Gross Capital Formation, 1919-1933

SIMON KUZNETS

I. VIEWPOINT AND SCOPE OF THE STUDY

CAPITAL FORMATION comprises the production, transportation and distribution of that portion of the nation's output of goods and services which is not consumed immediately, but is retained and added to the nation's stock of wealth. If, in measuring this retained portion of current output, allowance is made for the current consumption of the already existing finished capital goods, the results show the volume of *net* capital formation. If such an allowance is not made, the volume measured is that of *gross* capital formation.

The quantitative measurement of capital formation may be undertaken from either of two essentially different viewpoints. From one viewpoint, capital formation is treated as contributing to the accumulated wealth of the nation and as augmenting the material foundation upon which its economic progress rests. Net capital formation is the concept most appropriate for such treatment. From the other viewpoint, capital formation is treated as a process which exhibits significant peculiarities in the business cycle. The total flow of commodities which, because of their durable nature represent largely investment, and which account for the bulk of gross capital formation, has been observed to show cyclical fluctuations strikingly different from those in the flow of commodities that are fully consumable within short periods. The inference is natural that in measuring separately these two parts of the nation's output some light may be thrown on factors of importance in determining the business cycle. In a study guided by such a viewpoint, the concept of gross capital formation appears more useful than that of net capital formation, certainly in the first phases of the analysis. This is especially true when such an investigation is followed by a study of the parallel flow of money and credit: there is considerable fluidity between funds set aside to cover the consumption of already existing finished capital goods (for example, reserves for depreciation) and funds for the financing of additional capital goods. Since the study, of which the preliminary results are presented in this *Bulletin*, treats capital formation as a process which exhibits significant peculiarities in the business cycle; and since it is expected that this study will be followed by a parallel study of the flow of funds, the concept of gross capital formation was adopted as the basic one. This, of course, does not preclude the possibility of measuring net capital formation, and it is hoped that such measures will be given in the final report.

Gross capital formation, as estimated in this study, is composed of the following elements:

1. The flow of finished durable commodities to the nation's households and enterprises. Households comprise families and individual final consumers, while enterprises cover not only business establishments but also public and semi-public agencies. By durable commodities are meant those with an average period of useful life in excess of three years, whether used primarily by households (consumers' durable) or by enterprises (producers' durable). Notable examples are industrial and household machinery,

passenger cars and trucks, boats, railroad equipment, tools, furniture. This group, naturally, includes construction, which in the tables below is segregated for separate measurement. The distinction between durable and non-durable commodities, and especially between consumers' and producers' commodities, is necessarily approximate, but the line can be drawn clearly in the majority of cases.

2. Net change in the stocks of all commodities in the hands of their producers and distributors; of unfinished commodities in the hands of their industrial consumers; and of finished, but fully consumable commodities in the hands of ultimate consumers. However, for lack of data, net changes in stocks in the hands of public agencies and of ultimate consumers had to be omitted in our estimates, which thus cover changes in business inventories only.

3. Net change in claims against foreign countries. In so far as we deal with a single nation in the family of nations, its exports are part of its gross capital formation, and its imports are to be subtracted from the latter.

The estimates presented below attempt to measure the volume of gross capital formation, thus defined, in the United States from 1919 through 1933. The elements just listed are evaluated in terms of both current and 1929 prices; and the valuation is in terms of the cost of each element to the ultimate agency reached during the given year. Thus, the flow of finished durable commodities to households and enterprises is measured at cost to these ultimate users, and the amounts include not only the cost of production but also of transportation and distribution of the finished durable commodities purchased by their ultimate users. Net change in business inventories is evaluated, as far as possible, at cost to the agency which holds the inventories. Only in the case of new construction, the largest part of the total in the general category of construction, was it impossible to evaluate the total at cost to the ultimate user; instead, the value of new construction is measured at the point where the process is completed by the construction enterprise.

Inclusive as this concept of gross capital formation and the estimates based upon it are, they omit almost completely two types of capital formation. One is capital formation that finds its embodiment not in commodities but in the less tangible properties of human beings themselves. Such capital formation is obviously of considerable magnitude, the volume of economic resources devoted to and embodied in the state of the arts and the training of the people forming an appreciable part of the nation's wealth. But it is difficult in this field to disentangle purely economic factors from the totality of factors that determine individual or social life as a whole; and it is next to impossible to attain a tolerable degree of precision in estimating the volume of capital formation involved. The second type of capital

formation, also largely omitted, is that confined within the limits of single enterprises. It is exemplified by labor invested by a farmer in improving the quality of his land, or by wages paid by a manufacturer to his own workers for the improvement of his machinery and buildings. Some part of this activity is reflected in our inclusive estimates of the volume of construction, which cover a large part of construction done on their own account by non-construction enterprises. But the other types of capital formation in this group do not appear on the surface of the available statistical data; hence it is impossible to measure their volume.

In spite of these omissions, the concept of gross capital formation employed in this study may appear to be too wide. It may be argued that the flow of consumers' durable commodities does not constitute an element in capital formation; and, that net capital formation should have been measured rather than gross. However, neither of these restrictions of the concept is acceptable in a study of variations in the volume of capital formation in their relation to the business cycle. The flow of consumers' durable commodities is almost as variable in time as that of the producers' durable group, differing greatly in this respect from the flow of non-durable finished commodities. Also, gross rather than net capital formation, as suggested above, appears to be the appropriate basic concept in a study pointing to the analysis of business-cycle problems, at least as a first step. For these reasons it was decided to include the flow of consumers' durable commodities in capital formation, although our estimates segregate them and allow those who wish to subtract them; and to deal with gross rather than net capital formation, at least at first.[1]

II. THE AVERAGE VOLUME OF GROSS CAPITAL FORMATION AND OF THE FLOW OF NON-DURABLE COMMODITIES

It is here recognized that the average volume of capital formation and of any of its constituent elements for the period 1919-32 conceals significant variations in time, variations which are studied in Section III. The reason for discussing these average volumes for the post-War period as a whole is to show the approximate magnitude of the economic processes in question. Unless one is familiar with the average *weight* of these various elements, he cannot appreciate the significance of their variability in time, or of the differences in this variability.

Table 1 gives the average dollar volume of gross capital formation, most inclusively defined, for the period 1919-1932. The flow of durable commodities shown in this table includes not only the value of finished products, but also of parts, repairs and servicing, in so far as they can be ade-

[1] The results of an attempt to estimate net capital formation destined for use by business enterprises are presented in Table 10.

Table 1

GROSS CAPITAL FORMATION, INCLUSIVELY DEFINED,
AVERAGE DOLLAR VOLUME PER YEAR, 1919-1932

	Volume per year (millions of dollars)	Per cent of total
1. Flow of consumers' durable commodities to households and enterprises	7,458	27.3
2. Flow of producers' durable commodities to enterprises	6,409	23.5
3. Volume of total construction	11,826	43.3
4. Total flow of finished durable commodities (1+2+3)	25,693	94.0
5. Net change in business inventories	924	3.4
6. Net change in claims against foreign countries	712	2.6
7. Gross capital formation, inclusively defined (4+5+6)	27,329	100.0

Note: Estimates in Tables 1 through 4 are given in current prices only. The correction for price changes, while affecting the annual changes of the quantities, does not alter appreciably the averages for as long a period as is covered in the tables in Section II of this *Bulletin*.

Since the estimates for 1933 are much more tentative than those for other years, it was considered advisable not to use them in computing the averages for the post-War period.

quately gauged. Similarly, construction is measured by a most inclusive estimate, which attempts to cover not only sizable new construction projects, but also maintenance and repair.

It may be seen from Table 1 that the volume of gross capital formation during the post-War period amounted on the average to $27 billion per year; that the largest single item was total construction; that the flow of other durable commodities was divided almost equally between producers and consumers, the flow to the latter slightly larger; that all finished durable commodities together accounted for over 90 per cent of the total; and that, on the average, both net change in business inventories and net change in claims against foreign countries constituted but a minor part of the gross total.

The very size of the average volume of gross capital formation in Table 1 may suggest an element of exaggeration in our estimates; and such may be argued from the inclusive character of the definitions used. It may be contended that a large proportion of repairs and maintenance is consumed within a short period, and that they are thus on a par with the flow of non-durable commodities; and that especially in the case of construction, our estimates, based on the consumption of construction materials, may contain a large volume of such minor repair work. Similar objections may be raised to the inclusion of parts: the mere fact that parts are sold separately indicates that their

life is shorter than that of the durable product of which they are a constituent element. Finally, a doubt may be raised concerning the treatment of net change in business inventories. Such changes, when positive, do represent, like the flow of durable commodities, withdrawal of goods from current consumption into capital accumulation. But while a durable commodity, once produced, lasts usually an appreciable period, a change in inventories during a given year can easily be offset during the next year. In so far as the element of technical durability is of significance to the economic implications of capital formation, net change in inventories should be treated as the result of a process quite different from that involved in the flow of durable commodities, and possibly excluded from the total of gross capital formation.

Since it is impossible to segregate parts, repairs and servicing into durable and non-durable categories, the estimates in Table 1 cannot be modified precisely. But we can subtract the aggregate value of all parts and servicing; reduce the volume of total construction to a figure which can be interpreted as representing primarily new construction or very considerable alterations; subtract net change in business inventories—and thus obtain an estimate of the volume of gross capital formation, more narrowly defined. The average volume for the post-War period, which corresponds to this definition, is presented in Table 2.

A comparison of Tables 1 and 2 shows that the narrowing of the concept of gross capital formation results in a drop in the average volume of about 27 per cent. It still leaves, however, a strikingly high average volume of $20 billion, which is apportioned among the various constituent elements of gross capital formation in about the same way

Table 2

GROSS CAPITAL FORMATION, MORE NARROWLY DEFINED,
AVERAGE DOLLAR VOLUME PER YEAR, 1919-1932

	Volume per year (millions of dollars)	Per cent of total
1. Flow of consumers' durable commodities, exclusive of parts and servicing	6,140	30.7
2. Flow of producers' durable commodities, exclusive of parts and servicing	4,800	24.0
3. Volume of construction, exclusive of maintenance, repairs and the unallocable portion[1]	8,372	41.8
4. Total flow of finished durable commodities, more narrowly defined (1+2+3)	19,312	96.4
5. Net change in claims against foreign countries	712	3.6
6. Gross capital formation, more narrowly defined (4+5)	20,024	100.0

[1]For the explanation of the unallocable part, see Table 11 and comments in Section 2 of the Appendix.

as in Table 1. Total construction still remains the largest single item; the flow of consumers' durable commodities is still somewhat greater than that of producers' durable commodities; and with the omission of net changes in inventories, the importance of elements other than the movement of finished durable products becomes still more insignificant.

Whether the flow of consumers' durable commodities should or should not be included in gross capital formation, it is nevertheless important to ascertain the distribution of the latter total according to the economic characteristics of the ultimate user. The demand for capital goods by business firms is subject to the play of forces distinctly different from, even though related to, those affecting the demand for capital goods by households, or public and semi-public agencies. Table 3 presents an apportionment of gross capital formation in accordance with this principle of distinction. The classification is approximate, and can, at present, be carried back only to 1925. But subject to these limitations, the main results of the distribution are clear and appear reliable.

First, the approximate equality of weight between capital destined for use by business and that destined for use by consumers stands out; second, the relatively limited role played by public and semi-public agencies as the ultimate users of capital goods, accounting for 11 to 15 per cent of the total. It must be noted, however, that this proportion is an underestimate, since consumers' and producers' durable commodities which are eventually used by public agencies could not be segregated here, and line 3 in Table 3 thus covers only construction.

Formation of capital destined for use by final consumers is apportioned, in this table, between the flow of consumers' durable commodities and residential construction, since most students of the problem treat residential construction as *bona fide* capital formation, even though some exclude other consumers' durable products from the group of capital goods. The table indicates that the flow of consumers' durable commodities accounts for about one-third of total gross capital formation, whether the latter is defined inclusively or more narrowly. Residential construction accounts for an additional one-tenth of the total.[a] Even when both are excluded, the average volume of gross capital formation still amounts to $17 billion, when defined inclusively; and to $12 billion, when defined more narrowly. If residential construction is retained as part of capital formation the two average volumes become $19 and $14 billion.

The absolute figures for gross capital formation, striking as they are in their magnitude, do not tell the full story until compared with the volume of the other portion of the nation's output—that flowing into immediate consumption channels. This other portion consists of non-durable commodities and related services; and of services which are rendered directly to final consumers, such as professional and other personal services, transportation and communication services performed for ultimate consumers. Of these two groups of goods in the nation's immediately

[a] The percentage of gross capital formation, inclusively defined, constituted by residential construction is underestimated in Table 3, since the unallocable portion includes some construction that should be classified as residential.

Table 3

FORMATION OF GROSS CAPITAL BY TYPE OF ULTIMATE USER, AVERAGE DOLLAR VOLUME PER YEAR, 1925-1932

	Gross Capital Formation, inclusively defined		Gross Capital Formation, more narrowly defined	
	Volume per year (*millions of dollars*)	Per cent of total	Volume per year (*millions of dollars*)	Per cent of total
1. Destined for use by consumers				
a. Flow of consumers' durable commodities	7,987[1]	29.3	6,450[2]	31.5
b. Residential construction	2,066	7.6	2,066	10.1
c. Total	10,053	36.9	8,516	41.6
2. Destined for use by business	11,348[3]	41.7	8,541[4]	41.8
3. Destined for use by public and semi-public agencies (construction only)	3,067[5]	11.3	3,005[6]	14.7
4. Unallocable	2,768[7]	10.2	386[8]	1.9
5. Total gross capital formation (1c+2+3+4)	27,236	100.0	20,448	100.0

[1]Includes parts, repairs and servicing.
[2]Excludes parts, repairs and servicing.
[3]Includes flow of producers' durable commodities, volume of business construction and net change in business inventories.
[4]Same as 3 excluding parts, repairs and servicing of producers' durable commodities, maintenance and repair in business construction, and net change in business inventories.
[5]Includes public works and construction of theaters, lodges, clubs, religious and memorial structures.
[6]Same as 5 excluding repairs and maintenance in Federal construction.
[7]Includes net change in claims against foreign countries and unallocable construction.
[8]Includes net change in claims against foreign countries.

consumed output, i.e., of the output *not* entering gross capital formation, only the first—the flow of non-durable commodities and related services—has been measured adequately in the present investigation. The average volume of this flow is given in line 1 of Table 4.

The flow of non-durable commodities to households and enterprises comprises the volume of finished commodities whose period of average useful life is less than three years, estimated in terms of the cost of these commodities to their ultimate users. Adding to this flow of non-durable products the flow of durable commodities and the volume of construction, both inclusively defined, we therefore obtain, in line 2 of Table 4, the total flow of all finished commodities and related services. Of this total flow of finished commodities and related services to the nation's households and enterprises, finished durable goods and construction, defined inclusively, account, on the average, for 45 per cent. When parts, repairs, servicing and unallocable construction are treated as non-durable, the percentage of finished durable to the total of finished commodities declines to about 34. Thus, those goods whose useful life extends beyond three years are still of considerable weight in the nation's output of finished commodities.

If to the flow of non-durable commodities and related services we add the full volume of gross capital formation, inclusively defined, the resulting total measures gross domestic production of commodities and related services (line 4, Table 4). This total is gross in the sense that no adjustment is made for the consumption of finished capital goods incurred in producing the volume in question; but it is adjusted for any duplication between raw materials, semi-finished products, and finished goods. Of this gross output of commodities and related services, corrected for duplications but unadjusted for consumption of finished capital goods, gross capital formation, when inclusively defined, accounts for 46 per cent; when more narrowly defined, for 34 per cent; and with further exclusion of consumers' durable commodities, for about 24 per cent. Thus, according to the most restricted definition, gross capital formation still constitutes a substantial portion of the nation's gross output of commodities and related services.

Finally, we may attempt to indicate, even though tentatively, the importance of gross capital formation when compared with the most inclusive total, viz., the nation's gross domestic output of commodities and *all* services, corrected for duplications but not for business consumption of existing, finished durable goods. A study of the industrial allocation of national income produced suggests that in 1929 the volume of services not directly related to the production, transportation and distribution of commodities was about $17.5 billion. In the same year gross domestic output of commodities and *related* services amounted to $71.3

Table 4

GROSS CAPITAL FORMATION AND THE FLOW OF NON-DURABLE COMMODITIES, AVERAGE DOLLAR VOLUME PER YEAR, 1919-1932 AND 1925-1932

	Average for 1919-32	1925-32
1. Flow of non-durable commodities to households and enterprises (*millions of dollars*)	32,030	31,869
2. Total flow of all finished commodities and related services (1+flow of durable commodities and volume of construction, inclusively defined) (*millions of dollars*)	57,724	58,618
3. Percentage of (2) constituted by all finished durable commodities (including construction)		
a. Inclusively defined	44.5	45.6
b. Excluding parts, repairs and servicing and unallocable construction	33.5	34.1
4. Gross domestic production of commodities and related services (1+gross capital formation, inclusively defined) (*millions of dollars*)	59,360	59,106
5. Percentage of (4) constituted by gross capital formation		
a. Inclusively defined	46.0	46.1
b. Excluding parts, repairs and servicing, unallocable construction, and changes in business inventories	33.7	34.4
c. Total under b, excluding consumers' durable commodities	23.4	23.5
d. Total under c, excluding residential construction	(not available)	20.0

billion, and gross capital formation, most inclusively defined, to $34.5 billion (see Table 5).

Thus in 1929, gross capital formation, inclusively defined, accounted for about 48 per cent of the gross domestic output of commodities and *related* services, and for about 39 per cent of the gross domestic output of commodities and *all* services. It may be suggested in the light of these figures for 1929 and the percentages shown in Table 4, that of the inclusive total of gross domestic output of commodities and all services, gross capital formation, inclusively defined, constituted on the average about one-third; gross capital formation, with the exclusion of parts, repairs, servicing and unallocable construction, about one-quarter; and with the still further exclusion of consumers' durable goods (but not of residential construction), slightly more than one-sixth.
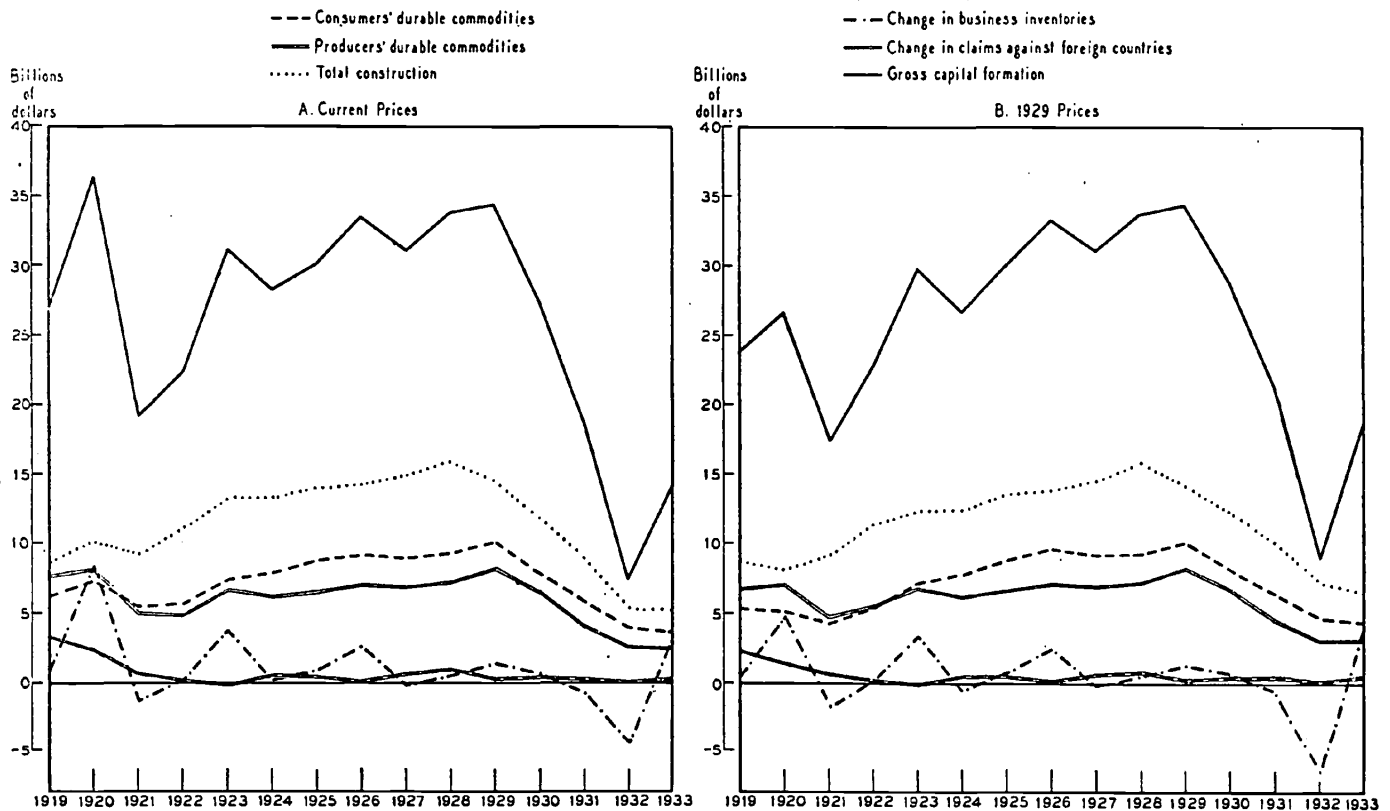
III. FLUCTUATIONS IN GROSS CAPITAL FORMATION AND IN THE FLOW OF NON-DURABLE COMMODITIES

Having established the substantial proportion that gross capital formation constitutes of the nation's total output of commodities and services, we may study the fluctuations in

Table 5

GROSS CAPITAL FORMATION, INCLUSIVELY DEFINED, AND THE FLOW OF NON-DURABLE COMMODITIES

1919-1933

(millions of dollars)

A. Current Prices	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933 (prelim.)
1. Flow of consumers' durable commodities to households and enterprises	6,418	7,414	5,562	5,719	7,497	7,908	8,664	9,316	8,887	9,175	10,058	7,892	5,885	4,022	3,737
2. Flow of producers' durable commodities to enterprises	7,822	8,246	5,131	5,001	6,859	6,422	6,666	7,204	6,964	7,372	8,366	6,638	4,315	2,720	2,626
3. Volume of total construction	8,638	10,200	9,224	11,033	13,315	13,308	14,032	14,343	14,876	15,919	14,381	11,921	8,920	5,458	5,253
4. Total flow of finished durable commodities (1+2+3)	22,878	25,860	19,917	21,753	27,671	27,638	29,362	30,863	30,727	32,466	32,805	26,451	19,120	12,200	11,616
5. Net change in business inventories	805	8,314	—1,383	390	3,690	304	916	2,664	—176	511	1,374	716	—725	—4,460	2,970
6. Net change in claims against foreign countries	3,319	2,354	628	215	—78	446	428	44	606	957	312	371	326	40	293
7. Gross capital formation, inclusively defined (4+5+6)	27,002	36,528	19,162	22,358	31,283	28,388	30,706	33,571	31,157	33,934	34,491	27,538	18,721	7,780	14,879
8. Flow of consumers' perishable commodities to households and enterprises	25,044	27,156	19,078	19,841	21,135	22,042	23,882	24,541	24,069	24,403	25,753	23,032	17,974	14,683	14,625
9. Flow of consumers' semi-durable commodities to households and enterprises	9,976	10,810	9,052	9,020	10,703	9,617	10,459	10,498	10,892	10,957	11,046	9,329	7,607	5,824	5,938
10. Flow of non-durable finished commodities to households and enterprises (8+9)	35,020	37,966	28,130	28,861	31,838	31,659	34,341	35,039	34,961	35,360	36,799	32,361	25,581	20,507	20,563
11. Total flow of all finished commodities (4+10)	57,898	63,826	48,047	50,614	59,509	59,297	63,703	65,902	65,688	67,826	69,604	58,812	44,701	32,707	32,179
12. Gross domestic output of commodities and related services (7+10)	62,022	74,494	47,292	51,219	63,121	60,047	65,047	68,610	66,118	69,294	71,290	59,899	44,302	28,287	35,442
B. 1929 Prices															
1. Flow of consumers' durable commodities to households and enterprises	5,443	5,175	4,423	5,405	7,249	7,830	8,733	9,734	9,189	9,343	10,058	8,223	6,544	4,690	4,513
2. Flow of producers' durable commodities to enterprises	6,820	7,179	4,782	5,519	6,910	6,228	6,679	7,204	6,977	7,341	8,366	6,899	4,717	3,247	3,223
3. Volume of total construction	8,681	8,239	9,308	11,421	12,261	12,380	13,584	13,899	14,485	15,793	14,381	12,405	10,242	7,416	6,583
4. Total flow of finished durable commodities (1+2+3)	20,944	20,593	18,513	22,345	26,420	26,438	28,996	30,837	30,651	32,477	32,805	27,527	21,503	15,353	14,319
5. Net change in business inventories	605	4,825	—1,664	215	3,511	—59	805	2,372	—192	479	1,374	833	—512	—6,484	3,922
6. Net change in claims against foreign countries	2,283	1,453	613	212	—74	433	394	42	605	943	312	409	426	59	423
7. Gross capital formation, inclusively defined (4+5+6)	23,832	26,871	17,462	22,772	29,857	26,812	30,195	33,251	31,064	33,899	34,491	28,769	21,417	8,928	18,664
8. Flow of consumers' perishable commodities to households and enterprises	19,550	19,138	19,978	21,197	21,634	23,300	23,367	23,872	24,436	24,114	25,753	25,089	23,164	22,313	22,852
9. Flow of consumers' semi-durable commodities to households and enterprises	7,001	6,060	7,905	8,156	9,236	8,503	9,298	9,465	10,422	10,587	11,046	10,196	9,906	9,185	8,341
10. Flow of non-durable finished commodities to households and enterprises (8+9)	26,551	25,198	27,883	29,353	30,870	31,803	32,665	33,337	34,858	34,701	36,799	35,285	33,070	31,498	31,193
11. Total flow of all finished commodities (4+10)	47,495	45,791	46,396	51,698	57,290	58,241	61,661	64,174	65,509	67,178	69,604	62,812	54,573	46,851	45,512
12. Gross domestic output of commodities and related services (7+10)	50,383	52,069	45,345	52,125	60,727	58,615	62,860	66,588	65,922	68,600	71,290	64,054	54,487	40,426	49,857

Chart I

GROSS CAPITAL FORMATION, INCLUSIVELY DEFINED,
AND ITS CONSTITUENT ELEMENTS, 1919-33

- - - Consumers' durable commodities   — ·— Change in business inventories
——— Producers' durable commodities   ——— Change in claims against foreign countries
······ Total construction   ——— Gross capital formation

its volume and compare them with variations in the flow of non-durable commodities. The annual estimates, available for such an analysis, are assembled in Table 5. In this table the flow of non-durable commodities is apportioned between perishable and semi-durable. Under perishable we include those commodities whose average useful life does not exceed six months, the group thus comprising food and tobacco products, gasoline, coal used by final consumers, stationery, newspapers, etc. By semi-durable are meant commodities whose average useful life is between six months and three years, the group thus comprising primarily articles of clothing and attire, some of the less durable types of housefurnishings, and automobile tires and tubes. Another distinction introduced in Table 5, which does not appear in the preceding tables, is that between dollar volumes in current and in 1929 prices. The correction for price changes, which does not affect appreciably averages taken for a long period, is of considerable importance when annual fluctuations are studied.

The dollar volume of gross capital formation, inclusively defined, as shown by the two sets of totals in Table 5 and by Chart I, exhibits marked fluctuations in time. The estimates, in terms of both current and 1929 prices, register declines in every year which, during the post-War period, marked recession or depression in the economic activity of this country: 1921, 1924, 1927 and 1929-32. But the contractions of 1921 and 1929-32 appear, at least in the an-

nual figures, much more substantial than the mild shrinkages during 1924 and 1927. The general movement of the annual totals suggests not so much a succession of four cyclical swings as a brief but clear-cut swing during 1919-21 and one major movement with the first trough in 1921, the peak in 1929 and the final trough, in so far as can be judged at present, in 1932.

The same movements characterize largely the flow of consumers' durable and producers' durable commodities, the volume of construction, and the flow of perishable and semi-durable commodities. But both net change in business inventories and net change in claims against foreign countries move quite differently (see Chart I). Neither exhibits the consistent rise from 1921 to 1929, which is an important feature of the major movement from 1921 to 1932 in the flow of finished commodities and of construction. Net change in business inventories shows marked fluctuations in close conformity with the three- or four-year cycle characteristic of general business conditions in this country during the post-War period. Net change in claims against foreign countries also fluctuates over brief intervals, but in no apparent conformity with the oscillations in general business conditions. Both elements exhibit through the post-War period a downward trend. Thus the percentage of gross capital formation accounted for by the sum of net change in business inventories and net change in claims against foreign countries was, for volumes in current prices,

Table 6

RISE AND DECLINE IN THE MAJOR MOVEMENT OF 1921-33 IN THE VARIOUS ELEMENTS OF GROSS CAPITAL FORMATION, INCLUSIVELY DEFINED, AND IN THE FLOW OF NON-DURABLE COMMODITIES

| | Rise, decline and total swing as percentages of the values in 1929 | | | | | |
| | A. Current Prices | | | B. 1929 Prices | | |
	Rise from 1921 to 1929	Decline from 1929 to 1933	Total swing	Rise from 1921 to 1929	Decline from 1929 to 1933	Total swing
1. Flow of consumers' durable commodities	44.7	62.8	107.5	56.0	55.1	111.1
2. Flow of producers' durable commodities	40.2[1]	68.6	108.8	42.8	61.5	104.3
3. Volume of total construction	42.1[2]	67.0[3]	109.1	47.8[5]	58.3[3]	106.1
4. All durable commodities	39.3	64.6	103.9	43.6	56.4	100.0
5. Gross capital formation	44.4	77.4[4]	121.8	49.4	74.1[4]	123.5
6. Flow of consumers' perishable commodities	25.9	43.2	69.1	25.7[6]	13.4[4]	39.1
7. Flow of consumers' semi-durable commodities	18.3[1]	47.3[4]	65.6	45.1[6]	24.5	69.6
8. Flow of non-durable finished commodities	23.6	44.3[4]	67.9	31.5[6]	15.2	46.7

[1] 1922-1929.   [3] 1928-1933.   [5] 1920-1928.
[2] 1921-1928.   [4] 1929-1932.   [6] 1920-1929.

29.2 in 1920, 11.6 in 1923, 8.0 in 1926 and 4.9 in 1929; for volumes in 1929 prices, the corresponding percentages were 23.4, 11.6, 7.2 and 4.9. One may conclude, therefore, that while the net change in business inventories and net change in claims against foreign countries are of minor importance in the *average* volume of gross capital formation over a considerable period, these two elements, especially the former, affect the annual fluctuations in the volume of gross capital formation significantly. A second conclusion is that the downward trend of these two elements, especially of net change in business inventories, offsets to some extent the consistent rise in the volume of finished durable commodities during the period 1921-29, thus suggesting a shift from capital formation in the form of inventories to that in the form of finished durable commodities.

In analyzing the timing and amplitude of variations shown by gross capital formation and most of its constituent elements, as well as by the flow of non-durable commodities, the comparisons and measurement could be advantageously subdivided into two groups: those for the major movement from 1921 to 1933, and those for the years of recession and depression in business at large, not included under the major movement, viz., 1924 and 1927. The evidence in respect of the timing and amplitude of the changes in the major movement from 1921 to 1933 is presented in Table 6. The conclusions may be summarized as follows:

1. In so far as timing can be judged from annual data, most of the elements of capital formation and of the flow of non-durable commodities show in the major movement a trough in 1921, a peak in 1929, and a trough in 1933. But in a few of the elements there is some departure from these dates. The flow of producers' durable and of consumers' semi-durable commodities, when measured in current prices, shows the first trough in 1922 instead of 1921; while in the estimates in 1929 prices the first trough in the flow of both consumers' perishable and semi-durable commodities occurs in 1920. The volume of construction, both in current and 1929 prices, reaches its peak in 1928 rather than in 1929. Finally, a number of the elements reach their trough in 1932 rather than in 1933: gross capital formation in both current and 1929 prices, flow of consumers' semi-durable commodities in current prices, of perishable commodities in 1929 prices, and the total flow of non-durable, finished commodities in current prices. But by and large, the similarity of the timing of the various processes listed in Table 6 in the major movement from a trough in 1921 to a peak in 1928 or 1929 to a trough in 1932 or 1933, is sufficiently great to allow comparisons of the amplitudes of their fluctuations.

2. In respect of amplitude, the movement in the flow of consumers' durable commodities, producers' durable commodities, and the volume of construction is much the same, whether the volumes are measured in current or 1929 prices. Similarly, the percentage rise to 1928 or 1929 and the percentage decline thereafter is fairly similar for these three elements, with the following interesting exceptions: (a) the flow of consumers' durable commodities shows a greater rise to 1929 than the other two elements, both in current and in 1929 prices; (b) the flow of producers' durable commodities, while showing the smallest rise to 1929 of the three elements, shows the greatest decline from 1929 to 1933. This result may be somewhat affected, in the case of the volumes measured in 1929 prices, by the inadequacy of price indexes for producers' durable commodities; and in the case of construction, whether in current or 1929 prices, by possible errors in our estimate. For this reason the difference just noted in the amplitude of rise and decline in the three parts of the total of finished durable commodities should be treated as highly tentative.

Chart II
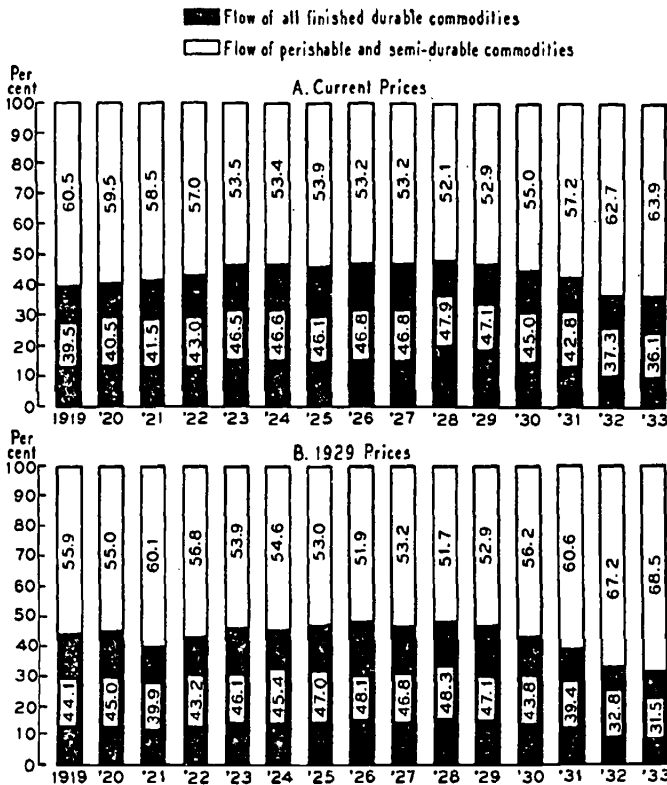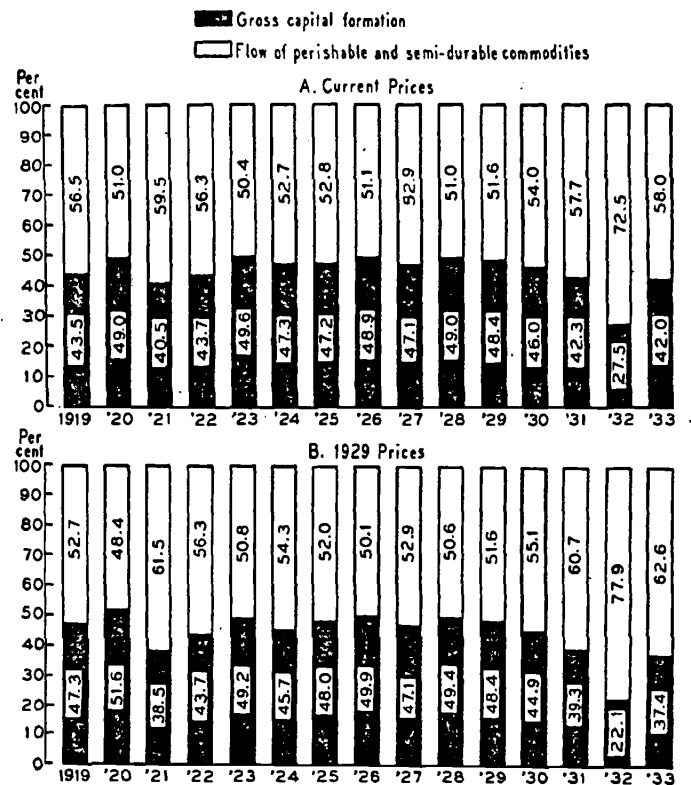PERCENTAGE DISTRIBUTION OF THE TOTAL
FLOW OF FINISHED COMMODITIES

■ Flow of all finished durable commodities

☐ Flow of perishable and semi-durable commodities

A. Current Prices

Per cent	1919	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33
White	60.5	59.5	58.5	57.0	53.5	53.4	53.9	53.2	53.2	52.1	52.9	55.0	57.2	62.7	63.9
Black	39.5	40.5	41.5	43.0	46.5	46.6	46.1	46.8	46.8	47.9	47.1	45.0	42.8	37.3	36.1

B. 1929 Prices

Per cent	1919	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33
White	55.9	55.0	60.1	56.8	53.9	54.6	53.0	51.9	53.2	51.7	52.9	56.2	60.6	67.2	68.5
Black	44.1	45.0	39.9	43.2	46.1	45.4	47.0	48.1	46.8	48.3	47.1	43.8	39.4	32.8	31.5

Chart III
PERCENTAGE DISTRIBUTION OF GROSS
DOMESTIC COMMODITY OUTPUT

■ Gross capital formation

☐ Flow of perishable and semi-durable commodities

A. Current Prices

Per cent	1919	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33
White	56.5	51.0	59.5	56.3	50.4	52.7	52.8	51.1	52.9	51.0	51.6	54.0	57.7	72.5	58.0
Black	43.5	49.0	40.5	43.7	49.6	47.3	47.2	48.9	47.1	49.0	48.4	46.0	42.3	27.5	42.0

B. 1929 Prices

Per cent	1919	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33
White	52.7	48.4	61.5	56.3	50.8	54.3	52.0	50.1	52.9	50.6	51.6	55.1	60.7	77.9	62.6
Black	47.3	51.6	38.5	43.7	49.2	45.7	48.0	49.9	47.1	49.4	48.4	44.9	39.3	22.1	37.4

3. Gross capital formation, both in current and in 1929 prices, shows a rise to 1929 and a decline to 1932 significantly larger than that in the total of all durable commodities. This difference is obviously due to the inclusion in gross capital formation, widely defined, of net change in business inventories, which is negative in 1921 and 1932 and positive in 1929. We can thus estimate the amplitude of gross capital formation, were it defined more narrowly. The exclusion of parts, repairs, servicing and unallocable construction would increase the amplitude over that shown in Table 6, because it would reduce the total to which negative change in business inventories in 1929 and 1932, and positive change in 1929, would be added. The further exclusion of net change in business inventories would, however, reduce the amplitude of the movement of gross capital formation below that shown in Table 6, bringing it down to that indicated for the total of all durable commodities. The further exclusion of consumers' durable commodities would leave the amplitude at about the same level as is shown in line 4 of Table 6.

4. The most significant result of the comparison is the appreciably greater amplitude of the movement in gross capital formation and in the total of all finished durable commodities compared with that of the flow in the non-durable groups. This difference is true of the total swing in the volumes, in both current and 1929 prices; of the

rise to 1929 in both current and 1929 prices, with the single exception of the flow of semi-durable commodities in 1929 prices; and of the decline after 1929, in volumes both adjusted and unadjusted for price changes.

5. The difference in the magnitude of the decline after 1928 or 1929 between gross capital formation and finished durable commodities on the one hand, and the non-durable group on the other hand, is so appreciable and developed over so brief a period, that there is little doubt as to its significance or its persistence from year to year. But it may be contended that the disparity in the magnitude of the rise to 1929, shown in Table 6, is due only to the greater severity of the depression of 1921 in gross capital formation and in the flow of commodities in the durable groups; and that were we to observe the movement say from 1923 to 1929 (instead of from 1921 to 1929), such a disparity would not be found in the magnitude of the rise of the different groups in the nation's total output.

Some light on this contention is cast by Charts II and III which show the percentages formed by all durable commodities of all finished commodities, and by gross capital formation of the gross domestic output of all commodities. Chart II indicates that in current prices the percentage of finished durable in the total of all finished commodities rose steadily from 1919 to 1924, and then, after a slight decline in 1925, rose further to a peak in 1928.

In estimates in 1929 prices the movement of the same percentage is somewhat less sustained, showing a decline in every year of recession in business at large (1921, 1924 and 1927). But if we observe the peak years of business at large, we find the percentage increasing from 1920 to 1923, from 1923 to 1926, and from 1926 to 1928.

Since gross capital formation is more susceptible to variations at frequent intervals than the total of durable commodities, its percentage to gross domestic output of all commodities and services manifests less of a sustained movement than the percentages in Chart II (see Chart III). Nevertheless, the existence of an upward movement in these percentages from 1921 to 1928 is indicated with considerable consistency. Also, in both charts, the decline in the relative importance of finished durable commodities or of gross capital formation after 1928 is shown to be consistently sustained from year to year, until the trough is reached. The charts thus confirm the conclusion that the disparity in the amplitude of movement between gross capital formation and the volume of all durable commodities on the one hand, and the flow of non-durable commodities on the other, was a fairly sustained difference, both in the rise to 1928 or 1929, and in the decline thereafter to 1932 or 1933.

We may now consider the fluctuations in the various elements of gross capital formation and of the gross domestic output during those years of contraction in business at large, 1924 and 1927, which were not treated in connection with the major movement from 1921 to 1933. Annual data are, of course, a fallible guide in the study of cyclical contractions of that order, especially if we consider that the peak in general business activity in 1923 was reached about May, and in 1926 about October; and that the trough in general business activity in 1924 occurred about July and in 1927 about December. The annual aver-

ages are thus bound to distort the comparative magnitude of decline in these two contractions, and no attention should be paid in Table 7 to the difference in the magnitude or direction of change between the two periods covered. It is believed, however, that the general differences in the changes among the various groups of finished commodities and gross capital formation are sufficiently reliable to merit attention. The evidence of Table 7 may be summarized as follows:

1. Gross capital formation, whether measured in current or 1929 prices, shows the greatest susceptibility to the recessions of 1924 and 1927. The total volume of durable commodities reflects these depressions in a much milder fashion, especially when the volume is measured in 1929 prices. We can infer, therefore, that the susceptibility to these recessions of gross capital formation is due primarily to net change in business inventories.

2. Of the three component elements of the total of durable commodities, only the producers' durable group shows consistently a significant decline during these years of contraction in business at large. This is true for volumes measured both in current and 1929 prices.

3. The flow of non-durable commodities does reveal some susceptibility to the contractions in question, when the volume is measured in current prices. When correction for price changes is introduced, however, such susceptibility is not manifested. Neither perishable nor semi-durable commodities, taken singly, reveal a consistent response to these contractions in business at large.

4. Gross capital formation as a whole, and the flow of producers' durable commodities, show a greater decline from 1923 to 1924, and from 1926 to 1927, than does the flow of non-durable commodities.

It might be expected that the fluctuations in the various categories of gross capital formation, when the latter is

Table　7

CHANGE FROM 1923 TO 1924, AND FROM 1926 TO 1927, IN THE VARIOUS ELEMENTS OF GROSS CAPITAL FORMATION, INCLUSIVELY DEFINED, AND IN THE FLOW OF NON-DURABLE COMMODITIES

	Change in percentages of the value in 1923 and 1926, respectively					
	A. *Current Prices*			B. *1929 Prices*		
	Change from		Average change	Change from		Average change
	1923 to 1924	1926 to 1927		1923 to 1924	1926 to 1927	
1. Flow of consumers' durable commodities	5.5	—1.6	.45	8.0	—5.6	1.20
2. Flow of producers' durable commodities	—6.4	—3.3	—4.85	—9.9	—3.2	—6.55
3. Volume of total construction	—0.1	3.7	1.80	1.0	4.2	2.60
4. All durable commodities	—0.1	—0.4	— .25	0.1	—0.6	— .25
5. Gross capital formation	—9.3	—7.2	—8.25	—10.2	—6.6	—8.40
6. Flow of consumers' perishable commodities	4.3	—1.9	1.20	7.7	2.4	5.05
7. Flow of consumers' semi-durable commodities	—10.1	3.8	—3.15	—7.9	10.1	1.10
8. Flow of non-durable commodities	—0.6	—0.2	— .40	3.0	—0.5[1]	1.25

[1]Trough in 1928.

Table 8

FORMATION OF GROSS CAPITAL, INCLUSIVELY DEFINED, BY TYPE OF ULTIMATE USER, 1925-1933

Current and 1929 Prices

(*millions of dollars*)

A. *Current Prices*

Destined for use by	1925	1926	1927	1928	1929	1930	1931	1932	1933[2]
1. Consumers									
a. Consumers' durable commodities	8,664	9,316	8,887	9,175	10,058	7,892	5,885	4,022	3,737
b. Residential construction	3,050	2,965	2,856	3,095	2,127	1,222	900	311	276
c. Total	11,714	12,281	11,743	12,270	12,185	9,114	6,785	4,333	4,013
2. Business									
a. Total of producers' durable commodities, business construction and net change in business inventories	12,998	15,605	12,433	13,570	15,980	12,752	7,245	204	7,262
b. Total, exclusive of net change in business inventories	12,082	12,941	12,609	13,059	14,606	12,036	7,970	4,664	4,292
3. Public and semi-public agencies Total of public work construction and theatres, clubs, lodges, religious and memorial construction	3,103	2,997	3,438	3,334	3,000	3,488	3,035	2,144 ⎫	
4. Unallocable Total of net change in claims against foreign countries and unallocable construction	2,891	2,688	3,543	4,760	3,326	2,184	1,656	1,099 ⎬	3,604
5. Gross capital formation								⎭	
a. 1c+2a+3+4	30,706	33,571	31,157	33,934	34,491	27,538	18,721	7,780	14,879
b. 1c+2b+3+4	29,790	30,907	31,333	33,423	33,117	26,822	19,446	12,240	11,909

B. *1929 Prices*

Destined for use by	1925	1926	1927	1928	1929	1930	1931	1932	1933[2]
1. Consumers									
a. Consumers' durable commodities	8,733	9,734	9,189	9,343	10,058	8,223	6,544	4,690	4,513
b. Residential construction	3,059	2,965	2,862	3,104	2,127	1,262	1,077	420	387
c. Total	11,792	12,699	12,051	12,447	12,185	9,485	7,621	5,110	4,900
2. Business									
a. Total of producers' durable commodities, business construction and net change in business inventories	12,944	15,273	12,470	13,530	15,980	13,303	8,289	—843	9,281
b. Total, exclusive of net change in business inventories	12,139	12,901	12,662	13,051	14,606	12,470	8,801	5,641	5,359
3. Public and semi-public agencies Total of public work construction and theatres, clubs, lodges, religious and memorial construction	2,664	2,669	3,108	3,221	3,000	3,747	3,639	3,239 ⎫	
4. Unallocable Total of net change in claims against foreign countries and unallocable construction	2,785	2,599	3,459	4,718	3,326	2,295	1,952	1,498 ⎬	4,483
5. Gross capital formation[1]								⎭	
a. 1c+2a+3+4	30,185	33,240	31,088	33,916	34,491	28,830	21,501	9,004	18,664
b. 1c+2b+3+4	29,380	30,868	31,280	33,437	33,117	27,997	22,013	15,488	14,742

[1]The more inclusive estimates of gross capital formation (line 5a) differ slightly from the equivalent figures presented in Table 5 (part B, line 7) since, in the above table, the values in current prices of the various types of construction were deflated separately, whereas in Table 5, the total volume of construction was estimated in 1929 prices by use of a single composite index of cost of construction.

[2]Preliminary.

Table 9

PERCENTAGE DECLINE IN THE FORMATION OF GROSS CAPITAL, BY TYPE OF ULTIMATE USER, 1928-1933

Destined for use by	Terminal years between which change is computed	Current prices	1929 prices
1. Consumers			
a. Consumers' durable commodities	1929-33	62.8	55.1
b. Residential construction	1928-33	91.1	87.5
c. Total	1928-33	67.3	60.6
2. Business			
a. Total	1929-32	98.7	[1]
b. Total, exclusive of net change in business inventories	1929-33	70.6	63.3
3. Public and semi-public agencies	1930-32	38.5	13.6
4. Unallocable	1928-32	76.9	68.2
5. Gross capital formation			
a. 1c+2a+3+4	1929-32	77.4	73.9
b. 1c+2b+3+4	1928-33	64.4	55.9

[1]The entry for 1932 is a negative value.

classified by type of ultimate user (business, consumers, etc.) would show significant differences in amplitude, and possibly in timing; and this surmise is supported by the results of the comparison made above between the flow of consumers' durable and that of producers' durable commodities. Unfortunately, annual data on gross capital formation by type of ultimate user extend only to 1925, and allow us to study the differences in the magnitude of the decline after 1929 alone.

The annual estimates are given in Table 8, while Table 9 shows the relative decline of the various groups of gross capital formation during the recent business depression. The conclusions which the tables suggest may be summarized as follows:

1. Of the four groups, formation of gross capital destined for business use shows the most drastic decline

whether the measurement is in current or 1929 prices. This is especially true when net change in business inventories is included, but holds also when this element is excluded.

2. Construction for public and semi-public agencies, the only element which could be segregated under formation of gross capital destined for use by public and semi-public enterprises, shows the mildest decline of all. This is true of the comparison both in current and in 1929 prices.

3. Formation of gross capital destined for use by consumers did not decline as drastically as that destined for business use. But the difference in the magnitude of the decline in these two groups is not appreciable, when net change in business inventories is omitted from gross capital destined for business use.

4. In so far as the estimates for 1933 can be relied upon,

Table 10

FORMATION OF NET CAPITAL, DESTINED FOR BUSINESS USE, 1925-1933

Current Prices
(millions of dollars)

	1925	1926	1927	1928	1929	1930	1931	1932	1933[1]
1. Formation of gross capital, destined for business use									
a. Exclusive of parts, repairs and servicing and repairs and maintenance of business construction	9,986	12,479	9,379	10,530	12,770	10,052	5,208	—1,255	5,864
b. Same as (a) excluding changes in business inventories	9,070	9,815	9,555	10,019	11,396	9,336	5,933	3,205	2,894
2. Depreciation and depletion	4,673	5,162	5,169	5,439	5,800	5,800	5,586	5,084	4,922
3. Various estimates of the formation of net capital destined for business use									
a. 1a—2	5,313	7,317	4,210	5,091	6,970	4,252	—378	—6,339	942
b. 1b—2	4,397	4,653	4,386	4,580	5,596	3,536	347	—1,879	—2,028

[1]Preliminary.

and in so far as annual averages can be used to reveal properly the timing of cyclical processes, recovery from 1932 to 1933 has occurred in the formation of gross capital destined for business use, inclusive of net change in business inventories, and in construction for public and semi-public agencies. Thus, the rise from 1932 to 1933 in gross capital formation was due to an increase in inventories and to a rise in public construction.

In concluding this discussion, it may be of interest to present a tentative estimate of formation of net capital destined for business use. The difficulty of passing from gross to net capital formation, that is, the difficulty of correcting for the consumption of existing durable commodities, is not only in the lack of data. The very concept of annual consumption of commodities that last over a number of years suffers from ambiguity.

The estimate presented below of formation of net capital destined for business use is based on the assumption that the allowance for depreciation and depletion on the books of business firms describes correctly the volume of consumption of already existing, finished durable goods used by business firms. But we cannot assume with equal validity that this figure covers the consumption of parts, servicing, repairs and maintenance, a large portion of which is treated on the books of the business firms under maintenance charges. It is therefore best to subtract depreciation and depletion from gross capital (destined for business use), not inclusively defined, but exclusive of parts, repairs, and servicing. This still leaves two variants of formation of net capital destined for business use: one in which net change in business inventories is taken into account, the other in which it is excluded (see Table 10).

The striking decline in formation of net capital destined for business use is shown quite clearly in Table 10. In the first variant, inclusive of net change in business inventories, the peak is somewhat higher in 1926 than in 1929, and the negative figure for 1932 is truly striking. In the second variant, exclusive of net change in business inventories, the peak is markedly in 1929, and the trough is reached not in 1932 but in 1933.

Of course, these estimates have to be treated with considerable caution. Obviously, in periods of such rapid change in economic conditions as that since 1925, the disparity between actual annual consumption of durable business capital and the depreciation and depletion allowance may be both large and variable. But the conclusions that the formation of net capital destined for business has declined much more drastically than gross capital formation of the same type, and that the former quantity was negative over a considerable period of the recent depression, appear to be warranted by the evidence.

IV. SUMMARY

Subject to the limitations imposed by the tentative character of our estimates, and by the annual character of the data, our main conclusions may be stated as follows:

1. Gross capital formation constituted during the post-War period a considerable portion of the nation's total production. Of the total output of commodities and services, corrected for duplications but not for the consumption of already existing finished durable commodities, gross capital formation, inclusively defined, accounted for about one-third. When parts, servicing, repairs and unallocable construction were classified in the non-durable group, the proportion fell to about one-quarter; and when a further reduction in gross capital formation was made by the exclusion of consumers' durable commodities, the weight in the total was reduced to slightly more than one-sixth. In view of the extreme variability of the flow of consumers' durable goods, its inclusion in gross capital formation, from the viewpoint of this study, was necessary. We may say, then, that under the narrowest definition of the concept of gross capital formation appropriate to the study, the proportion of gross capital formation in a corresponding total of the nation's output of commodities and services was about one-quarter.

2. Both in the major swing from 1921 to 1933, and in the years marking general business contractions, other than that which formed a phase of the major swing, 1924 and 1927, the fluctuations in the volume of gross capital formation were of an appreciably greater amplitude than those in the flow of non-durable commodities.

3. The greater amplitude of variations in gross capital formation in the major swing from 1921 to 1932 was due largely to the fact that the flow of consumers' durable commodities, of producers' durable commodities and the volume of total construction, each showed a greater rise to 1928 or 1929, and a greater decline to 1932 or 1933, than those observed in the flow of non-durable commodities.

4. The greater susceptibility of gross capital formation to the contractions of 1924 and 1927 was due to the fluctuations in business inventories and in the flow of producers' durable commodities. These two elements of gross capital formation, especially the former, appear much more sensitive to the cyclical fluctuations in business at large than the other elements of gross capital formation or than the flow of non-durable commodities.

5. Formation of net capital destined for business use declined during the recent depression much more drastically than did formation of gross capital destined for business use. During a considerable period of the recent depression, the value of net capital destined for business use was negative.

6. In so far as the preliminary estimates for 1933 can be trusted, and the timing of cyclical processes can be judged from annual data, the recovery in gross capital formation from 1932 to 1933 was due primarily to the increase of business inventories and the rise in public construction. When measured in current prices, the flow to households and enterprises of durable and of non-durable commodities has shown little change from 1932 to 1933. In terms of 1929 prices this total flow has shown a slight decline from 1932 to 1933.

In conclusion, a note of caution must be sounded with respect to the interpretation of the differences in movement between gross capital formation and the flow of non-durable commodities. Estimates such as are presented in this *Bulletin* are easily assumed to warrant the judgment that the disparities in the movements of the various economic elements during the period 1921-1929 represented a disturbance of the general economic equilibrium, and that both the absolute decline after 1929 and the disparities in the severity of this decline offer an example of the compensatory action of our economic mechanism. In view of this tendency to identify quantitative disparities with indications of abnormality, and quantitative similarities with indications of the existence of an equilibrium, it is important to point out that such disparities or similarities *in themselves* are not a sufficient basis for such a judgment. Gross capital formation may increase more rapidly, less rapidly or *pari passu* with the flow of non-durable commodities. This by itself indicates no over-investment, under-investment or the proper rate of investment of the national product in capital goods. Before judgment can be rendered, the disparity or similarity of the rates of change of these two streams in the total product must be related to parallel phenomena in the allocation of purchasing power, and interpreted in terms of long- and short-term aspects of supply and demand for the various groups of commodities subsumed under the broad divisions. The measurements offered in this *Bulletin* constitute only one among several sets of data needed to judge the economic implications of the changes which have occurred during the last fifteen years in the country's economic system.

APPENDIX

STEPS IN THE DERIVATION OF THE ESTIMATES AND SOME FURTHER DETAILS ON THE VOLUME OF PRODUCTION, CONSTRUCTION AND INVENTORIES

This Appendix describes briefly the data and our methods of estimating the formation of gross capital. It also supplies a few further details relating to the volume of production, construction and inventories. Both should provide a better foundation for understanding and interpreting the basic estimates discussed in the text.

1. *Output and Flow of Finished Commodities*

The essential steps in estimating the flow of finished commodities to households and enterprises may be outlined as follows:

(a) From the biennial *Census of Manufactures,* by a careful study of the value of products, the output of finished manufactured goods—inclusive and exclusive of parts —was estimated, in current prices at the factory door. For intercensal years these values were approximated with the help of various interpolating indexes, formed from data for Pennsylvania, from figures of *Statistics of Income* on corporate sales, and from other data available on the annual volume of manufacturing production. To the resulting value of manufactured goods was added—on a basis of data from the Bureau of Mines, the Department of Agriculture, and the Bureau of Fisheries—the value of output of finished, non-manufactured commodities, such as coal (used by final consumers), and some of the finished products of agriculture (milk, vegetables, fruits, fish, etc.). The final results were estimates of annual output of finished products, inclusive and exclusive of parts in so far as they are segregable, in current prices. The wholesale prices, as published by the Bureau of Labor Statistics, were used, group by group, to correct these totals for price changes. Thus we obtained the estimates of total output of finished products (inclusive of parts), in current and in 1929 prices.

(b) In passing from these estimates of the output of finished goods to the estimates of the flow of finished goods to households and enterprises, two adjustments were made: (i) for imports and exports; (ii) for changes in stocks in the hands of distributors. The former adjustment was based on the data on foreign trade of the Bureau of Foreign and Domestic Commerce, while the latter was based on our indexes of stocks of finished goods in the hands of distributors. The derivation of these indexes is discussed in Section 3 of the Appendix. Step (b) resulted in estimates of flow to domestic households and enterprises of the various groups of finished products, in current and in 1929 prices at the factory door.

(c) The addition for transportation charges and for distributive margins was made with the help of a rather detailed study of the *Census of Agriculture, of Mines and Quarries, of Manufactures* and *of Distribution* for 1929. For this year, for most of the commodity groups, we were able to estimate the flow of finished products at manufacturers' prices, and the total cost of this flow to ultimate users. (For most of the perishable commodities, the Census of Distribution was found deficient, and a somewhat different procedure—that of adding successive distributive margins to the value at manufacturers' or producers' prices was used.) The comparison of the two yielded the

approximate total spread between the value of finished commodities at the factory door and their value as they reached the households and enterprises. A study of the materials available on distributive margins and transportation charges indicated that the relative spread had undergone relatively little change during the post-War period, with the possible exception of 1919-21; and the evidence on the whole, justified the application of the total relative spread as ascertained in 1929 to all the other years in the period. This total relative spread, applied as a percentage to the flow of the goods, in current and in 1929 prices, yielded the estimates of the flow of the various groups of finished commodities to households and enterprises, at cost to the latter.

(d) Finally, the estimates of the cost of servicing and repairs were derived from the *Census of Manufactures* for the odd years 1919, 1921, etc.; and from the *Census of Distribution* for 1929. From the latter the charges for servicing of automobiles only were taken and extrapolated for other years by an index representing the number of passenger cars registered and an index of prices of consumers' durable commodities. The addition of the resulting estimates of the cost of repairs and servicing to the estimates arrived at as a result of step (c) provided the most inclusive figures of the flow of finished commodities to households and enterprises. Even these estimates fall short, since they do not include servicing provided by establishments other than retail or manufacturing firms, and omit servicing by retail firms in connection with consumers' durable commodities other than passenger cars.

The analysis of the various estimates used in the procedure just described reveals some interesting results, a few of which may be mentioned here. For example, the total spread between the value at the manufacturers' and producers' door and the cost to ultimate users of finished perishable commodities is 33 per cent of the latter figure, or 49 per cent of the former. Similar percentages for the other groups of finished commodities are: for semi-durable commodities, 30 and 43; for consumers' durable, 31 and 45; and for producers' durable, 15 and 17. The difference in the size of the total spread between producers' durable and all other finished commodities is quite striking. It is obviously due to the fact that a large proportion of producers' durable commodities is manufactured on an order basis and flows directly from the manufacturer to the ultimate user; and that the distributive services needed for a proper satisfaction of the demand for producers' goods, a large proportion of which comes from a few large business units, are much more limited than the services needed to distribute the other groups of goods to the vast number of households which demand them.

As a consequence of this difference in spread, the importance of perishable, semi-durable and consumers' durable commodities (exclusive of servicing) in the total of all finished commodities increases, and that of producers' durable commodities declines, as we pass from the measurement of output to that of the flow to households and enterprises. When, however, the allowance for servicing is added, it is found that the largest part is in connection with producers' durable goods. Consequently, the inclusion of servicing serves to raise the percentage accounted for by producers' durable in the total flow of finished commodities and related services back to the approximate level at which they stand in the total output of finished commodities.

Another significant result of the comparison between output and flow of finished commodities is the difference in the variability of these two sets of quantities in time. Output shows almost uniformly a greater amplitude of variations. In current prices, this is true of each of the four groups of finished commodities distinguished; it is just as true of the rise from 1921 or 1922 to 1929 as of the decline from 1929 to 1932 or 1933; and it is also characteristic of the recessions of 1924 and 1927. The same difference, with one or two exceptions, holds for the comparison in terms of 1929 prices. The statistical source of the difference is obviously in the changes in inventories of producers and distributors; and the economic rationale is the difference in response to changing market conditions among producers, distributors and ultimate users.

2. *The Volume of Total Construction*

The basic data employed in arriving at the volume of total construction were those on the output and flow of construction materials. From these data we arrived, by successive steps, at the estimates of the volume of construction materials consumed, and on the basis of the latter, at the estimates of the volume of construction. The steps may be outlined as follows:

(a) Total output of construction materials, at producers' current values, was estimated from the data in the biennial *Census of Manufactures,* data of the Bureau of Mines on non-manufactured construction materials, and state and other data for intercensal years. This annual volume of output of construction materials was corrected for price changes with the help of the Bureau of Labor Statistics index of wholesale prices of building materials, thus providing an estimate of output in 1929 prices.

(b) To pass from the output of construction materials to actual consumption in the process of construction, adjustments were needed for exports and imports; for changes in stocks held by the various agencies in the field, beginning with the producers and ending with the construction enterprises themselves; and for successive additions for transportation charges and distributive margins. The first cor-

rection was based, as usual, on the data on exports and imports published by the Bureau of Foreign and Domestic Commerce. The corrections for distributive and transportation charges were again made on the basis of a comparison of the *Census of Manufactures* and *Mines and Quarries* in 1929 with the *Census of Distribution*; while the adjustments for changes in stocks were based on a specially compiled stock index. The adjustments were made from stage to stage: from manufacturers to wholesalers; from wholesalers to retailers; from retailers to construction units. While the detailed figures at these successive stages are possibly subject to an appreciable error, it was felt that only such a successive correction would yield the best estimate of the volume of construction materials actually consumed in the process of construction.

(c) To pass from the value of construction materials consumed to the value of total construction, we needed an estimate of the ratio of the cost of construction materials to the value of the final product. Such a ratio is provided for various types of construction by the *Census of Construction* for 1929. The available evidence, scanty as it is, indicates that within each type of construction work, and in terms of constant prices, the ratio of cost of construction materials to the final value of the product tends to vary but little. Therefore, the ratio was allowed to vary only with the shift in importance of various types of construction work, shifts which may be gathered approximately from other available estimates of the volume of construction. These estimates are restricted in area of coverage but show construction by type. The application of the resulting ratio yielded the estimate of the total volume of construction in 1929 prices.

(d) A composite construction cost index was prepared from various indexes of cost of construction, such as the Bureau of Public Roads index of highway construction costs, the Richey electric light and power index, the American Appraisal Co. index of cost of construction, the Tuttle factory construction cost index, and others. The indexes were weighted by the approximate weights of the corresponding types of construction, as revealed by the currently available indexes of volume of construction by type. The application of this composite cost index to the volume of construction in 1929 prices yielded the final estimate of the volume of total construction in current prices.

It is obvious from this brief description of our procedure that the resulting estimates of total volume of construction may be subject to error. The critical steps in the estimates are the evaluation of the volume of construction materials and the establishment of the ratio of the cost of construction materials to the total volume of construction. An error in either will be reflected in the final totals. That such a procedure was adopted may be explained by the lack of inclusive estimates in this field, especially prior to 1925.

It is therefore highly important to compare our global estimates with the most inclusive estimates of the total volume of construction, based upon direct information on various types of construction activity. Table 11 presents the detailed estimates of the Federal Employment Stabilization Board for the period 1925-32,[1] and compares the totals derived from these estimates with our totals based upon the consumption of construction materials.

From the totals derived from the figures of the Federal Employment Stabilization Board, converted into indexes, with the value for 1929 as 100, and compared with the indexes of our estimates, we obtain:

	1925	1926	1927	1928	1929	1930	1931	1932
F.E.S.B.	101.8	102.9	105.0	106.6	100.0	88.9	66.8	38.7
N.B.E.R.	97.6	99.7	103.4	110.7	100.0	82.9	62.0	38.0

On the whole, our estimates show a somewhat more rapid rise from 1925 to 1928 and decline to 1930, the movement after 1930 being about the same in both indexes.

Our estimates indicate a volume of total construction larger than the sum obtained by adding the diverse types as measured by the Federal Employment Stabilization Board, the excess varying from a peak of about $4 billion in 1928 to a trough of about $1 billion in 1932. The reasons for this difference appear to be:

(1) The Board's estimates of private construction, based on the Dodge figures with the addition of farm construction, do not allow for the fact that the Dodge reports in the past failed to cover contracts under $5,000, or alterations and remodelling. The total estimate for this item by the Dodge Company amounted to $1.5 billion in each of the two years 1928 and 1929 (see Leo Wolman, *Planning and Control of Public Works*, National Bureau of Economic Research, 1930, p. 107). While some portion of this allowance is covered by the estimates of farm construction and by the Board's inclusive totals for public utilities, a considerable residue probably still does not appear in the Board's estimates.

(2) A small amount of private educational construction is omitted; and there appears to be some shortage in the figures on public construction in 1927 and 1928, when these are compared with the Dr. Wolman's estimates (see p. 126).

(3) The estimates for construction work by public utilities may be somewhat short, in so far as the accounting of the public utilities may fail to impute to cost of construction the full share of overhead expenses incurred.

[1] The Board's preliminary figures for 1932 were revised by us in the light of recent data, in accordance with the procedure of the Board.

Table 11

Allocation of Total Construction by Type, 1925-1932
Current Prices
(*millions of dollars*)

	1925	1926	1927	1928	1929	1930	1931	1932
1. Residential	3,050	2,965	2,856	3,095	2,127	1,222	900	311
2. Commercial	968	1,022	1,036	982	1,031	684	345	136
3. Factories	363	523	417	565	606	285	129	48
4. Theatres, clubs, lodges, religious and memorial	386	385	393	311	224	188	129	47
5. Farms	470	470	473	463	463	367	258	125
6. Total private	5,237	5,365	5,175	5,416	4,451	2,746	1,761	667
7. Railroads	1,223	1,371	1,339	1,280	1,370	1,230	812	479
8. Electric power companies	884	823	844	813	906	968	654	322
9. Telephone companies	502	534	545	613	795	817	604	439
10. Electric railways	242	207	205	194	194	189	155	98
11. Sub-total	2,851	2,935	2,933	2,900	3,265	3,204	2,225	1,338
12. Pipe-line companies						515	469	165
13. Gas companies						226	167	96
14. Telegraph companies						73	37	21
15. Waterworks companies						44	25	15
16. Total railroads and public utilities						4,062	2,923	1,635
17. Estimated total railroads and public utilities[1]	3,615	3,722	3,719	3,677	4,140	4,062	2,923	1,635
18. Cities	1,283	1,302	1,482	1,422	1,339	1,495	1,271	872
19. Counties	778	676	885	829	556	709	355	35
20. States (excl. Federal aid)	411	404	438	502	576	706	770	610
21. Federal (incl. Federal aid, excl. D. C.)	245	230	240	270	305	390	510	580
22. Total public works	2,717	2,612	3,045	3,023	2,776	3,300	2,906	2,097
23. Total derived from above (6+17+22)	11,569	11,699	11,939	12,116	11,367	10,108	7,590	4,399
24. Volume of total construction based on consumption of construction materials	14,032	14,343	14,876	15,919	14,381	11,921	8,920	5,458
25. Unallocable construction not covered under line 23 (24—23)	2,463	2,644	2,937	3,803	3,014	1,813	1,330	1,059

[1]For the years 1925 through 1929 this line was estimated on the basis of the 1930 relationship of line 16 to line 11.

(4) Finally, our estimates cover minor repairs and alterations, and construction work by non-construction enterprises other than public utilities and public agencies. It is interesting to observe that in the four constructional occupations listed in the *Census of Occupations* for 1930, painters, carpenters, plumbers, and brick and stone masons, a considerable number for each occupation appear as attached to industries that are neither in the construction nor in the public utility or public service groups.

Nevertheless, our estimates may still exaggerate the volume of total construction; and it is quite obvious that further, thorough analysis and reconciliation of the two types of construction estimates is necessary. This is especially important, since our estimates of total construction show a rise from 1921 to 1929 that is considerably milder than that indicated in such less inclusive estimates as the Federal Reserve Board's index of construction contracts awarded (based on Dodge data). Our estimates of the volume of construction are presented as first approximations, to be used jointly with other data in the field, and subject to possible revision in the final report of the study.

3. Business Inventories

Business inventories comprise the stocks of all finished commodities in the hands of their producers and distributors, and of unfinished commodities in the hands of their producers, distributors and industrial consumers. They do not include the stocks of finished durable commodities in the hands of their consumers, whether these be households or enterprises; nor do they include stocks of non-durable finished commodities, such as foods and clothing, in the hands of ultimate consumers, with the exception of farmers' holdings of their own products for eventual consumption.

The essential data relating to inventories are those on corporate inventories, reported by all corporations (with the exception of a small number, whose business constitutes about three per cent of the total corporate business of the country) to the Income Tax Bureau; and data on farmers'

harvestings and marketings, and occasionally stocks, which make it possible to measure the approximate volume of stocks of commodities held by farmers. The basic steps in arriving at the estimates of business inventories were:

(a) For all branches of business dominated by corporations, i.e., mining, manufacturing and public utilities, the annual data of *Statistics of Income* were used, and raised to cover the total by the ratio of the total value of product to the corporate value. For the service group, only corporate inventories were estimated, taken directly from *Statistics of Income*. For recent years not yet reported by *Statistics of Income*, extrapolating indexes were used, based on samples of large corporations. The ratio of the inventories to gross income in these samples was used to extrapolate a similar ratio for the corresponding industries. For years prior to 1923, inventories were estimated from a regression line of inventories on gross income, fitted to the data for the years covered by *Statistics of Income*.

(b) For branches of business not dominated by corporations, such as retail and wholesale trade, farming, and construction, other methods were employed. For farming, as indicated above, series on harvestings, monthly marketings, and the Census data on stocks in the hands of farmers were used. For retail and wholesale trade, inventories at the end of the year 1929 were given in the *Census of Distribution*. The ratio of inventories to sales was extrapolated for other years with the help of various interpolating indexes, such as that provided by the Federal Reserve Board's data on stocks and sales by department stores, data on corporate inventories and sales in the field of trade, similar data, but for more detailed subdivisions, in the corporate sample studied by Dr. Ralph C. Epstein. The volume of sales was itself estimated on the basis of the domestic output of products entering retail and wholesale trade. For construction enterprises, stocks for 1929 were estimated from corporate inventories, on the basis of a special breakdown of the Census data on contract construction into corporate and non-corporate; and for other years these total stocks for 1929 were extrapolated on the basis of a changing ratio of stocks to total cost of construction materials received during the year.

(c) All these operations under (a) and (b) resulted in estimates of the total volume of business inventories, by a number of minor divisions, in terms of current valuations. The correction for changes in these valuations was made with the help of the Bureau of Labor Statistics wholesale price indexes, and with due allowance in each case for the approximate age of the stocks. The assumption throughout was that inventories were being reported at cost or market, whichever lower. The corresponding application of the price indexes yielded the second set of estimates: business inventories in 1929 prices.

(d) Net changes in inventories in 1929 prices were obtained as successive differences of the estimates of inventories at the end of each year, in terms of 1929 prices. To obtain changes in inventories in current prices, the net changes in 1929 prices were multiplied by corresponding price indexes.

(e) The estimation of inventories of finished commodities (as distinct from inventories of all commodities, finished and unfinished) in the hands of distributors followed essentially the same procedure. The basic figures were derived for 1929 from the *Census of Distribution*, and estimated for other years with the help of indexes similar to those mentioned under (b) above. The correction of these inventories for price changes followed lines similar to those described under (c) and (d).

As indicated repeatedly, the final estimates of business inventories do not cover all the commodity stocks that should be taken into consideration in measuring gross capital formation. These estimates exclude stocks of unfinished and finished non-durable commodities in the hands of ultimate consumers and non-business agencies, and omit the business inventories of unincorporated establishments in the field of service. But even these incomplete estimates show a strikingly large figure for the total of business inventories for the country. The average volume for the post-War period as a whole is presented in Table 12. The classification, in this table, of inventories into perishable, semi-durable and durable is clear in the case of inventories of finished commodities. In the case of unfinished commodities, the characteristics of the preponderant eventual destined use form the basis of the classification. For example, stocks of raw cotton are classified under the semi-durable group, since the bulk of cotton is used in the production of clothing and attire.

Table 12

VOLUME OF BUSINESS INVENTORIES AND RATIO OF BUSINESS INVENTORIES TO FLOW OF FINISHED COMMODITIES

1929 Prices

| Commodity groups | Business inventories end of year | | Ratio of business inventories (average for the year) to flow of finished commodities and construction. Average for 1919-32 |
	Average volume for 1918-32 (millions of dollars)	Per cent of total	
1. Perishable	14,786	47.1	0.656
2. Semi-durable	5,835	18.6	0.658
3. Durable (including construction materials)	10,782	34.3	0.481
4. Total	31,404	100.0	0.580

An interesting comparison can be made between business inventories and the flow of commodities, its rationale being

the fact that business inventories are held largely in order to facilitate the eventual flow of the finished products. We can accordingly compute the ratio of business inventories held during the year (average of end-of-year and beginning-of-year inventories) to the value of the flow of finished commodities which these inventories, together with other factors of production, help to bring about. The averages of these annual ratios for 1919-32 are given in the last column of Table 12.

For the total of finished commodities and related services, business inventories amount to slightly less than six-tenths of the annual flow. But in the case of non-durable commodities the ratio runs at about 0.66, while in the case of durable commodities the ratio is appreciably lower. This difference in the stock burden is a matter of common knowledge, which the estimates above express with greater precision.

Dr. Kuznets is no newcomer to the readers of the National Bureau BULLETIN. *As a member of the staff of the National Bureau he is in charge of its studies of the amount and distribution of national income, and it was under his direction that the recently-issued estimates of national income, 1919-32, were made by the United States Department of Commerce with the cooperation of the National Bureau of Economic Research. The results of that study were presented in convenient summary form in* BULLETIN 49. *Dr. Kuznets is also the author of what is probably the most thorough study of the seasonal factor in business:* SEASONAL VARIATIONS IN INDUSTRY AND TRADE (*National Bureau of Economic Research, 1932*).

As indicated on the title page, the present study of gross capital formation was undertaken by the National Bureau at the request of a special Committee on Credit and Banking of the Division of Industry and Trade of the Social Science Research Council. Dr. David Friday is Chairman of the Committee on Credit and Banking and Dr. Meredith B. Givens is Secretary.

At the second stage of the credit and banking phase of its research in Industry and Trade, the Council proposes further studies of the financing of capital expansion and contraction during this same period. The first project at this second stage, a broad inquiry into the financing of real property, is soon to be undertaken by the National Bureau.

HUGH FRAYNE

The National Bureau regrets sincerely to record the death of Hugh Frayne during the summer. He had been a member of the Board of Directors, representing the American Federation of Labor, since February 1923.

THE BULLETIN

Subscribers receive in *Bulletin 52* preliminary findings of one of the major research projects being conducted at the National Bureau. Although the wealth of material available has resulted in a report considerably larger than that usually published in the *Bulletin,* making necessary an increase in the price of single copies to fifty cents, subscribers may expect another issue before the end of the year. In this last issue of the year, Dr. Mills will discuss price and production changes in American manufacturing industries during depression and recovery. Certain results of the 1933 Census of Manufactures, now being released, will be analyzed for the light they throw on this problem.

REVIEWS

Production Trends in the U. S. since 1870, by Arthur F. Burns ($3.50)

"At a time when the quantitative attack upon economic theory is marked by a bewildering mass of superficial and misleading investigations, it is a refreshing experience to examine a thoroughly workmanlike job such as the book by Professor Arthur F. Burns. Without necessarily endorsing all the methods or accepting all the findings of the book, the reviewer can speak with the highest enthusiasm of the work as a whole; and, without attempting to determine

with finality its place in the literature of economic statistics, one can heartily commend it to all thoughtful students as an outstanding contribution in the field of economic measurement. . . The reviewer closes the book with a feeling of profound satisfaction such as he rarely experiences in reading current contributions to quantitative economics."—W. L. Crum, *Quarterly Journal of Economics,* August 1934

Strategic Factors in Business Cycles, by John Maurice Clark ($1.50)

"Clark's book offers a most important contribution to the analysis and interpretation of cyclical movements. It substantiates once more the contention that no quantitative analysis is possible without a preliminary clarification of the data by the use of theoretical concepts and relationships; on the other hand, it shows that neither the working hypotheses underlying our thought nor its conclusions can be verified by "facts." Empirical evidence may suggest that certain conclusions are plausible or possible while others are inconsistent with reality. More can scarcely be expected from empirical observation in the economic realm where complex and inter-related short and long time fluctuations and secular trends lend the facts a peculiar aura of ambiguity. The serviceability of economic theory is not denied thereby; if it begins with correct assumptions and proceeds logically to conclusions compatible with facts it is just as effective as science is in the study of nature."—Emil Lederer, *Social Research,* May 1934

German Business Cycles, 1924-1933, by Carl T. Schmidt ($2.50)

"The author . . . has rendered an important service to students by providing, within the confines of some 280 pages, a summary of the salient factors which have affected the German economy since the Treaty of Versailles and the currency inflation of 1921-23. The main contributions of the study are an application of the technique of statistical analysis of representative time series as developed at the National Bureau of Economic Research. The evidence presented supports the view that most aspects of German industrial production, prices and finance passed through two cycles during the period 1924-32; the first of these cycles was approximately delimited by the dates December, 1923, and March, 1926, while the second began approximately in April, 1926 and continued until the late summer of 1932—one of the longest German cycles on record."—*Journal of the Royal Statistical Society,* Part IV, 1934