steady decline in the percentage rates of growth from line 1 (the earliest interval) to line 6 or 7 (the 1890's), a rise to line 8, another decline to line 9: and only beginning with line 10 is there fair similarity in the movement of the rates of change of capital formation and national product (or of flow of goods to consumers). Prior to the 1920's different factors seem to have determined the courses of capital formation and flow of goods to consumers. Some light is shed on them when we examine fluctuations in the rate of growth of the components of capital formation.

(b) *Fluctuations in rates of change of components of capital formation.* The rates of change from decade to decade for the three components of capital formation are given in Table 42, in a comparison limited to gross components in 1929 prices; the results for net components and for current price totals would be about the same.

The variations in the rate of change in gross construction are quite different from those in total national product, flow of goods to consumers, or the several components of the latter (column 1). The peak rate in gross construction, in the first of the three observed swings, is reached in the interval in line 3, not in line 1. The following trough is reached in line 5, not in line 4 as is the case with gross national product and flow of goods to consumers. Another peak follows in line 7; the peak

of the second swing in total product or in flow of consumer goods is in line 6. The next trough in construction is in line 9, whereas the trough in the rate of change in national product is in line 8. The later turning points in gross construction and in national product are fairly coincident; and the significant differences are thus confined primarily to the decades in the nineteenth century.

The different timing of the long swings in the rate of change in construction may possibly be the effect of war. The delay in the peak to the interval of 1879–88 to 1884–93 may well have been due to difficulties in expanding construction in the 1870's with the greater post Civil War pressure to raise the flow of consumer goods and producers' equipment. The trough in line 9, not apparent elsewhere, may be associated with the effects of inflation and restrictions incident to World War I. On the other hand, the swings in gross construction coincide with those in the growth of total population, an association to be expected because of the large weight and ramifying effects of residential housing in the total construction component. The turning points in construction are either coincident with or lag by a half decade behind those in total population (columns 1 and 2). The only significant exception is in line 13, where a rise in the rate of change in construction precedes that in population, and it is due to the effect of war construction which loomed large compared with either 1929–38 or 1944–48.

The swings in rate of change of producers' durable equipment (column 3) and of changes in inventories and in foreign claims (column 4) show much greater similarity to swings in rate of change of total national product or flow of goods to consumers. The results for column 4 are, to a large extent, predetermined by the estimating procedure: changes in inventories are the dominant subgroup here, and they were estimated as a function of changes in commodity flow (i.e. flow of consumer commodities, producers' durable equipment, and construction materials). Commodity flow is in turn quite similar to the flow of goods to consumers and is the dominating element in national product. Only in the decades of World War I (1909–18 and 1914–23), when changes in claims against foreign countries were large compared with inventory change, does the movement in column 4 differ from that in column 5.

This qualification does not apply to the estimates of pro-

TABLE 42

Percentage Change per Decade, Components of Capital Formation, 1929 Prices, U.S.A., 1869-1948

Number	Interval	Gross Construction (1)	Population (2)	Gross Producers' Durable (3)	Inventory and Foreign Claims (4)	Gross National Product (5)
1	1869–78 to 1874–83	28.3	12.2	57.0	69.2	43.3
2	1874–83 to 1879–88	39.5	12.5	36.6	−19.8	30.9
3	1879–88 to 1884–93	46.4	11.5	20.4	−46.4	18.5
4	1884–93 to 1889–98	19.6	10.5	15.0	56.2	16.0
5	1889–98 to 1894–03	6.4	9.5	28.2	155.4	23.9
6	1894–03 to 1899–08	17.1	9.9	41.5	−40.6	24.4
7	1899–08 to 1904–13	17.5	10.2	21.9	−19.0	20.1
8	1904–13 to 1909–18	−3.8	8.9	23.4	246.2	13.3
9	1909–18 to 1914–23	−7.5	7.5	20.3	73.6	14.6
10	1914–23 to 1919–28	35.9	7.6	17.3	−26.1	20.8
11	1919–28 to 1924–33	2.3	6.8	−2.6	−86.9	6.4
12	1924–33 to 1929–38	−31.8	4.5	−10.5	12.4	−1.3
13	1929–38 to 1934–43	11.6	3.8	94.8	578.0	21.4
14	1934–43 to 1939–48	10.2	5.4	87.2	55.8	29.4

Cols. 1, 3, 4: Calculated from absolute totals underlying Table 38, Panel A, cols. 4–6.
Col. 2: From Table 4, col. 2.
Col. 3: From Table 40, col. 3.

ducers' durable equipment, which are independent. The similarity in timing of the swings in its rate of change to those in gross national product thus reflects the effects of movements in the rate of increase in total volume of production on the rate of increase in gross flow of equipment relevant to production. The turning points in columns 3 and 5 are quite similar with two significant but easily explicable exceptions. These, in lines 8–9 and 13–14, are obviously due to the effect of wars on the flow of producers' durable equipment, an effect which tends to swell the latter by emergency war needs quite disproportionately to changes called for in demand for capital goods by movements in the national product.

Table 42 shows that variations in the share of capital formation in national product, the swings observed in this share and in marginal rate of investment, and the differences in timing of the swings in the rate of change in capital formation and in national product (or flow of goods to consumers), are due

almost exclusively to the behavior of the *construction* component of capital formation. The latter displays swings that either coincide or follow, with brief lags, the swings in rate of change in total population. It may be recalled now that in Part II we observed that swings in the rate of change in total population coincided with, or often lagged by one or a half decade behind, the swings in the rate of change in flow of goods to consumers, total or per capita. We thus get the semblance of a sequence by which swings in the rate of change in flow of goods per capita induce, with some lags, swings in the rate of change in total population, and the latter induce, either coincidentally or with some lag, swings in the rate of change in construction (gross or net). The swings in construction are thus removed by one or one and a half decades from those in flow of goods to consumers, total and per capita, and while in essence connected with the latter, display a sufficiently different timing to produce marked variations in the shares of construction and capital formation in total national product. However, this sequence is somewhat condensed in recent decades, and because of war and reduction of the lags involved, the differences in timing between the swings in rate of change of construction (and hence capital formation) and national product are less clear cut than they were in the nineteenth century.

(c) *Rates of change in components of flow of goods to consumers.* Two aspects of the shorter-term changes in the components of flow of goods to consumer are examined here. One is the way changes in the flow of different components respond when total flow, i.e. total expenditures, change; the other relates to the swings that are found in the rate of change in the total flow of goods to consumers, and those in the rate of change of the several components. The results of simple calculations relating to the two points are brought together in Table 43.

The total flow of goods to consumers is roughly total consumer expenditures, differing from the latter only by the inclusion of direct taxes – a relatively minor element through most of the decades. What happens when per capita expenditures increase; how much goes to increased purchases of perishable commodities, how much to semidurable commodities, and so on? The answer to this question, in terms of the four major components by durability, and based on per capita figures in 1929 prices, is provided in columns 1–4.

TABLE 43

Changes in Components of Flow of Goods to Consumers as Shares of Changes in Total Flow, and Percent Change in Volume per Decade, U.S.A., 1869-1948

(All calculations based on per capita values in 1929 prices)

No.	Interval	Percentage Share of Change in Component in Change in Total Flow of Goods to Consumers (Per capita)				Percentage Change per Decade (Per capita)				
		Perishable (1)	Semi-durable (2)	Durable (3)	Services (4)	Total Flow of Goods to Consumers (5)	Perishable (6)	Semi-durable (7)	Durable (8)	Services (9)
1	1869–78 to 1874–83	52	15	8	25	29	34	22	25	24
2	1874–83 to 1879–88	47	16	13	24	16	17	14	25	13
3	1879–88 to 1884–93	17	25	33	25	4	2	6	16	4
4	1884–93 to 1889–98	60	10	0	30	4	5	2	0	4
5	1889–98 to 1894–03	45	14	7	34	14	15	11	10	18
6	1894–03 to 1899–08	38	15	6	42	16	13	13	9	22
7	1899–08 to 1904–13	30	12	8	50	10	7	7	9	17
8	1904–13 to 1909–18	29	14	7	50	3	2	3	3	5
9	1909–18 to 1914–23	22	0	16	62	7	4	0	13	14
10	1914–23 to 1919–28	25	9	22	45	13	8	8	32	17
11	1919–28 to 1924–33	32	18	0	50	4	3	5	0	6
12	1924–33 to 1929–38	–	–	–	–	−1	6	−7	−17	−2
13	1929–38 to 1934–43	83		5	12	10	15		6	3
14	1934–43 to 1939–48	62		8	30	17	18		18	15

Derived from absolute totals underlying Table 37, Panel B. Col. 5 from Table 5, col. 5.

The marginal rate of response is, of course, much more variable than the average rate represented by the percentage shares in columns 1–4, Panel B of Table 37. Whereas the average share of perishable commodities, excluding the disturbed decades after 1919–28, varied from 39 to 45 percent, the share of the increase in flow of perishable commodities per capita in the increase in total flow of goods per capita varies from 22 to 60 percent. And there are similar contrasts between the average shares in Table 37 and marginal shares in Table 43 for the other three categories in total flow of goods to consumers.

Offhand, one would assume that the larger the relative increase in total expenditures per capita, the smaller the shares in this increase of additions to perishable and perhaps semidurable commodities (compared with the customary level of their marginal shares) and the larger the marginal shares of the consumer durable and service components. In other words, in comparing entries in columns 1–4 with those in column 5, we would expect that upward movements in column 5 would be accompanied by downward movements in column 1 and perhaps in column 2 and upward movements in columns 3 and 4.

For the intervals 8–11 there *is* a negative association between changes in column 5 and those in columns 1 (perishable) and 2 (semidurable); and a positive association with column 3 (durable), but not with column 4 (services). Prior to the second decade of the current century the association is, if anything, quite the opposite from that expected. The marginal rate for perishable commodities drops to a trough in line 3, and so does the rate of change in total flow of consumer goods per capita; both rise to a peak in line 4 or 6; and even the next trough is in line 8 in column 5 and in line 9 in column 1. In contrast with this unexpected *positive* association of changes in the marginal rate for perishable commodities with the rate of increase in total flow per capita, a distinctly negative association emerges between the marginal rate for durable commodities and the rate of change in total flow of goods per capita (see columns 3 and 5, lines 1 through 7).

It is possible that the series in columns 1–4, at least as far as variations from decade to decade are concerned, have no great significance: absolute changes in per capita flow of goods to consumers are fairly small, and those in the per capita of the several components are even smaller, so that percentage shares

of the former to the latter are erratic. Even more important is the fact that each component, as already indicated, is a fairly mixed one, and cannot easily be identified with a separate functional category whose differential response to increase in per capita expenditures can be safely diagnosed by a prior hypothesis. Nevertheless, one cannot help but feel that the associations indicated are not completely or largely within the bounds of possible errors of estimates and that the four components, while crude, do reflect different levels of indispensability and responsiveness to increases in expenditures. If so, the results for the first eight intervals, which contradict so flatly expectations inferred from the hypothesis, present a puzzle that suggests need for further analysis.

A glance at columns 6–9 indicates that variations in the marginal rates in columns 1–4 are due to differences in *amplitude* of the swings in rate of change per decade in the four components, but not in the *timing* of these swings. Indeed, for each component, the rate of change per decade shows the same three swings that are observed in the decade rate of change in total flow of goods to consumers, as well as in total national product. In all four components the rate of increase is at peak in lines 1 (tentative), 6 (or 5 for perishable and durable), 10, and 14 (tentative); and at trough in lines 4 (or 3 for perishable), 8 (or 9 for semidurable) and 12 (or 11 for perishable).

Some of this similarity in timing may be due to procedural devices. For example, the crude estimation of the service component might well have produced a movement similar to movements in the commodity components. But procedure alone could not have introduced such similarity in the movements of the three commodity components, each based on detailed production data. Nor can conversion to a per capita basis be the reason: the swings are shown also by totals of commodity flow. At least as far as the present estimates go, there is a clear and significant suggestion of these three swings in the rate of increase – with timing that is quite similar for the four components of flow of goods to consumers.

The reasons for these swings are a matter of conjecture. So far as the experience of the recent decades is concerned, i.e. with a peak in line 10, trough in line 12, and another rise to the last interval, sufficient analysis and knowledge have been accumulated to provide a variety of explanations, and it would be easy

to demonstrate why this swing should have affected all the major components of flow of goods to consumers. Furthermore, explanation is facilitated by the agreement between changes in the marginal rates in columns 1–4 with the change in the rate of increase in flow of all consumer goods per capita in column 5. But I have no easy explanation of the factors that made for the swings in the rate of change prior to the 1920's. The high rates of increase in the early decades are plausible and perhaps explained by the drive for reconstruction after the Civil War. But the reasons for the sharp decline of these rates to line 3, and the subsequent swing, are still to be sought for.

VII. FLOWS ACROSS BOUNDARIES

The present part deals with flows of men, capital, and goods (commodities and services) across boundaries. Since the customary measures of such flows leave us with an inadequate impression of the role in the country's economic growth of its position in the concert of nations, we conclude with some general comments on this point.

1. *The migration of men*

The movements which are most important here are those involved in a relatively permanent shift of residence, resulting in long-term addition to or withdrawal from the country's economically active population. Hence we are not concerned with tourists or visitors, but with the flows ordinarily designated 'immigration' and 'emigration'.

Through most of the period under review, migration in and out of the United States was relatively unrestricted; and the flows were quite substantial in both directions. Data on emigration are scanty prior to 1907, and it would take us too far afield to attempt to cover both the in- and outflow of migrants. For the present purpose it seems adequate to confine attention to the net result of the process, as it affected the resident population of the country. Since the flows across boundaries affected the native-born population of the United States but little, the net result of migration can be observed by gauging the relative importance of the foreign born in total population (Table 44).

The proportion of foreign born to total population stayed from 1870 to 1910, with minor fluctuations, at about one-

TABLE 44

The Proportion of Foreign Born in Total Population and in the Labor Force, U.S.A., 1870-1940

(Population in millions)

Year	Total Population (1)	Foreign Born (2)	Total Gainfully Occupied or Labor Force (3)	Foreign-born Workers[1] (4)	Percentage (2) to (1) (5)	Percentage (4) to (3) (6)	Percentage (4) to (2) (7)
1870	38.56	5.57	12.51	2.70	14.4	21.6	48.5
1880	50.16	6.68	17.39	3.49	13.3	20.1	52.2
1890	62.62	9.25	22.74	5.10	14.8	22.4	55.1
1900	75.99	10.34	29.07	5.74	13.6	19.7	55.5
1910	91.97	13.52	37.37	7.81	14.7	20.9	57.8
1920	105.71	13.92	42.43	7.75	13.2	18.3	55.7
1930	122.78	14.20	48.83	7.41	11.6	15.2	52.2
1940	131.67	11.59	52.79	5.80	8.8	11.0	50.0

[1] For 1890–1940, foreign-born white only.

Cols. 1, 2, 5: *Historical Statistics of the United States* (Washington, 1949), Series B 182, 193, 194, p. 30.
Cols. 3 and 4: Successive censuses.

seventh – indicating that net immigration and mortality kept the growth of foreign born more or less at the same rate at which the native-born population grew. The break came after 1910: World War I sharply reduced the flow of immigrants, and immediately after the war legislative and administrative measures, growing progressively more restrictive, reduced immigration to the United States to a minor fraction of what it had been in the decades preceding World War I. As a result, reduction of foreign born in the United States, primarily by mortality and only in small part by emigration, was not compensated by adequate immigration; and the share of foreign-born population in the total declined to 9 percent by 1940 and should show a substantial further shrinkage in the 1950 Census data.

Because the immigrants were predominantly males, because by far the preponderant proportion of them (over 80 percent) were over 14 or 15 and in the prime working ages, and because their participation in the labor force tended to be higher than that of the native population even for the same age and sex classes, the share of foreign born among the gainfully occupied was, throughout the period, markedly greater than their share

in total population. Prior to 1910 the foreign born accounted on the average for somewhat over a fifth of the country's gainfully occupied, compared with only a seventh of total population. Even in 1940 the foreign born accounted for a ninth of the labor force, and only an eleventh of total population.

All the characteristics of immigrants (and emigrants) into the United States prior to the 1930's – their responsiveness to short-term economic changes in the United States (the preponderance of the 'pull' over the 'push'), their sex and age characteristics, and their high labor force participation ratios – clearly indicate that this inflow of people was an economic response, an adjustment of population to this country's needs for it. Considering the magnitude and duration of this movement, it is difficult to exaggerate its importance as a factor in the economic growth of the United States. Since immigration brought in a large labor force the cost of whose rearing and training was borne elsewhere, it clearly represented an enormous capital investment that dwarfed any capital inflows of the more orthodox type – a conclusion that stands with any reasonable estimate we can make of the money value of labor.[1]

While the over-all volume of immigration responded to the short-, and sometimes, longer-, term economic changes in this country – rather than to the push in the countries of origin – distinguishing the latter reveals that the 'push' exercised considerable influence on the *secular* changes in origin of American immigration. The shift from Great Britain and Ireland to Germany and the Scandinavian countries, and then to Italy and Eastern Europe, follows the trail of the industrial revolution in Europe. It at least suggests that immigration into the United States (and, at a far second remove, into other countries in the Western Hemisphere) provided a welcome alternative to population groups displaced by revolutionary changes in agriculture and industry; and thus facilitated in no small measure the course of industrialization in the European countries. This migration may thus be viewed as an adjustment of population to resources that affected a substantial part of the world, that in its magnitude and the extent to which it could adapt itself to purely economic needs has few parallels in history. Indeed, it is matched only by the vast and free *internal* migration that occurred in

[1] See the calculation by Agostino de Vita supplementing the article by Corrado Gini in *Weltwirschaftliches Archiv*, July 1940, Vol. 52, pp. 31–35.

the process of economic growth of such larger land-mass units as the United States and Russia.

This inflow of people may have been an even greater factor in the economic growth of the United States than is suggested by the percentages in Table 44. Many of the native born of this country at any given time are children of foreign born; and if no immigration had taken place, this country would have been deprived not only of the foreign born surviving at the time of record but also of the native-born children of immigrants.

Partly as a matter of curiosity we calculated the population and labor force of the United States on the assumption that, starting in 1870, all foreign born are omitted, and net immigration is reduced to zero: (i) for the Census decade 1870–80 the total net increase in native born was expressed as a ratio to the total population, including the foreign born in 1870; (ii) this ratio was applied to native born in 1870 to yield an estimated net addition attributable to the native born alone; (iii) the addition of the result under (ii) to the native born of 1870 yielded a new figure for native born of 1880; (iv) for the decade 1880–90 we again applied the ratio of total increase in native born to total population (including foreign born in 1880) to the native born of 1880 secured in step (iii) above, and calculated the increase in 1880–90 attributable to the native born of 1880 (not actual but derived in step (iii) on the basis of our assumption); and added this increase to the native born in step (iii), to yield an estimate of native born in 1890. A repetition of the procedure for each Census decade gives us the figures in Table 45, column 2, with which the actually reported native born can be compared.

The effect of omitting the foreign born beginning with 1870 as progenitors of native born reduces the latter to somewhat over 100 million in 1940, compared with an actual figure of 120 million. With no immigration the total population of the United States would have been not 132 but 102 million in 1940, or almost a quarter less.

Many American demographers have argued that less or no immigration might have slowed down, if not prevented, the decline in the birth rate and rate of natural increase of the native population. But this argument reduces itself largely to saying that, with no immigration, the economic rise of the native groups with the attendant industrialization and decline in the

birth rate would not have been as great – which is but another way of attributing a large positive economic weight to the immigration stream. Since the procedure used here exaggerates the hypothetical additions to the native-born population by ascribing to the native born a rate of natural increase for total population, including the foreign born who because of their age structure and family rearing propensities tend to have a higher rate of natural increase than the native born, the purely demographic effects of omitting immigration and foreign born are probably not significantly exaggerated in column 2 of Table 45.

A similar calculation was made for the labor force, except that the changes were measured over a two-decade rather than one-decade span, since it is more reasonable to assume that a labor force is produced in twenty rather than ten years. Here again, by attributing to the native-born population the propensities of total population including foreign born, we may have exaggerated the hypothetical rate of increase of the native-born labor force – and even more than in the case of total

TABLE 45

Effects of Exclusion of Foreign Born on Total and Working Population, and Shares of Changes in Foreign Born in Changes in Total Population, U.S.A., 1870-1940

Year	Population (millions)		Gainfully Occupied (millions)		Pct. Proportion of:	
	Total Native Born	Same, assuming no Foreign Born in 1870 or later	Total Native Born	Same, assuming no Foreign Born in 1870 or later	Change in Foreign Born Pop. to Change in Total	Change in Foreign Born Workers to Change in Total
	(1)	(2)	(3)	(4)	(5)	(6)
1870	32.99	32.99	9.81	9.81		
1880	43.48	41.96	13.90		9.6	16.2
1890	53.37	50.23	17.64	15.95	20.6	30.1
1900	65.65	60.08	23.33	21.43	8.2	10.1
1910	78.46	70.17	29.56	24.31	19.9	24.9
1920	91.79	80.34	34.68	29.79	2.9	−1.2
1930	108.57	93.12	41.42	32.03	1.6	−5.3
1940	120.07	101.87	46.99	38.43	−29.4	−40.7

Cols. 1, 3, 5, and 6: Derived from Table 44.
Cols. 2, 4: Calculated from Table 44 by method described in text.

population because of the greater weight of foreign born in the labor force. Be that as it may, we arrive at a labor force of about 38.5 million in 1940, compared with the actual native-born labor force of 47 million, and the total labor force of almost 53 million.

Whatever specific criticism can be made of the calculations for columns 2 and 4, the conclusion suggested by them can scarcely be contended: without immigration between 1870 and 1930 the country's total population would have been not much greater than three-quarters and its labor force about seven-tenths of what they actually were in 1940. Nor is it likely that, with such substantially different magnitudes of population and labor force, the economic growth of the country would have displayed the rate and structure that it actually did. The sheer difference in magnitudes, and particularly in the ratio of the labor force to total population (e.g. by 1940 the country would have had a labor force equal to its 1910 number of workers but a total population close to that in 1920), would have produced substantial changes in the structure of production and consumption.

The decline since 1910 in the contribution of immigration to the increase of the country's population and labor force has already been noted. But even before 1910 this contribution varied. Fluctuations in the shares of changes in the foreign born in the changes in total or in working population reflect this variation (columns 5 and 6). The shares are low in 1870–80; rise markedly in 1880–90; decline in 1890–1900; and rise again in 1900–10. Obviously, the processes whose net results are reflected in the successive totals of foreign born in this country were characterized by swings that must have differed from those in the native population, with respect to timing, amplitude, or both.

The explanation of these swings, as well as of the earlier emergence of negative entries for the labor force than in population in Table 45, columns 5 and 6, is provided by Table 46. We take gross immigration, an easily available series, as an index that adequately reflects swings in the rate of *net* immigration, since for the years when the latter can be calculated (i.e. when emigration data are available) the swings in it reproduce, with considerably wider amplitude, those in gross immigration. Variations in the last two columns of Table 45 are associated

TABLE 46

Rate of Change per Decade in Gross Immigration and in Proportion of Males in the Latter, U.S.A., 1869-1948

(Annual averages for overlapping decades)

Number	Decade	Average Annual Gross Immigration (thousands) (1)	Pct. Change per Decade in (1) (2)	Pct. Change per Decade, Total Pop. (3)	Pct. Change per Decade, Flow of Goods to Consumers Per Capita (4)	Pct. of Gross Immigration, Male (5)	Change in (5) (6)
1	1869–78	292				61.5	
2	1874–83	369	26.4	12.2	29.2	62.6	1.1
3	1879–88	498	35.0	12.5	16.3	61.3	−1.3
4	1884–93	476	−4.4	11.5	3.6	61.3	0
5	1889–98	383	−19.5	10.5	4.2	60.7	−0.6
6	1894–03	410	7.0	9.5	14.3	63.8	3.1
7	1899–08	776	89.3	9.9	15.7	68.7	4.9
8	1904–13	972	25.3	10.2	10.1	68.0	−0.7
9	1909–18	696	−28.4	8.9	3.2	63.4	−4.6
10	1914–23	446	−35.9	7.5	6.9	57.8	−5.6
11	1919–28	416	−6.7	7.6	13.5	56.3	−1.5
12	1924–33	262	−37.0	6.8	4.0	50.3	−6.0
13	1929–38	90	−65.6	4.5	−1.2	42.9	−7.4
14	1934–43	48	−46.7	3.8	10.3	43.2	0.3
15	1939–48	75	56.2	5.4	17.4	39.9	−3.3

Col. 1: Fiscal years, ending 30th June, *Historical Statistics of the United States*, Series B-304, pp. 33-34. For recent years from the Immigration and Naturalization Service records.
Col. 3: Derived from Table 4, col. 1.
Col. 4: Derived from Table 5, col. 5.
Col. 5: *Historical Statistics*, Series B-332, p. 37 (fiscal years ending 30th June). For recent years from the Immigration and Naturalization Service records.

with larger than usual gross immigration in 1879–88, smaller than usual in 1889–98, and again a much augmented volume in 1899–1908. In other words, the long swings in the contribution of changes in foreign born to changes in total population or labor force are clearly due to long swings in the rate of gross (and presumably net) immigration.

The rate of change per decade reveals these swings quite clearly (column 2); and the sequence suggested in our earlier discussion is pointed up (columns 3 and 4). Disregarding the

decades after 1909–18 as affected by legislation, we find the variations in the rate of change in gross immigration to be similar in timing, but of much wider amplitude, than the swings in rate of change in total population – suggesting quite strongly that the latter are, either synchronously or with a short lag, reflections of the former. But what is most interesting here is the relation between the fluctuations in the rate of change of flow of goods to consumers per capita and those in gross immigration. The two are quite similar, but the former precede the latter: the first peak in column 4 is in line 2, in column 2 in line 3; the first trough is in lines 4 and 5 respectively; the next peak in line 7 in both; the next trough in lines 9 and 10. Fluctuations in consumer goods (and the identically timed swings in net product) per capita seem to produce, with some lag, a pull on immigration, and are then reflected in swings in rates of growth in total population. It has already been suggested that the latter initiate, either synchronously or with a short lag, swings in the rate of change in residential and related construction; and therefore in total construction – with effects on the distribution of national product between consumer goods and capital formation. This sequence is here tied to the flow of migrants across the country's boundaries.[1]

The ratio of males in total gross immigration (column 5) indicates the extent to which inflow of people was truly an economic response; and explains why the contribution of immigration to gainfully occupied began to fall off before its contribution to total population. Except in the interval from 1934–43 to 1939–48 affected by the war, whenever the rate of

[1] This factor has possible bearing upon analysis of business cycles in recent decades. The severity of the depression of the 1930's was due in part to the coincidence of the shorter business cycle with the contraction phase of the longer cycle in residential and related construction. Such coincidence might have been minimized in the nineteenth and early twentieth century in this country by the sequence suggested in the text, in which fluctuations in the rate of growth of national product and flow of consumer goods produced, with a *substantial lag*, swings in the rate of change of residential and related construction. Because of the lag, the upward phase of the construction swing may have coincided, at least in part, with the downward phase of the swing in the flow of consumer goods per capita; and vice versa. The reduction or elimination of the lag in recent decades, because of war, the reduction in migration, and possibly greater over-all capacity, may have increased the chances of coincidence between the longer swings in residential and related construction and those in the rate of change in the rest of the economy. A similar coincidence might possibly have developed after World War II if not for the emergency and cold war mobilization pressures of 1950–51. This, of course, does not mean that a protracted depression of the 1930 type was in any sense inevitable, since other factors that permitted it were no longer present in recent years.

change in gross immigration rose, the proportion of males tended to rise – with some lead in the former over the latter (columns 5 and 6). Thus the peaks and troughs in column 6 tend to coincide with or lead by half a decade the peaks and troughs in column 2, an observation true even of most decades affected by war and restrictive legislation. Since the male immigrants had by far the highest rate of participation in the labor force, this movement of the proportion of males is further support of the view that fluctuations in the rate of immigration were an economic response to varying opportunities for work in this country.

The proportion of males declined drastically after the 1904-13 decade, since World War I and then restrictive legislation reduced the volume of immigration to a trickle. War, in general, impedes the movement of males more than that of females; and the restrictive legislation of this country, with its emphasis on family ties between already established residents and would-be migrants, also favored an easier movement of females. For this reason migration started at an earlier date to contribute less to the labor force than to total population. Finally, the drastic change in the sex ratio indicates an equally drastic change in the economic nature of immigration: instead of being a free and effective response to economic opportunities in this country, it has been transformed largely into a relief and personal adjustment process – which, however important for specific groups and individuals, cannot, in the nature of the case, approach the economic significance of the earlier process of free migration across boundaries.

2. *The movement of capital*

The estimates of the international investment position of the United States, for selected dates through the period under discussion, although they omit war debts of the allies of the U.S. in World War I, are relatively complete; and despite their approximate character indicate the order of magnitudes (Table 47).

The capital volumes involved are strikingly small. At the beginning of the period, total foreign investment in this country amounted to only $1.5 billion and the *gross* volume never exceeded (prior to recent inflated currency years) $8 billion. Since total *reproducible* capital of the country, even excluding

inventories, was close to $15 billion in 1880, $40 billion in 1900, and about $130 billion in 1912, gross foreign investments must never have exceeded a few percent of the country's total wealth; and the *net* investment even less than that. And what is true of the gross or net debit balance is equally true of the gross or net credit balance. Ever since the United States became a creditor country its investments abroad have amounted to only a minute fraction of its total wealth.

TABLE 47

International Investment Position of the United States, Selected Years, 1869-1945

(Billions of dollars)

Year	Foreign Investments in U.S.			U.S. Investments Abroad			Net Position
	Direct	Short Term and Portfolio	Total	Direct	Short Term and Portfolio	Total	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1869	n.a.	n.a.	1.54	n.a.	n.a.	0.08	−1.46
1897	n.a.	n.a.	3.4	0.64	0.05	0.69	−2.71
1908	n.a.	n.a.	6.4	1.6	0.9	2.5	−3.9
1914 (June 30)	1.3	5.9	7.2	2.6	0.9	3.5	−3.7
1919	0.9	2.4	3.3	3.9	3.1	7.0	+3.7
1924	1.0	2.9	3.9	5.4	5.5	10.9	+7.0
1930	1.4[1]	7.0[1]	8.4	8.0	9.2	17.2	+8.8
1935	1.6	4.8	6.4	7.8	5.7	13.5	+7.1
1940	2.9	10.6	13.6	7.3	5.0	12.3	−1.3
1945	2.7	15.0	17.7	8.1	8.7	16.8	−0.9

[1] Long-term investments for 1929.

Historical Statistics of the United States, Series M 1–13, p. 242. The data are for the end of the year, unless otherwise indicated.

The disturbed conditions of the world since World War I, with their discouraging effect on flow of capital abroad, might explain the latter phenomenon. But no such explanation applies to the meager relative volume of foreign capital in the United States prior to World War I. The factors involved were suggested in an earlier discussion, from which I quote:

> Since a rapidly developing country provides such splendid opportunities for capital investments, it may at first appear surprising that investment funds did not flow into the United States in much greater volume during the century preceding World War I. But it must be remembered that prior to the recent era of direct investments . . . credits in a foreign country could be accumulated only by importing commodities or services without a *quid pro quo* in commodities or services received. This meant that a borrower country could build up a foreign debt only by a consistently unfavorable balance in commodity trade, or in the flow of services, or in both. Prior to the 1870's, the United States did have a fairly consistent unfavorable trade balance. . . . But even this excess was relatively small, and the possession of a merchant marine capable of active participation in international trade served to keep down the unfavorable balance on the service account. During this period also, European countries imported a great deal of capital, and provided competition to the United States as an international borrower. After the Civil War the vigorous growth of production in the United States, combined with the protective system, resulted in a consistently favorable balance of commodity trade, and under these conditions accumulation of a debt balance on the international account could come only from either the service account or from direct investments. The former is naturally a limited source of international indebtedness because of the small ratio of international services to the total product of any country of fair size; and the latter was inhibited by the distance between the would-be direct investor (in the European creditor countries) and the United States, as well as by the fact that funds available for direct investment at that time were only a limited proportion of all funds available for placement in the international investment market.[1]

To these suggestions a general comment may be added on the relative size of the United States and the potential creditor countries. Considering their identity through the second half of the nineteenth and the first decade of the twentieth centuries, and foreign markets other than in the United States for capital investment, it is obvious that a large proportion of the capital investments of the United States could not have been financed by foreign funds. The population of the main creditor countries, Holland, England, France, and somewhat later Germany, did not greatly exceed that of the United States through most of

[1] See my paper, 'Foreign Economic Relations of the United States', *Proceedings of the American Philosophical Society*, Vol. 92 (1948), pp. 232–33. Many points discussed in the present part are dealt with at greater length there.

the period (in 1880 it was about twice); and their combined national product was probably a smaller ratio to that of this country than was population. Unless there was a 'flight' of capital from these European areas to this country, or unless all other foreign investments outlets were completely shut off, foreign capital could not possibly be a large proportion of the total investment of the United States.[1]

Three further comments are suggested by the evidence in Table 47.

(i) The shift from debtor to creditor position occurred quickly during the few years of World War I. It is difficult to tell what might have happened if the war had not taken place, or if it had not assumed the magnitude that it did. Possibly the United States might have remained a net debtor on international accounts for a long time, since more favorable opportunities for foreign investment might have long continued to outweigh the investments American business would be induced to place abroad. In that sense the shift to a world creditor position was more a matter of the war-induced disinvestment by older international creditor countries than of a drive by the economy of the United States toward a greater share of international investment.

(ii) The investments of the United States abroad were more heavily weighted by direct investments than were foreign investments in the United States. Except for the temporary boom in foreign securities in the American markets in the 1920's, investment abroad was essentially branch extension of American producers, whereas investments by foreigners here were largely purchases of claims to income. The United States tended to export its production to other countries; the latter tended to export their savings to this country, even though compensatory real flows had to occur elsewhere in the world network of trade.

(iii) The figures fail to show the extent to which political and other non-economic events have affected the movement of capital either to or from this country. The consequences of the two World Wars, the movement of 'hot' money during the 1930's, the economic steps in international diplomacy after

[1] The small absolute volumes of foreign investment could loom large as proportions of total capital within this country if the capacity for capital accumulation within the United States itself were quite limited. But this would mean unfavorable economic conditions in the United States, which would in turn bar large inflows of foreign funds.

World War II, have all had their effects; and the gyrations in the net position (e.g. the net debt position in 1940 and 1945) reflect them. In that respect the totals and their changes after 1914 differ significantly from those during the earlier decades. And the mobile and erratic nature of the changes after 1914 means also that small as the balances may be in comparison with over-all totals of national wealth and capital, they may, nevertheless, exercise sizable short-term effects on the economic position of this country, and possibly more sizable and more lasting effects on the economic movements in other countries.

3. *The flow of goods*

We are not interested here in the net change in claims against foreign countries since it is affected by unilateral transfers, in addition to flow of commodities and services across the boundaries; nor are we concerned with the *net* balance of the flow of goods, for, in the long run, it can constitute only a minor fraction of the national product. In fact, it reached a few percent of the United States product only in the extraordinary decade of World War I. Our interest here is in the gross flow of goods into and out of the country – on both the credit and debit sides of the goods account in the balance of payments.

No difficulty is encountered in measuring commodity exports and imports over the period (Table 48, columns 1 and 4), but for flow of services, continuous data are available only beginning with 1919. Yet while for the earlier decades the figures in columns 2 and 5 are decidedly crude, their order of magnitude can be safely accepted.

Except for recent decades, when income from investments and other services reached more than negligible magnitudes, the outflow of services from the United States was so small that it can be disregarded. Since the Civil War and until World War I the United States exported commodities and practically no services; and on the commodity account it had a substantial excess of exports over imports, with the single exception of the first post-Civil War decade. By contrast, throughout the period, the United States imported a relatively substantial volume of services (income on foreign investments in the country, shipping, insurance and similar charges, etc.); and prior to the 1920's had a continuous excess of service imports over service exports. This unfavorable balance on the service account offset the favorable

TABLE 48

Flow of Commodities and Services across the Boundaries, U.S.A. 1869-1948

(All figures in billions of dollars, current prices; annual averages for overlapping decades)

Decade	Outflow			Inflow		
	Commodities (1)	Services (2)	Total (3)	Commodities (4)	Services (5)	Total (6)
1869–78	0.54	0.03	0.57	0.51	0.12	0.63
1874–83	0.72	0.01	0.73	0.57	0.14	0.71
1879–88	0.77	0.01	0.78	0.66	0.16	0.82
1884–93	0.82	0.02	0.84	0.74	0.18	0.92
1889–98	0.98	0.03	1.01	0.76	0.23	0.99
1894–03	1.24	0.07	1.31	0.81	0.31	1.12
1899–08	1.59	0.09	1.68	1.06	0.46	1.52
1904–13	1.94	0.11	2.05	1.44	0.61	2.05
1909–18	3.44	0.29	3.73	2.01	0.68	2.69
1914–23	5.39	0.91	6.30	3.08	0.91	3.99
1919–28	5.50	1.40	6.90	3.99	1.11	5.10
1924–33	4.01	1.29	5.30	3.34	1.05	4.39
1929–38	2.91	1.06	3.97	2.46	0.93	3.39
1934–43	5.10	1.53	6.63	3.01	1.12	4.13
1939–48	10.79	2.89	13.68	4.82	2.21	7.03

Col. 1: 1919 to date, *Historical Statistics*, Series M-16, p. 242, and *Balance of International Payments, 1946–48*, Table A, pp. 189–92; 1869–1918, commodity exports, including silver, *ibid.*, Series M-48 and M-52, pp. 243-4. Data adjusted to calendar year.
Col. 2: Col. 3 minus col. 1.
Col. 3: 1919 to date, see col. 1; back of 1919 estimated by ratios for longer periods taken from *Historical Statistics*, Series M-15 – M-16, p. 242.
Col. 4: See notes to col. 1, *Historical Statistics*, Series M-25, M-49, M-53, M-54.
Col. 5: Col. 6 minus col. 4.
Col. 6: *Ibid.*, Series M-24 and prior to 1919 based on ratios for longer periods of Series M-24 to Series M-23.

balance on the commodity account almost completely during the first few decades in the period. But beginning with 1894–03 there has been a continuous favorable balance on the goods account.

The volumes shown in Table 48 could possibly have been adjusted for changes in price levels and the rate of increase at least in commodity exports and imports studied. But since our interest is in the long-term trends in flows relative to national product, the proportion of the former to some measure of the country's total output in current prices is adequate.

o

The question is with what measure of total output can exports and imports of commodities and services be properly compared. The *net* balance is properly part of, and can be compared with, net national product. But exports or imports of goods, while each in and of itself an unduplicated total in that no duplication can exist between a raw material and a manufactured good exported or between a raw material and a finished product imported, are, nevertheless, gross: each good moving across the boundary is taken at full value, although it may be fully offset by another good moving in the opposite direction, and each good embodies the value of durable capital consumed in its production. The volume of exports or of imports can, therefore, exceed materially the net national product of the country.

The proper total to which exports and imports should be related seems to me to be gross national product, as we define it, plus all imports of goods. Exports can originate only in total domestic production during the year (including value of durable capital consumed) or in imports; and imports should be related to a total of all goods originating in the economy, whether domestically or coming in from abroad. With this denominator the ratio of exports or imports to total product would exceed *1* only under one or two unusual conditions: that all of the total is either imported or exported, and that there are in addition unilateral transfers abroad or exports out of existing inventories.

This provides the rationale for Table 49, columns 1–3, with the total with which exports and imports of goods are compared entered in column 3. Columns 4 and 5 show the percentage shares of inflow and outflow of goods in this total.

The shares are quite low – averaging about 7 percent for exports and less for imports – because of the narrow limits, particularly in a large country like the United States, of the proportion of total product that can flow either in or out. If we consider commodities alone, the gross volume of all movable commodities (including all consumer goods and all producer durable equipment at final cost) amounted in 1929–28 to $48 billion, out of a gross national product of $81 billion, and a product gross of imports of $86 billion. Furthermore, a substantial part of such movable commodity product could not, because of costs of transportation and advantages of adaptation to local market structure, be produced economically except within the country. And the larger the country the smaller the

proportion of commodities that can move in foreign trade for which production could be economically undertaken outside of the country's boundaries. Similar considerations apply to exportable and importable services. Indeed, cross-section studies of the ratio of exports and imports to properly defined national product for a variety of countries indicate that a ratio of 20–25 percent is about the highest attained; and that there is significant negative correlation between the ratio and the size of the country.

TABLE 49

Flow of Goods across Boundaries as Percentage of Gross National Product (Gross of Inflow), Current Prices, U.S.A., 1869-1948

(Absolute figures in billions of dollars)

Decade	G.N.P. Current Prices	Inflow	G.N.P. Gross of Inflow (1+2)	Pct. to Col. (3) of:	
				Outflow	Inflow
	(1)	(2)	(3)	(4)	(5)
1869–78 . .	7.06	0.63	7.69	7.4	8.2
1874–83 . .	8.99	0.71	9.70	7.5	7.3
1879–88 . .	10.7	0.82	11.5	6.8	7.1
1884–93 . .	11.8	0.92	12.7	6.6	7.2
1889–98 . .	12.7	0.99	13.7	7.4	7.2
1894–03 . .	15.9	1.12	17.0	7.7	6.6
1899–08 . .	21.7	1.52	23.2	7.2	6.6
1904–13 . .	28.6	2.05	30.6	6.7	6.7
1909–18 . .	40.1	2.69	42.8	8.7	6.3
1914–23 . .	61.9	3.99	65.9	9.6	6.1
1919–28 . .	81.2	5.10	86.3	8.0	5.9
1924–33 . .	79.1	4.39	83.5	6.3	5.3
1929–38 . .	70.0	3.39	73.4	5.4	4.6
1934–43 . .	92.2	4.13	96.3	6.9	4.3
1939–48 . .	154.8	7.03	161.8	8.5	4.3

Derived from Table 48. For col. 1 see Table 1.

There is no apparent long-term trend in the share of exports in total product. It hovers at slightly over 7 percent up to 1909–18; rises markedly during the decades affected by World War I and the 1920's; but then drops sharply during the depression decades. The rise during the decades of World War II must have been due largely to the war and postwar emergency. It is quite possible that if we could have limited exports during recent decades to those that were on a purely business basis

and unaffected by war and political considerations, the low percentage shares of the 1929–38 decade would have persisted or perhaps even declined. If so, there would have been ground for inferring a downward drift in the ratio of exports to total product.

There seems little doubt that such a downward trend characterized the ratio of imports to total product. Even if we disregard the rather high ratio in the first decade, there is a fairly marked decline from levels above 7 percent in the early decades to barely above 4 percent in the later. Whereas the relative weight of exports may have been maintained by the increasing demand which the rest of the world made for commodities and services of the American economy and, in recent years, by the political factors that constituted non-business stimuli to American exports, the growth of the economy in this country seems to have been accompanied by a declining proportion of imports to domestic production. Part of the explanation may lie in the increase within the American economy of production devoted to non-importable services; part may lie in the increased weight in American production of fabricating functions in the more complex type of commodities, compared with the weight of the raw materials and simpler type of products which an advanced economy of the U.S. type can import from abroad. Whatever the reason, this steadily declining ratio of imports to national product is an important finding for any analysis of import ratios for the future.

In this connection, data on the structure of U.S. *commodity* exports and imports are of interest (Table 50). The classification in Panel A is by type of commodity: crude materials include agricultural and mineral products – such as raw cotton, coal, and crude petroleum among exports and crude rubber, raw silk, and hides and skins among imports; crude foodstuffs are non-manufactured agricultural products – grains, fruits, vegetables, coffee, tea, fruits; manufactured foodstuffs are meat, lard, sugar, butter and cheese, etc.; semi-manufactures are the simpler semi-fabricates such as lumber, iron and steel plates, wood pulp, and some refined metals in pig form (copper, tin, etc.); finished manufactures are not necessarily all finished products, but those that require a great deal of fabrication relative to cost of raw materials.

The systematic shift in structure of both exports and imports

by type is the classic illustration of changes in the process of a country's industrialization. The proportion of crude product and raw material exports, whether or not food, declines, from well over half in the first decade to less than a third in the last. Even the export of the simple manufactures relying heavily on agricultural materials, such as foodstuffs, declines in relative importance – from over a fifth to about 7 percent. The share of finished manufactures rises from 15 to close to 50 percent; and the relative increase in semi-manufactures is even greater.

The opposite type of shift but with significant departures is observed in the structure of imports. The share of raw materials rises from 17 percent to over a third, the decline in the depression decade possibly being due to differential price shifts. The share of crude foodstuffs fails to rise and that of manufactured foodstuffs declines – reflecting the secular decline in the relative weight of agriculture in the economy. The share of semi-manufactures increases, indicating that despite the rapid growth of the country's industrial power it can still use an undiminished proportion of the simpler semi-fabricates from abroad (the

TABLE 50

Structure of Commodity Exports and Imports, U.S.A., 1871-1940

(Based on values in current prices)

A. PERCENTAGE DISTRIBUTION BY 'ECONOMIC' CLASSES

Decade	Crude Materials (1)	Crude Foodstuffs (2)	Manufactured Foodstuffs (3)	Semi-manufactures (4)	Finished Manufactures (5)
			EXPORTS		
1871–80	38.6	19.7	22.0	4.6	15.1
1881–90	36.0	18.0	25.3	5.1	15.6
1891–1900	29.9	18.1	25.6	8.0	18.4
1901–10	31.0	10.5	20.1	12.8	25.6
1911–20	24.5	9.0	16.0	15.4	35.1
1921–30	26.0	8.1	11.8	13.3	40.8
1931–40	24.6	3.8	7.2	16.9	47.5
			IMPORTS		
1871–80	17.3	16.1	20.8	13.1	32.7
1881–90	21.3	15.3	17.8	14.8	30.8
1891–1900	26.5	16.9	16.9	13.9	25.8
1901–10	34.0	11.9	12.1	17.2	24.8
1911–20	37.5	12.5	14.4	17.2	18.4
1921–30	37.1	11.8	11.4	18.3	21.4
1931–40	31.0	14.4	13.9	19.8	20.9

TABLE 50 (*Concluded*)

B. PERCENTAGE DISTRIBUTION BY CONTINENTS OF ORIGIN AND DESTINATION

Decade	North America		South America	Europe	Asia	Oceania	Africa
	North (1)	South (2)	(3)	(4)	(5)	(6)	(7)
			EXPORTS TO:				
1871–80	5.7	6.3	3.6	81.6	1.4	0.9	0.5
1881–90	5.3	5.8	4.0	80.2	2.5	1.8	0.5
1891–1900	6.2	6.2	3.4	78.1	3.1	2.0	1.0
1901–10	9.4	7.7	3.9	70.2	5.4	1.9	1.5
1911–20	13.1	7.7	5.3	63.6	7.1	2.0	1.2
1921–30	15.8	9.2	8.1	49.7	11.7	3.5	2.0
1931–40	15.5	8.5	8.4	44.4	17.0	2.6	3.6
			IMPORTS FROM:				
1871–80	5.8	17.1	12.4	53.0	10.5	0.8	0.5
1881–90	6.0	14.1	11.5	55.5	10.4	2.0	0.5
1891–1900	4.8	13.3	14.1	51.6	12.7	2.6	0.9
1901–10	5.7	13.3	12.1	51.3	15.3	1.1	1.2
1911–20	10.2	16.0	15.2	33.5	21.5	1.6	2.0
1921–30	11.7	13.1	12.8	30.2	28.5	1.5	2.2
1931–40	14.3	10.1	14.0	27.7	30.1	1.2	2.6

Statistical Abstract of the United States, 1946, Tables 1008 and 1017, pp. 898 and 912. The percentages, given by quinquennia and based on added absolute values, were directly averaged here to yield entries for decades. Fiscal years ending 30th June 1915; calendar years beginning with 1916.

rise in column 4 for imports in Table 50, Panel A, nearly offsets the decline in the percentage share of all imports in Table 49, column 5). The proportionate share of finished manufactures in imports, however, declines – and this despite the secular rise of manufactures in the economy.

Partly associated with these changes in structure of foreign trade by type of commodity are shifts in structure by origin and destination (Panel B). Although only the continents are distinguished (with a break between north of North America, meaning Canada; and south of North America, meaning Mexico), the shift of imports away from manufactures and the shift of exports away from raw materials is clearly reflected in a downward trend in Europe's share in both exports and imports: from over 80 percent of U.S. exports to less than a half in the last decade, and from 53 percent of U.S. imports to less than 30 percent. Contrasting with this declining share of Europe are the increasing shares of the North American continent and of Asia and other distant continents; the North American share in U.S.

exports grew from somewhat over 10 to well over 20 percent; that of Asia in U.S. exports from 1.4 to 17 percent, in imports from 10 to 30 percent.

From the standpoint of distance, of reaching out to the far corners of the earth, the structure of U.S. foreign trade was subject to conflicting trends. An increasing proportion of its exports went to contiguous countries: the Western Hemisphere's share grew from 15.6 percent in 1871–80 to 32.4 in 1931–40. But, at the same time, the flow to the more distant places also increased: the share of Asia, Oceania and Africa from less than 3 percent in 1871–80 to 23.2 in 1931–40. In imports the fanning out over the world was more conspicuous than in exports: the share of the Western Hemisphere in imports rose only slightly, from 35.3 percent in 1871–80 to 38.4 in 1931–40. Most of the decline in the share of U.S. imports coming from Europe was absorbed by the rise in the proportion of imports coming from Asia, Oceania and Africa: the combined share of the latter rose from 11.8 percent in 1871–80 to 33.9 in 1931–40. Thus the shift to manufactures made for a limited dispersion of U.S. exports, whereas the shift to raw materials and simple semi-manufactures made for a more conspicuous dispersion of sources of U.S. imports.

4. *General comments*

The general impression conveyed by the statistical measures in the preceding sections is of limited involvement of the U.S. economy in the economic network of nations. The shares of total capital accounted for by investments abroad or by foreign investments in the U.S. are quite small, as are the ratios of flow of goods across the boundaries to total output. Even in migration of men, the recent decades witnessed a dwindling of the flow to a mere trickle. One is tempted to infer, therefore, that the economic growth of this country can be recorded, and even understood, without too much attention to its role in the world.

This impression is quite misleading, in my opinion, and it is the purpose of these comments to correct it. Three major aspects of our estimates call for correction: (a) the measures relate to peacetype flows alone and disregard the economic implications of armed conflict or political tension in international relations; (b) even in studying the measures of peacetype flows small percentage shares should not be interpreted as indexes of minor

effect; (c) economic growth processes in a given country are deeply influenced by patterns of growth in other countries, an influence that cannot be found in measures for a single country.

(*a*) The effects of World War I and II and of the recent international tensions are conspicuous enough to preclude any doubt as to their long-term effects on economic growth of the United States, as well as of other countries. On this point it seems best to quote again from the earlier article (see note on p. 206), pp. 238–9:

> In thinking of the economic consequences of such participation [i.e. in the two world wars – S.K.] the first consideration is usually of the direct outlays involved. In these terms, the impact of World War I on this country was moderate. For 1917 through 1919, the three years in which such outlays were large enough to be included in the account, total war output in 1914 prices amounted to some $19 billion. For the same three years the nonwar output of our economy amounted to $108 billion.[7] We thus expended the equivalent of about one fifth of our nonwar output – not much more than our gross capital accumulation in many normal years. The same comparison for World War II (possible for totals in current prices alone) reveals the much greater effort in the recent conflict. For 1942–46, total war expenditures amounted to $316 billion; during the same five years, nonwar output (gross of depreciation) amounted to $661 billion. Thus our direct war outlays were equivalent to 50 percent of total nonwar output for these five years; and even this ratio should be raised because 1946, a year of proportionately low war outlays, was marked by a price inflation that disproportionately increased its weight in the total of five years. Thus, the recent conflict with its longer period of participation and its mobilization of a much larger relative share of total output for war expenditure has a much greater impact on our domestic economy than did World War I.
>
> But the direct cost of participation in a war, especially to a country which, like ours, did not become a battlefield, is only part of the war's impact upon its domestic economy. A more important aspect is the opportunity cost. Even without direct participation in armed conflict, a country's economy responds to the pressures of war by a reorientation of its resources to new uses and by either complete cessation or drastic restriction of efforts directed towards normal, peacetype purposes. In the years prior to our entry in

[7] The estimates for World War I are from Kuznets, S., *National Product in Wartime*, N.Y., NBER, 1945; for World War II, from 'National Income', *Supplement to Survey of Current Business*, U.S. Department of Commerce, Washington, July 1947.

World War I, from 1914 through 1917, there was already a distortion of our domestic economy by pressure to supply the allied countries; a restriction of certain peacetype activities, e.g., residential construction; and inflationary price rises that were scarcely conducive to the consistent growth of our domestic economy viewed as a servant of long term, peacetime needs. Whatever might be put on the other side of the scale, in the way of forced growth of some techniques and acceleration in the use of some resources during wartime, intensive economic participation in a war, whether or not accompanied by direct fighting, carries heavy net costs with it. It represents an interruption in that steady concern of the economy with the needs of consumers that is the vital basis for sustained economic growth. The technical accomplishments of a military production effort have dubious transference value to peacetime; the opportunity costs represented by the diversion of economic effort to transient needs but dimly related to those of peacetime, are, by contrast, exceedingly heavy.

It is difficult to estimate this indirect cost of war. To use World War I as an example, how much was lost in the sense that it interrupted the normal immigration flows and reduced our population growth accordingly? How much did it cost us by accelerating expansion of capacity in some war needed industries, such as bituminous coal and steel, capacity unnecessary in post war years? How much loss was involved in reducing residential construction and wearing down the industrial structure of the country by limiting replacement? How much did the war cost us by imposing an unhealthy price structure and inhibiting a vigorous search by the community of producers for goods wanted by consumers, a search made unnecessary by the inflationary situation? Such questions cannot be answered adequately in quantitative terms. Yet one cannot avoid the impression that these opportunity costs were heavy. Is it unreasonable to argue that the drastic decline in the rate of growth of our economy, apparent when one contrasts the percentage increase in real national product during the years from 1914 through 1938, with the record for periods extending back to the Civil War, is in large part due to World War I and the dislocation it brought about in its wake? Is it unreasonable to suggest that, with a world at relative peace after 1914, our average rate of growth – as measured by total national product, would not have dropped from 20 percent per quinquennium to 9.3 percent; or the rate of increase in per capita output from 9.7 percent to 2.6 percent?[8] The opportunity cost involved in the reduction of these rates of growth by 3 or 4 percent is vast indeed.

[8] The comparison is between decades prior to and after 1914, and uses the estimates in Kuznets, S., *National Product since 1869*, N.Y., NBER, 1946.

> In inhibiting the growth of our domestic economy as a servant of peacetime needs, World War II is, by all signs, likely to constitute an even greater opportunity cost than did World War I. The form which this cost will assume may be different from that during the two decades from 1919 to 1939. In these earlier decades, the cost took the form of lower *total* productivity than otherwise might have been attained, and the loss emerged as one associated largely with the depression of the 1930's. We *may* escape that particular consequence because, in contrast to post-World-War I days, we are not making such an abrupt turn from a war to a peacetime economy. If the outlay of real resources on non-peacetype and lendlease uses is kept at the proportions predicated in present plans, we may avoid a severe depression of the 1930's model and in that sense will not pay for World War II by a reduction in total output. But, from the point of view of economic development envisaged as growth in service of peacetime needs, there is little to choose between reduction of productivity that assumes the shape of an economic depression and a reduction of peacetype productivity accompanied by maintenance of high levels of total output *via* increase of outlays on military and defense purposes. Indeed, one might well argue that *if* we have to choose between these two evil consequences of major wars – dislocation and depression in a peaceful world as over against dislocation and high levels of production bolstered by military output in a warlike world – the choice is not necessarily in favor of the latter.

There is little to add to these earlier comments, except to say that the events during the three or four years since that paper was written appear to add more emphasis and greater weight to the possible effects of war and political conflicts on the course of economic growth of nations. The related types of flow across boundaries, only a small part of which enters the measures discussed in the preceding sections, are, therefore, an important element in our consideration of the problem.

(*b*) But even if we view the peacetype flows alone, we may be misled by their apparently small magnitudes. Although commodity imports, for example, form such a small proportion of the total product of the United States they are heavily concentrated in a few basic raw materials; and the circumstance that the sources of these imports have become quite widespread is only another indication of their importance. Were they not that important, the cost and effort of securing them from distant places would not have been borne. These raw materials, rela-

tively small as their volume is, may penetrate deeply into the industrial system of this country; and their withdrawal may have far-reaching ramifications hardly suggested by the tiny percentages which they may form of total national product. In other words, the very process that brought about the development of the U.S. economy into one of the most advanced, and raised the absolute levels of its national product to heights that necessarily dwarf any percentage shares of imports, also made for a much greater selectivity in the latter, for a possibly heavier proportion of items that were either indispensable or of the first order of priority in running this country's industrial machine.

These conclusions apply equally to U.S. exports – viewed not only as imports by other countries, but from the standpoint of America's domestic economy. While the share of total exports in total product may be small, the proportions for some specific industries may be quite substantial. The role of these industries in the domestic economy, both their direct weight and their possible contribution to other industries, may depend heavily upon their export markets. And where these export-dependent industries are distinguished by some peculiar characteristics, as they are likely to be, the effect of their 'foreign entanglement' may be quite out of proportion to their statistically measured economic weight. For example, the dependence of American cotton producers upon foreign markets affects particularly a section of the country, and does not spread evenly through the economy; any shifts in the foreign markets may therefore represent a peculiar multiplier that is not revealed by measures of the type discussed earlier. That this has bearing upon *secular* trends in a country's economic growth seems quite obvious as does the interrelation, e.g. between trends in agriculture and trends in the exports of the United States, a relation that runs both ways.

(*c*) We come finally to perhaps the most important consideration, viz. that a single country's economic growth is only part and parcel of a larger and more widespread economic and social process. The long-term changes in level and structure of the national product of the United States cannot be understood, indeed cannot be conceived, out of the framework of Western civilization, with its devices for social and political organization, a stock of technological knowledge, a pattern of development in

other countries some of which (like Great Britain) served as the leader and model; and more literally, without the import of a large body of men who were living carriers of that civilization, no economic development remotely resembling the one that in fact occurred and the quantitative outlines of which we reviewed would have materialized. The flows across the boundaries were, therefore, not only the material ones – of men, capital, or goods – but even more the intangible ones of knowledge, leading to imitation or modification; and of the two, the latter was probably by far the more important.

This opens up a whole set of problems that cannot be discussed at the present juncture. If the long-term economic changes of national units, even of a country like the United States, can be understood only as part of a wider complex, is there much use in attempting to establish the statistical record for the United States via the estimates of *national* product and its components? How useful can quantitative measures be if they are limited to the selected material results of economic processes, but cannot penetrate at all close to the factors that determine the long-term trends and short-term changes in these processes, particularly the former? Should we consider measures for wider aggregates than nations? Should we try to push measurement beyond the level of economic performance, e.g. to such matters as the stock of knowledge or the course of *technological* change as distinct from economic?

It is possible only to mention the questions as illustrating the problems suggested by consideration of the non-material flows across boundaries. Some can be dealt with more effectively when our discussion shifts from long-term trends in the national product of a single country to a comparison of trends in the products of several countries; others we may never be able to deal with effectively, certainly not on a level of discourse directly tied to statistical measures of income and wealth and their components.

APPENDIX

CURRENT NATIONAL INCOME ESTIMATES FOR THE PERIOD PRIOR TO 1870

The current estimates of national income in the United States prior to 1870 present a puzzling, and, most likely, a misleading picture. Yet it is of interest to analyze them, if at least to indicate their limitations and to prevent their misuse. We deal here with estimates prepared in the twentieth century, and linking the more distant past with recent years.

1. *Contrast between 1800–40 and 1840–80: R. F. Martin's estimates*

The only series now available on the national income of the United States back to 1799 is that by Robert F. Martin. It is referred to frequently, despite general recognition of the tenuous basis upon which the estimates for the early decades rest – evidence of the scholar's abhorrence of a statistical vacuum. The testimony of the estimates concerning the movement of total and per capita income, *adjusted* for price changes and thus presumably representing approximations to the real volume of commodities and services produced, is given in Table 51.[1]

The first and foremost impression is that, while total national output increased markedly throughout the period, so did total population, and in the first half of the period covered in the table per capita real income *declined.* In contrast, during the second half, 1839–79, with somewhat slower growth in total population, per capita income in real terms increased over 50 percent – and this despite a protracted and destructive Civil War in the 1860's.

Of course the estimates relate to single years, and may, therefore, be affected by circumstances peculiar to those years. As Martin points out, 1799 happens to be a year of relative prosperity, whereas 1839 appears to be in a somewhat lower phase of the business cycle (see *National Income in the United States, 1799–1938*, pp. 9–12); consequently, at least some of the decline shown between the two dates may be due to cyclical rather than to secular factors. But even so, it seems puzzling that over a period of 40 years the increase in real income per capita should not have been substantial enough to show up in the record, no matter how crude. And Martin does interpret the figures as suggesting absence of significant advance in the secular levels of product per capita. The explanation suggested – the state of "general pioneering turmoil, punctuated by controversies,

[1] The concept followed by Martin approximates closely that used in the present paper, i.e. what is commonly referred to as national income at factor costs. Martin does not include undistributed corporate profits, a relatively negligible item throughout the period under consideration.

TABLE 51

National Income, in Dollars of 1926 *Purchasing Power, Total and Per Capita, R. F. Martin's Estimates,* 1799-1879

Year	Total National Income (millions of dollars) (1)	Population (millions) (2)	Income Per Capita (dollars) (3)
1799–1800	1,115	5.2	216
1809–10	1,441	7.1	204
1819–20	1,625	9.4	173
1829–30	2,057	12.5	164
1839–40	3,295	16.6	198
1849–50	5,319	22.6	235
1859–60	9,095	30.7	296
1869–70	8,995	38.0	237
1879–80	15,183	49.1	309
Percentage Change (initial year base):			
1799 to 1839	195.5	222.5	−8.3
1839 to 1879	360.8	195.3	56.1
1799 to 1879	1,261.7	852.3	43.1

Cols. 1 and 3: Robert F. Martin, *National Income in the United States, 1799–1938* (National Industrial Conference Board, New York, 1939), Table 1, p. 6.
Col. 2: Col. 1 divided by col. 3.

first with European countries, culminating in the War of 1812 with the British, and then the series of Black Hawk, Seminole, and other Indian Wars''[1] – is far from convincing. The much more serious disturbance of the Civil War failed to produce a downward trend in per capita real income for 1839–79 and the earlier wars and other disturbances mentioned could hardly have been a significant impediment to rapid growth of the economy under the conditions in which the American population found itself in the early nineteenth century.

The question whether the four decades from 1800 to 1840 were in fact characterized by declining or stable secular levels of per capita income is of some importance. Unfortunately, the statistical evidence that can be mustered for the period is scanty. Yet the consensus of whatever evidence can be assembled strongly indicates that the impression conveyed by Martin's estimates, if taken as an approximation to secular changes in per capita income, is highly questionable. We discuss this evidence briefly, without laying claim to com-

[1] *Ibid.*, p. 8. The reference is to the period 1799–1849, but it applies equally to the four decades under discussion. The totals in Table 51 are adjusted for price changes by a cost of living index. The results for totals adjusted by an index of the general price level are roughly the same.

pleteness and without attempting to revise Martin's estimates by substituting different figures.

2. *The shift toward non-agricultural industries, 1800–40*

Martin's estimates provide a distribution of total income, in current prices, among the various industrial sectors in which it originated. This industrial distribution may, and in fact must, be subject to at least some of the serious qualifications that will have to be made concerning the per capita figures in constant prices. But let us assume here that the distinction, at least between agriculture and all other pursuits as sources of income, is acceptable. The share of agriculture in the total is roughly about a third through 1839 and then declines to a fifth by 1879 (Table 52, columns 1–3).

From the industrial distribution of gainfully occupied, available from 1820 onward, we can secure the share attached to agriculture; and on the basis of the association of the latter with the proportion of total population living outside urban communities, we can extrapolate agriculture's share of gainfully occupied back to 1800.[1] Comparison of this share with agriculture's share of total income reveals a familiar inter-industrial difference in income per person engaged: income per person engaged in agriculture is appreciably lower than that for the country as a whole. This deficiency in the share of agriculture is exaggerated because persons among the gainfully occupied attached to agriculture may engage in other pursuits and thus derive income from other sources. But while allowance for such non-agricultural income of farm population would raise the ratio somewhat above the level of about 0.5 (Table 52, column 5), the adjustment would probably not bring it much closer to 1.0.[2]

With such income-per-worker differences persisting, as they obviously do, a shift of the labor force from agriculture to other pursuits should in and of itself raise per worker income in *real* terms. Any adjustments for price changes ordinarily made are based upon changes in prices of identical goods, and do *not* allow for shifts in

[1] There may be a slight difference in the dating of population (and gainfully occupied) figures and those for income originating: the latter are designated in Martin's book 1799, 1809, etc., whereas the former are for the Census dates of the following year. However, as Martin indicates, his estimates, prior to 1899, "apply to no specific year but to a twelve months' period, beginning and ending within the two years beginning on January 1 of the year indicated" (*ibid.*, p. 134).

[2] Martin assigns the value of home or 'family' manufactures reported in the Census of Agriculture to manufacturing (see *ibid.*, p. 137). For the earliest Census for which I could find these data (1839) the reported value is $29 million (see 7th Census of the United States, 1850, *Statistical View of U.S., Compendium*, pp. 179 ff.). This compares with Martin's estimates of total income from agriculture (net) of $548 million. However, further allowance should be made for income from work by farm residents in cities and for their receipts of property income from sources other than agriculture.

TABLE 52

Share of Agriculture in National Income and in Gainfully Occupied, 1799-1879

Year	Income from Agriculture (current prices, million $) (1)	National Income (current prices, million $) (2)	Percent (1) is of (2) (3)	Percent of Gainfully Occupied in Agriculture (4)	Ratio of (3) to (4) (5)
1799–1800	266	677	39.3	72.8	0.54
1809–10	307	915	33.6	71.8	0.47
1819–20	295	876	33.7	71.8	0.47
1829–30	330	975	33.8	70.5	0.48
1839–40	548	1,631	33.6	68.6	0.49
1849–50	747	2,420	30.9	63.7	0.49
1859–60	1,288	4,311	29.9	58.9	0.51
1869–70	1,552	6,827	22.7	53.0	0.43
1879–80	1,408	7,227	19.5	49.4	0.39

Col. 1: *Ibid.*, Table 16, p. 58, plus net rent on farm houses, calculated from Tables 43 and 44, pp. 98–99.

Col. 2: *Ibid.*, Table 1, p. 6.

Col. 4: For census years beginning with 1819, estimates by the Bureau of the Census, see *Historical Statistics of the United States*, Series D-7, p. 63. The figures relate to 1820, 1830 and so on, the particular dates being those at which the population census was taken.

For 1799–1800 and 1809–10, extrapolated from 1819–20 on the basis of the ratio at later dates to proportion of rural territory population in the total. For information on latter see *Historical Statistics*, Series B-159 and 146, p. 29. The proportions were: 1800, 93.9 percent; 1810, 92.7 percent; 1820, 92.8 percent; 1830, 91.2 percent; 1840, 89.2 percent.

the composition of product between rural and urban uses. Indeed, if we assume that the productivity in real terms per worker did not change either within agriculture or within other pursuits from 1799 to 1839, the rise in real product per worker that should have resulted from the shift of the labor force away from agriculture is 7.8 percent.[1]

3. *Changes in ratio of workers to total population, 1800–40*

Since we are concerned here with real product per capita, the ratio of the gainfully occupied to total population is of importance. All

[1] Calculated on the assumptions stated in the text, and setting the ratio in column 5 at 0.5, product per worker outside of agriculture, expressed as a ratio to countrywide product per worker, amounted in 1799 to $2.34=[(100)-(72.8\times0.5)]\div27.2$. In 1839 the product of workers in agriculture was (68.6×0.5), and that of non-agricultural workers (31.4×2.34). The sum of these two products for 1839 is 107.8, compared with 100.0 in 1799. The increase in product per worker (member of the labor force) is thus 7.8 percent.

other conditions being equal, an increase in this ratio will tend to raise real product per capita. In fact, there was a fairly substantial increase in this ratio from 1800 to 1840. Census population figures go back to 1800; and population 10 years of age or over before 1820 can be estimated on the basis of its ratio to the total for the white population alone. The size of the gainfully occupied force in 1800 and 1810 can be estimated by extrapolating the changing ratio of gainfully occupied to population 10 years of age and over (Table 53, columns 3 and 4).

The comparison thus made possible reveals that between 1800 and 1840 the ratio of gainfully occupied to total population rose from 0.29 to 0.32, or about a tenth. We can now add this factor to the one considered in Section A-2 – the shift of the labor force toward non-agricultural industries – which would have raised *per worker* product, in constant prices, from 100 in 1800 to 107.8 in 1840. On a *per capita* basis this would mean a shift in income in constant prices from 100.0×0.29 in 1800 to 107.8×0.32 in 1840, or from 29.0 to 34.5, a rise of 19 percent in per capita real product. To repeat, this

TABLE 53

Gainfully Occupied as Proportion of Total Population, U.S.A., 1800-1880

Year	Total Population (thousands) (1)	Population, 10 Years of Age and over (thousands) (2)	Gainfully Occupied (thousands) (3)	Percent (3) is of (2) (4)	Ratio of (3) to (1) (5)
1800	5,308	3,509	1,523	43.4	0.29
1810	7,240	4,800	2,107	43.9	0.29
1820	9,638	6,488	2,881	44.4	0.30
1830	12,866	8,639	3,932	45.5	0.31
1840	17,069	11,629	5,420	46.6	0.32
1850	23,192	16,453	7,697	46.8	0.33
1860	31,443	22,430	10,533	47.0	0.33
1870	39,818[1]	29,124	12,925	44.4	0.32
1880	50,156	36,762	17,392	47.3	0.35

[1] Revised for under-coverage of the 1870 Census.

Col. 1: *Historical Statistics of the United States*, Series B-2, p. 25.
Col. 2: For 1820–80, *ibid.*, Series D-1, p. 63; for 1800 and 1810, estimated by extrapolating ratio of col. 2 to col. 1 by that for *white* population. For latter, see *ibid.*, Series B-126, p. 28, and B-18, p. 25.
Col. 3: *Ibid.*, Series D-2 and D-3, p. 63 for 1820–80. For 1800 and 1810 estimated by application of ratios in col. 4, which were extrapolated by continuing to 1800–20 the trend observed for 1820–40.

rise in per capita product in constant prices does not allow for any secular increase in product per worker either in agriculture or in non-agricultural industries.

4. *Product per worker: Martin's estimates, 1800–80*

It is clear from the preceding discussion that Martin's estimates must imply a substantial decline in real product per worker from 1800 to 1840, certainly for the economy as a whole and most probably also for some major sectors in it. To reveal these implications, to explain how the puzzling decline in per capita real income was derived for the period 1800–40, to shed some light also on the behavior of the estimates from 1840 to 1880, and perhaps to provide some basis for revising our impressions (if not necessarily deriving new estimates), we analyze the movements in income or product per worker derived from Martin's estimates and some supplementary data on gainfully occupied and on prices.

For the full period of eight decades two major sectors, agriculture and all non-agricultural pursuits, are distinguished (Table 54). The income from agriculture, shown in Martin's estimates in current prices, is adjusted for price changes by the Warren-Pearson index of wholesale prices of farm products – an adjustment which, however subject to criticism on general grounds, is appropriate since Martin derives his estimates of agricultural income in the first half of the nineteenth century by 'inflating' a commodity volume index (used as an extrapolator) by the Warren-Pearson prices of farm products. From the adjusted volume of net income in agriculture and the gainfully occupied attached to agriculture, per worker 'real' product of agriculture can be derived (column 5). Per worker product in agriculture declines about 20 percent from 1800 to 1840; and then rises rather moderately from 1840 to 1880. Both movements are puzzling and surprising. What is perhaps even more puzzling and doubtful is the indication that price adjusted product per worker in agriculture was *lower* in 1880 than in 1800, eighty years earlier, and more than 10 percent lower.

Subtracting total income from agriculture, adjusted to 1926 price levels, from countrywide income, likewise adjusted, we get the income from all the non-agricultural sectors combined, also on a 1926 price base. The two variants of the price adjustment employed by Martin, one for cost of living and the other for the general price level, yield two variants of total income from the non-agricultural sectors, adjusted to the 1926 price base. Dividing them by the number of gainfully occupied attached to non-agricultural industries, we get income in 1926 prices per worker in the non-agricultural sectors (two variants, columns 9 and 10). While the timing of the movement

TABLE 54

Income per Worker, Agriculture and Non-agricultural Industries, R. F. Martin's Estimates, 1799-1879

Year	Income from Agriculture, Current Prices (millions of $)	Prices of Farm Products (Index, 1926=100)	Income from Agriculture, 1926 Prices (millions of $)	Gainfully Occupied in Agriculture (thousands)	Income per Worker in Agriculture, 1926 Prices ($)	Income from Non-agric. Industries, 1926 Prices (millions of $)		Gainfully Occupied in Non-agric. Industries (thousands)	Income per Worker, Non-agric. Indus. in 1926 Prices ($)	
						Cost of Living Adj.	General Price Index Adj.		Based on Col. 6	Based on Col. 7
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1799–1800	264	70	377	1,109	340	738	715	414	1,783	1,727
1809–10	306	61.3	499	1,513	330	942	924	594	1,586	1,556
1819–20	294	55	535	2,070	258	1,090	1,041	811	1,344	1,284
1829–30	329	41.5	793	2,770	286	1,264	1,290	1,162	1,088	1,110
1839–40	545	54	1,009	3,720	271	2,286	2,273	1,700	1,345	1,337
1849–50	737	47	1,568	4,900	320	3,751	3,882	2,797	1,341	1,388
1859–60	1,264	56.4	2,241	6,210	361	6,854	6,971	4,323	1,585	1,613
1869–70	1,517	85	1,785	6,850	261	7,210	7,058	6,075	1,187	1,162
1879–80	1,371	54	2,539	8,570	296	12,644	12,903	8,822	1,433	1,463

Col. 1: R. F. Martin, *National Income*, etc., Table 16, p. 58.
Col. 2: *Historical Statistics*, Series L-4, pp. 31–33 (Warren-Pearson index). The index was averaged for each pair of years (1799–1800, 1809–10, etc.); then converted to 1926=100.
Col. 3: Col. 1 divided by col. 2.
Col. 4: For 1799–1800 and 1809–10, Table 52, col. 4 multiplied by Table 53, col. 3. For 1819–20 to 1879–80, *Historical Statistics*, Series D-48, p. 64.
Col. 6: Obtained by subtracting entries in col. 3, from Martin, *National Income*, Table 1, col. 2, p. 6.
Col. 7: Obtained by subtracting entries in col. 3, from Martin, *National Income*, Table 1, col. 3, p. 6.
Col. 8: By subtraction of entries in col. 4 from entries in col. 3, Table 53.

is slightly different here from that of 'real' income per worker in agriculture, real income per worker in non-agricultural industries shows an even sharper drop from 1800 to 1840 (almost one-quarter in one variant, and about 23 percent in the other); a rather moderate rise from 1840 to 1880; and also, rather incredibly, income per worker in non-agricultural industries substantially lower in 1880 than in 1800 (almost 20 percent in one variant, and about 15 percent in the other).

Evidently, whatever rise in 'real' income per worker was shown by Martin's estimates between 1800 and 1880 was due exclusively to the shift in the distribution of the labor force away from agriculture toward non-agricultural pursuits: within both agriculture and the non-agricultural sectors, his estimates show a significant decline in per worker income from 1800 to 1880. Furthermore, this shift away from agriculture tended to reduce, but did not fully offset, the decline per worker from 1800 to 1840: if not for that shift, the decline in the countrywide estimates would have been significantly greater. Finally, whereas we would expect the trend in product per worker to be upward, and more so in non-agricultural than in agricultural industries, the decline in price adjusted product per worker in non-agricultural industries is greater than in agriculture.

Because of the importance of distinguishing between the inter- and intra-sector shifts, as illustrated by the analysis in Table 54, we attempt to analyze further the various sectors within the non-agricultural industries. Unfortunately, the estimates of the gainfully occupied provide practically no breakdown of the non-agricultural sector before 1840; and the price adjustment of the separate sectors is also difficult, if not impossible. Table 55 pushes the analysis as far as data permit, and perhaps even beyond legitimate limits.

Panel A of the table distinguishes the combined sector of mining, electric light and power and gas, manufacturing, and construction – the commodity producing sector. The adjustment of net income originating in it, as estimated by Martin, by the wholesale price indexes of various groups of finished commodities, is a rough and ready procedure.[1] The calculations show that, in this sector, 'real' product per worker rises from 1840 to 1880 by a substantial margin (over 40 percent) (column 5); whereas the rise in product per worker for the same period for the whole non-agricultural sector was only

[1] It will be shown below that during this period prices of raw organic materials rose more or declined less than those of manufactured products. Hence the prices implicit in *value added* must have risen less or declined more than the prices of *commodities*. Consequently, the procedure used underestimates the rise shown in per worker product in the commodity producing industries (non-agricultural); and, if revised, would show an even greater contrast between rise in product per worker in this sector and the absence of such a rise in product per worker in the combined total of other non-agricultural industries.

between 7 and 9 percent, depending upon the price adjustment (Table 54, columns 9 and 10).

There is even a greater contrast between the rise in real product per worker in the commodity producing industries for 1840–80, and that in the residual non-agricultural sector (a combination of transportation and communication, trade, and all services). The latter is between 6 and 9 percent, and in view of the crudity of the estimates, absence of significant change is the safest inference (Panel A, columns 9 and 10).

The rather limited increase in per worker product, shown for all non-agricultural industries between 1840 and 1880 in Table 54, is then the result of disparate trends: a substantial increase in per worker product in the commodity producing sector; an insignificantly slight increase in the other non-agricultural industries; and no significant shift in the distribution of gainfully occupied in non-agricultural industries between the two broad sectors distinguished within the latter (see Panel A, columns 4 and 8).

The rise in real product per worker in the non-agricultural commodity producing industries is no surprise: it should have been expected during 1840–80, and, as suggested in footnote 1 on p. 228, is probably underestimated in Table 55. But it is puzzling that real product per worker in other non-agricultural industries should rise only slightly. Unfortunately we have no price adjusted figures for the several industries included in this sector; but the unexpected behavior of Martin's estimates of its product per worker can, perhaps, be explained in part with some income totals in current prices.

In Panel B of Table 55 we segregate the combined sector of transportation and communication, and trade, leaving a residual that is largely the service industries (private and government). The estimates of gainfully occupied attached to the transportation and trade sector are necessarily rough; include postal service, which Martin presumably includes under government; and begin in 1850. Yet the group is largely that occupied in the transportation and trade sector of Martin's estimate. For the short period, 1850–80, Martin's estimates imply a high per worker income for this sector – much higher than in any other. But income per worker in this sector, in current prices, drops about one-third from 1850 or 1860 to 1880 – a far greater decline than that in the general price level or cost of living.[1] In contrast, the per worker income in the service industries, which is usually

[1] The indexes used by Martin to 'deflate' the national income total are (calculated from *ibid.*, Table 1, p. 6): cost of living: 1849, 45.5; 1859, 47.4; 1869, 75.9; 1879, 47.6; general price level: 1849, 44.4; 1859, 46.8; 1869, 77.2; 1879, 46.8. There was thus a slight rise rather than decline from 1850 to 1880. The price indexes in column 2 of Table 54 and Table 55 indicate the same level in 1850 and 1880.

TABLE 55

Income per Worker, Non-agricultural Industries, R. F. Martin's Estimates, U.S.A., 1840-1880

A. COMMODITY PRODUCING (MINING, ELECTRIC LIGHT AND POWER AND GAS, MANUFACTURING, CONSTRUCTION) AND OTHER INDUSTRIES

Year	Income from Com. Prod. Industries, Current Prices (million $)	Prices of Manufact. Com. (1926 = 100)	Income from Com. Prod. Industries, 1926 Prices (million $)	Gainfully Occupied in Com. Prod. Industries (thousands)	Income per Worker, 1926 Prices (3) : (4) ($)	Income from Other Non-agric. Indus., 1926 Prices (million $)		Gainfully Occupied in Other Non-agric. Industries (thousands)	Income per Worker, Other Non-agric. Indus., 1926 Prices ($)	
						Cost of Living Adj.	General Price Index Adj.		Based on Col. 6	Based on Col. 7
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1839–40	263	98.6	267	805	332	2,019	2,006	895	2,256	2,241
1849–50	442	72.8	607	1,350	450	3,144	3,275	1,447	2,173	2,263
1859–60	729	76.7	950	2,100	452	5,904	6,021	2,223	2,656	2,709
1869–70	1,512	112.2	1,348	2,930	460	5,862	5,710	3,145	1,864	1,816
1879–80	1,506	73.1	2,060	4,380	470	10,584	10,843	4,442	2,383	2,441

Col. 1: R. F. Martin, *National Income*, etc., Table 16, p. 58.
Col. 2: *Historical Statistics*, pp. 232–3. The Warren-Pearson indexes, combined with the following group weights: foods (20); textiles (30); fuel and lighting (10); metals (20); building material (15); chemicals (10); house furnishings (15).
Col. 4: *Historical Statistics*, Series D-50–52, p. 64.
Cols. 6 and 7: Table 54, cols. 6 and 7, reduced by entries in col. 3 here.
Col. 8: Table 54, col. 8, reduced by entries in col. 4 here.

TABLE 55 (*Concluded*)

B. TRANSPORTATION AND TRADE, AND RESIDUAL SERVICES

Year	Income from Transp. and Trade, Current Prices ($ million) (1)	Gainfully Occupied in Transp. and Trade (2)	Income per Worker, Transp. and Trade (1) : (2) ($) (3)	Income from Residual Services, Current Prices ($ million) (4)	Gainfully Occupied, Residual Services (thousands) (5)	Income per Worker, Residual Services (4) : (5) ($) (6)
1849–50	594	386	1,539	611	1,061	576
1859–60	1,188	718	1,655	1,018	1,505	676
1869–70	1,757	1,324	1,327	1,792	1,821	984
1879–80	2,062	1,970	1,047	2,000	2,472	809

Cols. 1 and 4: R. F. Martin, *National Income*, etc., Table 16, p. 58, and Table 40, p. 87.
Col. 2: *Historical Statistics*, Series D-53–55, p. 64. Finance and real estate sectors were eliminated by assuming that the numbers were 8 percent of the combined total in 1850 and 1860, and 12.5 percent in 1870 and 1880.
Col. 5: By subtraction of entries in col. 2, Panel B, from entries in col. 8, Panel A.

at lower levels than that in transportation and trade, when measured in current prices, rises fairly substantially from 1850 or 1860 to 1880.

It is hard to pass judgment on the movement of per worker income in the service industries. But it seems incredible that the income per worker in the combined sector of transportation and trade should have moved from 1850 to 1880 in the manner indicated in Panel B, suggesting stability in real product per worker from 1850 to 1860, and a sharp decline from 1860 to 1880.

To repeat, the questionable aspects of the evidence implicit in the Martin estimates are: (a) the decline in real product per worker in agriculture from 1800 to 1840, and the small magnitude of the rise from 1840 to 1880; (b) the decline in real product per worker in agriculture from 1800 to 1880; (c) the decline in real product per worker in the non-agricultural sectors, either from 1800 to 1840, or from 1800 to 1880 – as well as the moderateness of the rise from 1840 to 1880; (d) the movement of income per worker from 1850 to 1880 in the combined sector of transportation and trade.[1]

5. Trends in product per worker in agriculture

In examining the evidence that would shed some light upon the validity of the Martin estimates, it seems best to emphasize the period 1800–40, because of the surprising character of the results for that period. We begin with agriculture, and ask whether there is any evidence that real product per worker in agriculture declined, or even remained stable, from 1800 to 1840.

While there are almost no series relating to agricultural output prior to 1839, the few bits of data presented in Table 56 indicate that there is no ground for assuming that real product per worker in agriculture declined from 1800 to 1840. Indeed, there is strong suggestion that it rose substantially.

Of the major agricultural crops, we have specifically traceable data on volume of product only for wheat and cotton (columns 4 and 5), which indicate rates of growth from 1800 to 1840 that exceed the rates of increase in the estimated number of gainfully occupied in agriculture: almost a thirtyfold increase in cotton and about a fourfold increase in wheat, compared with less than three and half times increase in the number of gainfully occupied. The same is true of lumber, which at that time was part of the activity of people located on farms and outside of urban areas.

[1] We did not comment in the text on differences in average levels of income per worker. Two findings are subject to serious question: (a) that income per worker in commodity producing, non-agricultural industries should be so close to that in agriculture in 1839–40 ($332 compared with $271); (b) that income per worker in transportation and trade should be so much larger than that in any other sector distinguished. However, the calculations here of levels are subject to much greater error than those of changes over time; and should not be assigned as much importance.

TABLE 56

Data relating to Agricultural Production in U.S.A., 1800-1850

Year	Gainfully Occupied in Agriculture (thousands)	Cotton Crop (thousands of bales)	Wheat Crop (millions of bushels)	Lumber Cut (million feet, board measure)	Grain Product (millions of bushels)	Tobacco Product (millions of lbs.)	Number on Farms (millions)		
							Horses	Cattle	Sheep
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1800	1,109	73	22	300	160	107			
1810	1,513	178	30	400		117	0.3	0.6	0.6
1820	2,070	335	38	550	343	127			
1830	2,770	732	50	850	463	142			
1840	3,720	1,348	85	1,604	616	219	4.3	14.9	19.3
1850	4,900	2,136	105	5,392	867	250	4.9	17.8	21.7

Col. 1: Table 54, col. 4.
Col. 2: *Historical Statistics*, Series E-218, p. 109.
Col. 3: From F. J. Guetter and A. E. McKinley, *Statistical Tables Relating to the Economic Growth of the United States* (Philadelphia, 1924), and sources given therein.
Col. 4: *Historical Statistics*, Series F-109, p. 125.
Cols. 5–9: Michael G. Mulhall, *The Dictionary of Statistics* (London, 1892), pp. 41–44. The grain products entered in col. 5 include corn, oats, wheat, barley, rye, and other minor grains.

The other entries in Table 56 (columns 5–9) are from Mulhall, a source whose accuracy it is difficult to appraise. But there is justification for using it here because Martin's estimates themselves rest in part upon some data from Mulhall (see footnote on p. 235). If, then, one may use the same authority, it is clear that the output of tobacco alone rises less rapidly than the number of workers in agriculture. The much more important total of grain products rises from 144 bushels per worker in 1800 to 166 in 1840, or 15 percent; and with the probable shift toward the more valuable grains the rise in real product per worker may have been appreciably greater. The number of horses, cattle, and sheep all show much greater rises from 1810 to 1840 than the number of workers, suggesting a substantial rise in work animals and presumably animal products per worker.

Two other bits of evidence are of interest in this connection. One relates to estimated man-hours used to produce wheat, corn, and cotton in 1800 and 1840. According to the figures given in Martin R. Cooper, Glen T. Barton, and Albert P. Brodell, *Progress of Farm Mechanization*, USDA Misc. Publication No. 630, Washington, October 1947, the following reduction in man-hours occurred (figures are averages rather than for the specific years):

	Wheat (bushels)		Corn for Grain (bushels)		Cotton (gross, lint, lbs.)	
	1800	1840	1800	1840	1800	1840
Yield per acre	15	15	25	25	154	154
Man-hours per acre:						
Before harvest	16	12	56	44	135	90
Harvest	40	23	30	25	50	45
Total	56	35	86	69	185	135
Man-hours per unit	3.73	2.33	3.44	2.76	1.2	0.88

(All data from *ibid.*, Table 1, p. 3.)

Thus, without any indicated increase in yield per acre (the yields are rough estimates by the authors and perhaps fail to reflect an actual increase), the number of man-hours per unit product of each of these three important crops dropped, during these forty years, by percentages ranging from 20 to over 35.

The second item relates to wages, including the value of board, paid to farm workers in Vermont, for which records are available back to 1780; and for which the adjustment of the current wages per month by changes in the cost of living is also possible (T. M. Adams, *Prices Paid by Vermont Farmers*, etc., Vermont Agricultural Experiment Station, Bulletin 507, February 1944, Burlington, Vermont). The necessary full data are given only back to 1805. But if

we average real earnings in the quinquennia centering on 1809, 1819, etc., we find that the index (1910–14=100) moves from 53 in 1809, to 70 in 1839 – a rise o :over 30 percent for just three of the four decades in the period under discussion (see *ibid.*, Table 47, p. 97).

Despite the paucity of data, one cannot but get the strong impression that product per worker in agriculture could not have shown the secular decline from 1800 to 1840 implicit in Martin's estimates. Indeed the data suggest that the minimum rise in per worker product in agriculture over that period might have been 20 to 30 percent.[1]

It did not seem advisable to assemble evidence to test Martin's implicit estimates of the rise in product per worker in agriculture from 1839 to 1879. On the surface, the rise from $271 to $296 seems too low since that period follows the introduction of farm machinery and the rapid expansion of agriculture to the fertile areas of the midwestern and western sections of the North American continent. One must also leave to future exploration the question whether the rise in product per worker in agriculture from 1840 to 1880 was greater than that from 1800 to 1840, and what the order of magnitude of the difference was.

6. *Trends in product per worker in non-agricultural industries*

In spite, or perhaps, because of scarcity of data on production in non-agricultural sectors of the economy prior to 1840, most of the few series available show astronomical rates of increase. For example, total output of bituminous coal for 1807–20 was just 3 thousand tons, or about 0.2 thousand per year; a similar average for the output of anthracite coal during the same period was 0.9 thousand per year. Presumably around 1800 the annual output was still smaller, if it existed at all. But by 1840, the annual output was already about 1 million tons for each type (see *Historical Statistics for the United States*, Series G-13 and G-14, p. 142). There was thus over a thousandfold increase in output over a period appreciably shorter than the four decades under discussion. Similar rates of increase could be derived for any currently important and established industrial product, which was only in its embryonic beginnings at about 1800. Indeed, the only series relating to volume of industrial activity that fail to show such enormous rates of increase over the period are those relating to foreign trade. But the lag of the latter behind growth of population, if demonstrated, would only reflect the effects of U.S. expansion westward, away from the eastern seacoast.

[1] If one traces Martin's procedure to see how he secured such unacceptable results, the main reason is found in the use of Mulhall's estimates of agricultural capital (to which a large weight is assigned) in calculating the index used to extrapolate gross farm output to the beginning of the century (see Martin, *op. cit.*, pp. 135–6). It is difficult to understand why an item subject to changing valuation, and whose accuracy and relevance to estimating physical output of agricultural production are most doubtful, was used at all.

To attempt a laborious assembly of evidence for testing the implication of Martin's estimates, which show a drastic decline from 1800 to 1840 in real product per worker in non-agricultural industries (see Table 54), would hardly be worth while if the purpose were to disprove Martin's figures; and would be a task much beyond feasible scope if it were to lay the foundation for a more acceptable set of estimates. Instead we use the easily available series on commodity prices. Differences in trends of prices presumably reveal differences in productivity. If prices of manufactured products rise less or decline more, in the long run, than prices of agricultural products, the implication is that productivity in manufacturing (and related processes) rises more (or declines less) than productivity in agriculture.

This provides the rationale for the comparisons presented in Table 57. In both panels we compare price indexes for groups of commodities ranging from farm products to others in which manufacturing operations are dominant. The series are quinquennial averages (to reduce short-term fluctuations) and are given at decennial intervals for the first eight decades of the nineteenth century.

The indexes reveal that, during both the first and second half of the period, prices of manufactured commodities least affected by agricultural processes (textiles, metals, and chemicals in Panel A, and clothing, paint, other building materials, equipment and supplies in Panel B) declined more (or rose less) than prices of farm products (or prices received by farmers). This differential movement in price levels was particularly marked during the second half of the period in the series in Panel A; but no such marked disparity in inter-group price shifts between the first and the second half of the period is observed in the Vermont prices in Panel B.[1]

It was suggested earlier that product per worker in agriculture probably increased significantly from 1800 to 1840, and perhaps rose even more from 1840 to 1880. The evidence just presented strongly suggests that product per worker in extractive (other than agriculture), manufacturing, transportation and distribution operations involved in turning out manufactured products must have increased appreciably more than product per worker in agriculture. By inference, product per worker in a major sector of all non-agricultural industries must have risen substantially from 1800 to 1840, 1840 to 1880, or 1800 to 1880. It is, therefore, impossible to accept the implications of Martin's estimates.

[1] The single exception to the greater decline or lesser rise in prices of manufactured products is that in prices of footwear in Panel B, which rise from 1837–41 to 1877–81 appreciably more than do prices received by farmers. This may be the effect of the great climb in prices of hide and leather, which in Panel A is much more marked during this period than the rise in prices of farm products.

TABLE 57

Changes in Prices of Agricultural and of Other Products, 1800-1880

(All price indexes to the base 1910–14=100; quinquennial averages)

A. WHOLESALE PRICES: WARREN-PEARSON

Year	Farm Products (1)	Hides and Leather (2)	Building Materials (3)	Foods (4)	Fuel and Lighting (5)	Textiles (6)	Metals and Metal Prod. (7)	Chemicals and Drugs (8)
1797–1801 . . .	100	66[1]	52	158	150	231[1]	317	462[1]
1807–11 . . .	84	76	58	133	158	279	334	497
1817–21 . . .	92	96	55	141	150	240	274	311
1827–31 . . .	65	88	49	98	127	184	224	236
1837–41 . . .	76	83	68	116	118	154	218	246
1847–51 . . .	67	64	60	88	92	114	160	154
1857–61 . . .	81	111	66	101	92	124	156	171
1867–71 . . .	123	129	110	152	149	192	221	207
1877–81 . . .	80	105	78	100	93	120	143	125
Percentage Change:								
1797–1801 to 1837–41	−24.0	+25.8	+30.8	−26.6	−21.3	−33.3	−31.2	−46.8
1837–41 to 1877–81 .	+ 5.3	+26.5	+14.7	−13.8	−21.2	−22.1	−34.4	−49.2

[1] The missing figure for 1797 was estimated by extrapolating from 1798 by the movement in the index for all commodities.

Historical Statistics, Series L-4–11, pp. 231–2. The index for col. 2 covers just two commodities – hides and leather; that for col. 3 largely pine lumber and few manufactured commodities; that for col. 5 includes prices of wood and coal.

TABLE 57 (*Concluded*)

B. PRICES RECEIVED AND PAID BY VERMONT FARMERS

Year	Prices Received	Prices Paid								
		All	Domestic Food	Clothing	Footwear	Lumber	Paint	Other Building Materials[1]	Equip.[2] and Supplies	Freight[3]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1797–1801	57		36	567	70					
1807–11	61	147	46	493	72	95	312	526	160	
1817–21	65	138	49	437	76	90	240	404	153	1.25
1827–31	52	103	43	276	70	65	193	247	125	0.81
1837–41	65	101	68	221	55	70	146	213	128	0.98
1847–51	60	81	61	135	53	70	101	137	101	
1857–61	72	86	73	132	60	74	105	122	89	
1867–71	111	133	120	198	108	114	155	184	129	
1877–81	72	92	86	102	82	83	94	121	82	
Percentage Change:										
1797–1801 to 1837–41	+14.0		+88.9	−61.0	−21.4					
1807–11 to 1837–41	+ 6.6	−31.3	+47.8	−55.2	−23.6	−26.3	−53.2	−59.5	−20.0	
1837–41 to 1877–81	+10.8	− 8.9	+26.5	−53.8	+4.91	+18.6	−35.6	−43.2	−35.9	

[1] Includes: nails (largest weight), window glass, lime, cement.
[2] Includes: clover seed, horse-shoeing, salt, scythes, timothy seed.
[3] Dollars per 100 lbs., from Boston.

T. M. Adams, *Prices Paid by Vermont Farmers*, Vermont Ag. Exp. Stat. Bulletin No. 507, February 1944, Burlington, Vt., cols. 1 and 2, Table 54, pp. 105–6; col. 3, Table 10, p. 33 (1797–99 extrapolated by index for all food); cols. 4 and 5, Table 14, pp. 38–9 (1797–99 extrapolated by index for all clothing); cols. 6–9, Table 16, pp. 42–43; col. 9, Table 40, p. 80; col. 10, Table 18, p. 46.

In closing the discussion of Martin's estimates we repeat that they do not convey an acceptable picture of the longer-term changes in the national product of the United States from 1800 to 1880; and that until the questions they raise are answered and the resulting doubts allayed, any impressions of such changes conveyed by Martin's estimates should be disregarded.

7. W. I. King's estimates back to 1850

In his *Wealth and Income of the People of the United States* (New York, Macmillan, 1915), W. I. King presents estimates of national income back to 1850. The figures are for 'census' years and are therefore, in fact, a hybrid of measures for 1849, 1859, etc. and the following year; and are provided at decennial intervals alone to 1909–10. The concept is similar to that followed here.

We have not placed much emphasis on these estimates because they provide only a short extension of the measures used in the text (about 20–25 years); because that period is affected by the Civil War, a circumstance that makes it difficult to interpret it in any analysis concerned with long-term changes; and because figures given at decennial intervals are not too useful for proper study of long-term changes. Nevertheless, it may be interesting to glance briefly at the estimates and see how much or how little can be learned from them.

Table 58 provides a comparison of W. I. King's estimates with those based on the more recent work on national product back to 1869. The entries in column 2 are means of annual estimates for the pairs of years to which King's estimates are assigned.

It will be observed that the differences between King's and our series range from —14 to +29 percent of the more recent estimates which we use as criterion. King indicates in his book that his estimates for earlier years are subject to wider errors than those for the later years, so that it is quite possible that the errors in the figures for 1850 and 1860 are as large as 20 or 30 percent. This circumstance must be kept in mind in trying to derive any picture of long-term changes from the King series.

An attempt to do so is provided in the remaining columns of Table 58. King's estimates, adjusted for price changes (column 5) suggest an increase in real product of about 165 percent from 1850 to 1880, and of about 300 percent from 1880 to 1910 – a marked difference accounted for in part by the effect of the Civil War on the first period. But if we substitute our estimates for 1880 and 1910 and retain King's figure for 1850, the increase from 1850 to 1880 rises to 208 percent and is quite close to the revised increase from 1880 to 1910 (216 percent). The percentage rise during the first half

of the period then equals that during the second half, despite the effect of the Civil War on the former (which, however, is presumably offset by the accelerated rise from 1870 to 1880).

TABLE 58

W. I. King's Estimates of National Income, 1849-50 to 1909-10

Year	W. I. King Totals, Current Prices (bill. $) (1)	NBER N.N.P. Current Prices (bill. $) (2)	Diff. (1)−(2) as Pct. of (2) (3)	Price Index, 1929=100 (4)	W. I. King Totals, 1929 Prices (bill. $) (5)	King Total Per Capita 1929 Prices ($) (6)
1849–50	2.2			45.3	4.9	214
1859–60	3.6			49.0	7.3	235
1869–70	6.7	5.2	+29	73.1	9.2	233
1879–80	7.4	8.6	−14	56.8	13.0 (15.1)	262 (304)
1889–90	12.1	10.9	+11	51.8	23.4	375
1899–1900	18.0	15.3	+18	49.0	36.7	487
1909–10	30.5	27.5	+11	57.7	52.9 (47.7)	579 (522)

Figures in brackets (cols. 5 and 6) are based on entries in col. 2.

Col. 1: W. I. King, *The Wealth and Income of the People of the United States* (New York, Macmillan, 1915), Table XXIII, p. 138.
Col. 2: From unpublished annual estimates.
Col. 4: For 1869–70, from same source as col. 2. Extrapolated to earlier years by general price index of Snyder-Tucker. For latter see *Historical Statistics*, Series L-1, pp. 231–2.
Col. 6: Entries in col. 5 divided by total population. For latter see *Historical Statistics*, Series B-31, p. 26.

If we reduce the totals to a per capita basis, King's unadjusted figures show an even more striking contrast in the rate of increase between the first and second thirty-year periods covered – somewhat over 20 percent from 1850 to 1880 compared with more than 120 percent from 1880 to 1910. But here also, replacing the King figures by ours reduces the difference drastically, although it is not wiped out entirely: with the adjustments, the percentage increase in per capita is 42 for 1850–1880 and 72 for 1880–1910. But an adjustment for the possible error in the King estimate for 1850 may either wipe out this difference or greatly increase it.

The import of this discussion is that the only safe inference one can draw is that per capita real income did show some increase from 1850 to 1880, perhaps as much as 50 percent or more, perhaps as little as 20 percent or less. But no safe comparison between the

increase in 1850–80 and 1880–1910 in national product, either total or per capita, can be made from the figures as they now stand. It seemed best to confine the analysis in the paper to the estimates beginning with the recent series in the 1870's; and wait with extending the analysis to earlier decades until a more acceptable series for them can be constructed.