AN ESTIMATE OF CAPITAL FORMATION IN JAPAN BY "COMMODITY FLOW" METHOD

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I. *Intrcduction*

It is a recognized fact that the growth rate of the prewar Japanese economy surpassed that of any other country, especially in reference to her manufacturing industry. But the background of the high growth, i.e., her capital formation, even now remains unexplored and in an obscure condition.

At present, in order to estimate capital formation, the so-called "commodity flow method" is often used in foreign countries, especially in the U.S.A. In the U.S.A., an estimate from the side of production is taken primarily and an estimate from the side of moneyflows is only subsidiarily adopted. On the contrary, in the case of Japan capital formation has been estimated almost entirely from financial statistics. The housing building alone is computed from building statistics, and the industrial funds, excluding the so-called "overlap between investment moneyflows", are regarded as corresponding to investment for equipment and inventories. In Japan, private capital formation as announced officially, consists of, (1) producers' durable equipment (including every construction except housing building), (2) housing and, (3) changes in inventories. Among these, (1) and (3) are estimated from the money side.

From the 1930's to the end of the War, the above method was used, and, after the War, it was changed. A new estimate was introduced by utilizing the "Unincorporated enterprises survey" and the "Corporated enterprises survey." This, however, does not stand for a change of estimation from the money side to the real side. Even if, by the above surveys, we might find the increments in the current value of fixed assets (exclusive of land) and inventories, this would be nothing but an estimate from the money aspect, as far as these increments are not deflated by price changes, because a mere revaluation of assets will cause an apparent increase or decrease in their values. Imagine that a price adjustment is made, but still a difficult problem arises and this is that various assets have been purchased or constructed at different points of time, and that the times of evaluation are completely different, thus making invalid the use of a com-

posite price index as a common deflator. Especially in post-war Japan, there have occurred among various lines of firms a discontinuous and discrete revaluations of fixed assets in order to fill the tremendous gap between current and original prices caused by the severe inflation. In such a case, price deflation is by itself a difficult and almost impossible matter, and so capital formation in the postwar period had no other way than to be represented by the original figure without a price deflation.

On the other hand, we come across with another difficulty when we estimate capital formation from financial statistics and this is the "overlapping between different investment moneyflows". We find an overlap if there are holding companies which invest the funds collected by issuing their stocks to the other companies' stocks or debentures. Moreover, the money supply by issuing new stocks does not always be embodied in the new real assets.

In Japan, the "commodity flow method" has never been employed in order to estimate a capital formation. There is, of course, severe lack of statistical data, and the application of the method is limited in Japan, but we must take step in order to overcome this difficulty.

II. *The Meaning of "Commodity Flow Method"*

There are two approaches in estimating capital formation from the'real' side ; one is a method, by which the increment of real 'reproducible wealth', excluding land etc., from national wealth statistics is seeked, and another is the so-called "commodity flow method", which aggregates part of various products that flow into capital formation. We shall at first explain the main skeleton of the latter method by following Simon Kuznets' exposition.[1]

Kuznets considers there are two methods to estimate of capital formation from the real side ; one is the flow-of-goods method, which will be explained in this essay, and another is the change-in-stock method, which is applied, for example, to national wealth statistics. But the flow-of-goods method is not sufficient to obtain the total figure of capital formation, because although investment for producers' durable equipment and construction can be estimated by it, the estimate of investment for inventories cannot be drawn by it, and the use of the change-in-stock method jointly is inevitable. Kuznets employs both methods.

The various flows of commodities are broken down by Kuznets as follows :

[1] Simon Kuznets, *Commodity Flow and Capital Formation*, 1938, Vol. 1.

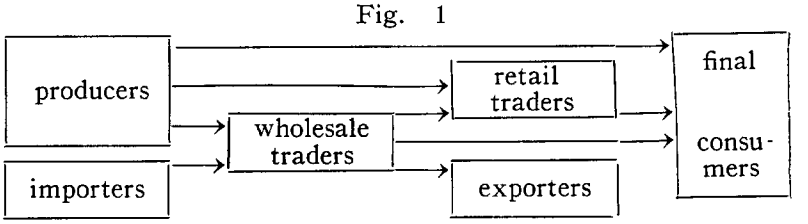
- I. commodities
  - 1. finished
    - a. perishable
    - b. semidurable
    - c. consumers' durable
    - d. producers' durable
  - 2. unfinished
    - e. construction materials
    - f. other unfinished
- II. servicings and repairs of durable goods

He pursues the path of flow of various commodities according to the above classification, and estimates the two major parts of GNP, that is, consumers' goods and capital formation (inclusive of public capital formation) as carefully and precisely as possible, excluding (f) and adding some other elements.

But, since we are only concerned with the estimate of capital formation, we may only pick up what resulted in capital formation in the above breakdown. First, we must select the following : producers' durable equipment, construction materials and servicings in order to derive gross capital formation (inclusive of private and public). Changes of inventories alone must be estimated in a different way. The most difficult case in the classification is where one commodity is used in more than two directions. In case of such "mixed commodities", it is necessary for them to be allocated among different uses, in such a way that a certain percentage goes into unfinished goods, another particular percentage flows into producers' durable equipment, the other is used as construction materials, and so on, by making use of the Census of Distribution and others. This decomposition of mixed commodities is the first difficult problem we shall have to deal with.

Kuznets seeks after the process in which various commodities moves from producers or importers, through different kinds of distribution stages, on to the final consumers or exporters. The analysis of the process of this distribution is very important, because the question of whether the amounts of freights or distributive margins until the goods arrive to the final consumers are large or small, depends upon the difference and length of the distribution processes. In Japan, however, we have no perfect "Census of Distribution", and this is the second difficulty in trying to apply the commodity flow method to estimate the capital formation.

Fig. 1



To show the process in a nutshell, first the whole of finished goods inclusive of producers' durable goods, will pass through the process of Fig. 1, then the amount of imported goods will be added and from here the amount of exported goods, will be deducted. Moreover, as the adjustments of freights and distributive margins will be made, we shall finally deduce the value for the final consumers (users). Kuznets postulates, then, that imports will be injected in the stage of wholesalers and exports too will flow out at the same stage. Furthermore, parts implements of consumers' durables are considered to be unfinished, and yet producers' durables parts are treated as finished commodities.

Construction too is treated in a similar way. At first, the value of construction materials is totalled, then adjustment is made so as to swell its value to that of the construction itself. That is, the output of construction materials is adjusted and transformed into the value of their sales by taking into consideration the changes of their stocks, then allowance for exports and imports of construction materials is made and freight is added. Finally, the value of labor and profit is added to that of the materials adjusted as mentioned above. This method is called by Kuznets the 'global estimate' and checked with the 'by type' estimates (with reference to housing building, business construction, public construction, etc.).

Lastly, changes in inventories are estimated with regards to their net increase or decrease considering the entire fields of commodities, inclusive of those in the process of production and distribution, but exclusive of those nondurables in the hand of final consumers.

Thus, Kuznets follows closely the every flows of various goods in order to get the amount of the national product, and reach the value of the final product at their final stage, not only with reference to capital formation but also to consumers' goods. Of course, constructions, as a part of capital formation are still the unfinished goods at the first stage as construction materials, but they are to be transformed sooner or later into finished goods as construction works are completed.

The greatest obstacle in the application of this method in Japan is that there is no perfect " Census of Distribution ". But in so far as the producers' durable equipment is concerned, there are only a few "mixed commodities". This is why I am moved to undertake this unexplored research in Japan.

III. *Prewar Capital Formation*

Our estimate of prewar capital formation will be restricted to the period 1919-1936, largely owing to the limitation of statistics, such as the " Census of Manufactures". Our estimate cannot separate private from public capital formation, because, as already stated, we have no large-scale " Census of

Distribution", so that we cannot but estimate total capital formation including public capital.

1. *Investment for producers' durable equipment*

The amount of output in the machinery industry will be a basic figure to estimate the value of investment for producers' durable equipment, but the former is not the same as the latter. We must deduct such items, as consumers' durable goods, durables of less than three years, construction materials, and unfinished commodities. Thus the following items will be deducted; electric fans, heaters, electrical insulated wire and cables, storage batteries, printing type, elevator, thermometer, clinical thermometer, watches and clocks, camera, electric lamps, lenses, telescopes, binoculars, microscopes, musical instruments, phonograph, bicycle, "Jinrikisha", carts, valves and cocks, gas and water pipes, other fixtures, and so on. Although microscopes, bicycles, "Jinrikisha" and carts may be regarded partly as producers' durable equipment, we shall assume these portions as being offset by the other unspecified part of "mixed commodities", and neglect them. And items to be included will be such as: steam boiler, gas generator, prime mover, electrical machinery (electrical generator, transformer, electromotor, communication equipment, etc.), agricultural and construction machinery and tools, various kinds of industrial machineries, machine tools, crane, hoist, pump, hydraulic press, voltage regulator, measuring instruments,* electric meter,* mechanical testing instruments, laboratory, scientific and engineering instruments, surgical, medical and dental instruments, surveying and drawing instruments, computing machines, typewriter, etc.,* searchlight, safes,* transportation equipments (locomotives, train and freight cars, electric cars, vessels, riggings, airplanes, motor vehicles, motor cycles and other parts), gears, speed changers, bearings, firearms, shots etc., and other machineries.

Among the above, the items with an asterisk bear the nature of mixed commodities between consumers' durables and producers' durables, and the portion in the nature of consumers' durables is assumed to be offset by bicycles, "Jinrikisha", etc. already mentioned. Particularly to be noticed in this case is the fact that we assume motor cars as producers' durables, because in Japan motor cars as contrast with the U.S. haven't been used for household purposes.

The resulting figures derived from the above process are not yet those of home-made producers' durable equipments. First, they do not involve machines produced by small scale factories where the number of manual workers are less than five. But this proportion seems to be a small fraction as far as machinery production is concerned. It would be rather wiser for us to assume that machine output from such household industry is to be offset in the amount by machine parts, which are doubly entered into the

statistics of finished machines... Second, as we attempt to estimate the gross capital formation, the servicings and repairs of equipments should be included. Third, the amount of output in the "Census of Manufactures" does not include those produced by factories operated by state and local governments. So, we shall adopt a convenient device where in order to obtain this amount the private machinery output will be multiplied by the ratio of the employees of government and municipal factories on the one hand and private factories on the other. In this procedure, it is postulated that the same level of productivity prevails between the two kinds of factories. But, in fact, the average productivity of private factories seems to be lower than the government ones, because the former are probably of smaller scale than the latter. As we may consider that a relatively large proportion of machine output was produced by government factories, this is likely to be one of the most important causes of the probable underestimation of producers' durable equipment. Our estimate is, however, in the nature of preliminaries, and we must postpone the fuller estimate into the future.

Table 1 represents an estimate of the home production of producers' durable equipment, after giving allowance for the output of government

Table 1. *Home Production of Producers' Durable Equipment*

	Output in machinery industry (a)	Producers' durable equipment [among (a)] (b)	Servicings and repairs in machinery industry (c)	Output of machinery by govt. and municip. factories (d)	Home production of producers' durable equip. [b+c+d] (e)
	thousand yen	thousand yen	thousand yen	million yen	million yen
1914	110,900	93,465	6,903	106	206
1919	716,241	626,252	37,732	323	987
1920	888,020	783,879	47,737	438	1,270
1921	568,322	488,124	37,746	308	834
1922	545,447	431,982	67,474	208	707
1923	392,066	285,181	49,055	144	478
1924	447,490	327,335	58,031	142	527
1925	458,570	347,883	48,647	148	545
1926	538,917	392,462	54,998	163	610
1927	582,961	410,985	62,390	189	662
1928	629,926	455,162	57,141	186	698
1929	682,162	533,233	53,090	246	832
1930	615,683	465,702	41,439	216	723
1931	443,341	324,427	35,185	147	507
1932	543,842	397,508	36,893	186	620
1933	805,115	607,047	53,156	235	895
1934	1,082,073	818,418	65,727	298	1,182
1935	1,380,583	1,090,601	71,178	90	1,252
1936	1,609,254	1,418,312	95,245	90	1,604

Source: "Kōjō Tōkeihyō" (Census of Manufactures).

and municipal factories (which is derived from Table 2) and the servicings and repairs of equipment. Column (b) of Table 2, i.e., the employees of municipal factories, is assumed to be 4,000 men before 1928, because we cannot find any statistics about it, but an error caused by this assumption seems to be negligible.

Table 2. *Estimate of Machinery Production in Govt. and Municipal Factories*

	Employees in govt. machinery factories (a)	Employees in municip. machinery factories (b)	(a+b) (c)	Employees in private machinery factories (d)	(c÷d) (e)	Output of machinery in govt. & municip. factories (f)
			thousand	thousand	%	million yen
1914	92,288	4,000	96.3	106.0	95.4	106
1919	110,814	4,000	114.8	254.4	45.1	323
1920	112,960	4,000	117.0	237.2	49.3	438
1921	111,316	4,000	115.3	212.0	54.4	308
1922	103,854	4,000	107.9	283.0	38.1	208
1923	91,373	4,000	95.4	260.3	36.7	144
1924	81,877	4,000	85.9	271.1	31.7	142
1925	80,001	4,000	84.0	260.9	32.2	148
1926	78,445	4,000	82.4	273.2	30.2	163
1927	87,524	4,000	91.5	282.7	32.4	189
1928	82,588	4,000	86.5	293.3	29.5	186
1929	80,478	4,098	84.6	234.9	36.0	246
1930	66,833	4,994	71.8	205.3	35.0	216
1931	59,530	4,013	63.5	191.4	33.2	147
1932	74,321	4,318	78.6	230.8	34.1	186
1933	81,208	4,011	85.2	291.6	29.2	235
1934	95,878	4,531	100.4	365.3	27.5	298
1935	23,054	4,464	27.5	424.4	6.5	90
1936	25,257	4,259	29.5	524.8	5.6	90

(1) (f)=(a) in Table 1×(e) in Table 2.
(2) Employees in municipal machinery factories before 1928 are assumed to be 4,000 men every year.

If further adjustments are made on Table 1 regarding home production of producers' durable equipment, such as exports, imports, freights, distributive margins and so on, then we shall have a series of figures corresponding to the investment for producers' durable equipment. In Japan, however, we cannot find any adequate statistical data for allocating the distributive margins among various stages of commodity distribution. Due to this, we roughly added an uniform rate of freight and distributive margin (15%) to the output adjusted by export and import (Table 3, column (h)→(i)). As the products are evaluated in the "Census of Manufactures" at the factory

Table 3. *Estimate of Investment for Producers' Durable Equipment*

	Home production of producers' durable equipment (a)	Its import from foreign countries (b)	Its import from Korea (c)	Its import from Formosa (d)	Its export to foreign countries (e)	Its export to Korea (f)	Its export to Formosa (g)	(a+b+c+d)−e−f−g (h)	Investment for producers' durable equipment (i)
1914	206,000	31,701		3	3,087	1,586	904	232,127	266,946
1919	987,000	112,006		282	24,448	11,847	7,783	1,055,210	1,213,492
1920	1,270,000	134,068		3	35,978	11,677	11,103	1,345,313	1,547,120
1921	834,000	142,644		—	18,269	6,553	8,013	943,809	1,085,380
1922	707,000	139,637	47	—	17,773	6,601	4,948	817,362	939,966
1923	478,000	145,665	487	3	11,253	8,219	3,562	601,121	691,289
1924	527,000	187,897	618	13	11,882	10,202	3,521	689,923	793,411
1925	545,000	138,637	663	11	14,967	8,866	4,818	655,660	754,009
1926	610,000	134,406	689	4	11,268	13,010	5,967	714,854	822,082
1927	662,000	119,031	592	25	15,066	14,712	7,224	744,646	856,343
1928	698,000	152,506	1,054	—	16,548	23,288	9,915	801,809	922,090
1929	832,000	173,505	1,396	2	23,864	25,738	9,655	947,646	1,089,793
1930	723,000	110,818	1,278	1	23,239	22,897	9,408	779,553	896,486
1931	507,000	74,329	1,210	—	21,042	16,118	6,788	538,591	619,380
1932	620,000	88,347	1,207	—	22,597	16,590	6,992	663,375	762,881
1933	895,000	102,485	1,394	—	38,240	26,518	8,302	925,819	1,064,692
1934	1,182,000	138,204	1,630	—	72,565	35,580	13,822	1,199,867	1,379,847
1935	1,252,000	151,185	2,682	—	79,314	55,225	18,047	1,253,281	1,441,273
1936	1,604,000	144,024	2,438	706	105,139	70,239	21,800	1,553,990	1,787,089

Unit: thousand yen

Sources: "Census of Manufactures"; "Nihon Bōeki Seiran}" (Foreign Trade of Japan, A Statistical Survey); "Nihon Gaikoku Bōeki Nempyō" (Annual Tables on the Japanese Foreign Trade); "Chōsen Bōeki Nempyō" (Annual Tables on the Korean Trade); "Taiwan Yonjūnempyō" (Forty years of Trade in Formosa); "Taiwan Bōeki Nempyō" (Annual Tables on the Formosa Trade).

delivery price, it is not adequate to compare them with exported and imported goods quoted at wholesale price basis or to make additions or deductions between them. But this drastic measure is an inevitable one owing to the lack of data. The process of estimate is shown in Table 3.

Then, why 15% is used as a ratio of freights and distributive margins? This is based upon the U.S. data of Kuznets, on the one hand, and the "Shōwa 5 nen Kokuminshotoku Chōsa Hōkoku" (Reports of National Income Survey in 1930) of Japan, on the other. Kuznets refers as "Total spread", the ratio between the producers' price and the total cost to consumers. This ratio was 65.6 % for perishables, 63.0 % in the case of semidurables, 63.1 % and 86.8 % respectively in regard to consumers' durables and producers' durables in U.S.A. The reciprocal of 86.8 % in the case of producers' durables, is 1.152, and we see freights and distributive margins were about 15 % compared with the producers' price. On the other hand, the "Reports of National Income Survey in 1930" suggest in p. 46 that "the ratio of net income to the cost price" was, in the case of wholesale trade for machinery, 18.14 % according to a sampling survey (if the expenses for advertising, light and heat, and repairs were added to net income, it would be 18.6 %). But in fact there were, of course, the direct purchases from producers to some extent, and the ratio 15 % seems to be fairly adequate.

The above estimate includes not only producers' durable equipment in the "peace-time concept", but also one which belongs to the "war-time concept", because, for example, warships are entered in the item of vessels.[2] Consequently, in our estimate, firearms, shots, airplanes, etc. are included, and in effect, it is the same as the estimate of capital formation by the so-called "war-time concept" of Simon Kuznets. In prewar Japan, it is not feasible to make such estimate in accordance with "peace-time concept", owing to the lack of statistical data. For instance, it is very difficult to separate military from private products in regard to airplanes.

2. *Investment for Construction*

It might be conceivable that investment for producers' durable equipment can be estimated fairly accurately, apart from the probable error arising from the assumption of equal comparative productivity between government and private factories. However, as regards to investment for construction purposes, the error of estimation is expected to be relatively large, for there are many commodities in construction materials which are in the nature of "mixed comodities", as compared with producers' durable equipment. Therefore, we must be careful to determine the amount of construction materials which actually flow into construction works.

[2] Simon Kuznets, *National Product in Wartime*, 1945, Part I, "Treatment of War Output".

Anyhow, our first task is to adjust the output of construction materials by their export and import. There are some obstacles in the way of this adjustment from the fact that the classification of commodities between production statistics and foreign trade statistics does not always coincide with one another. This inconsistency takes place not only in construction materials but also in producers' durable equipment. In such a case, we are compelled to neglect the probable error which may arise from our arbitrary decisions in reference to adjustments between statistics.

The items of construction materials may be enumerated as follows: clay pipe*, plate glass, brick and refractories, clay roofing tile*, cement, cement products, lime, asphalt*, pitch*, granite*, marble*, audesite* and other building stones, ballast*, lumber, furniture and fixtures, "tatami mats"*, repair and contract works in saw and planning mills, cast iron pipes, bolts, nuts, washers, rivets, nails, wire netting, rolled steel (steel plates and sheets, steel bars, etc., wire rods, steel wires, steel tubular products, rails, etc.), lead tubes, hardwares for furniture and fixtures, metal furniture, other construction materials, tin plates, galvanized sheets, electrical insulated wires and cables, gas and water pipe and other fixtures, repair and contract works in metal industry, elevator, "Urushi", wanisher, paints, industrial explosives, coal-tar, wall papers, asbestos, asbestos products, and so on.

The items with an asterisk are based on the "Shōkōshō Tōkei-hyō" (Statistical Bulletin of the Commerce and Industry Department), and not on the "Kōjō Tōkei-hyo" (Census of Manufactures). Whereas, the latter excludes the figures of small scale factories with less than 5 manual workers, the former includes almost the entire amount of production inclusive of small scale factories, although the commodities listed are extremely limited. But an existence of the "Shōkōshō Tokeihyo" was very useful for our estimate of construction. Although we cannot include, in principle, the output of government factories in this case, the only exception is rolled steel, as to the production of which we can include that of government factories. Rolled steel is a dominant construction material, and asterisked items include the production of household industry. Consequently, it can be said that a large part of production in small-scale industries and in government factories can be included.

Nextly, we shall adjust these gross figures (Table 4 (a)), with reference to import and export of construction materials (Table 4, (b)-(h)), through a series of Foreign Trade Statistics enumerated in the footnote of Table 3. Thus, we have home consumed construction materials. These figures, however, have not eliminated yet, what is to be allocated into non-construction uses, and they are in the nature of "gross". It is our next work to deduct a part of construction materials which is not used for the purpose of construction, and add to it freights and distributive margins, as well as the value added by the construction works. We find this in Table 7.

Table 4. *Production and Consumption of Construction Materials (gross)*

	Output of construction materials (gross) (a)	Its import from foreign countries (b)	Its import from Korea (c)	Its import from Formosa (d)	Its export to foreign countries (e)	Its export to Korea (f)	Its export to Formosa (g)	Construction materials consumed (h)
1914	94,449	43,023	4	188	10,518	2,990	5,455	118,701
1919	477,035	221,911	924	572	48,510	13,401	13,204	625,327
1920	485,568	282,815	5,673	1,652	52,640	10,044	21,772	691,252
1921	495,815	205,033	7,099	667	28,800	11,713	16,438	651,663
1922	490,522	257,931	6,451	2,487	26,789	12,320	11,081	707,201
1923	619,700	227,163	7,122	4,354	15,600	17,378	9,545	815,816
1924	628,626	346,569	5,476	4,052	19,333	14,952	9,523	940,915
1925	643,870	182,141	3,761	3,008	27,155	13,417	13,146	779,062
1926	712,753	234,344	3,704	4,337	23,238	19,203	14,251	898,446
1927	699,627	220,623	2,289	2,665	25,033	24,895	17,593	857,683
1928	782,567	232,161	2,259	1,999	28,283	29,833	20,580	940,290
1929	835,207	204,205	2,805	2,165	39,970	30,831	21,518	952,063
1930	622,389	119,754	2,368	1,317	32,670	27,967	19,172	666,019
1931	533,942	79,148	2,456	1,149	26,684	19,437	17,449	553,125
1932	650,709	78,694	1,706	1,799	30,982	27,335	20,848	653,743
1933	917,363	105,849	1,693	2,228	54,133	35,872	25,251	911,877
1934	1,180,269	107,953	6,031	1,876	101,081	52,266	28,666	1,114,116
1935	1,380,937	109,559	10,341	1,363	124,086	68,887	37,557	1,271,670
1936	1,469,707	111,114	11,081	2,030	127,236	87,797	42,430	1,336,469

Unit : thousand yen

Table 5. *Allocation of Rolled Steel between Different Uses*

(%)

	Railroad *	Cages for construction *	Shipbuilding	Machinery and iron industry	Petroleum gas, water works *	Mining *	Others	Total of *
1914								estimate 50
1919								estimate 50
1920								estimate 50
1921								estimate 50
1922								estimate 50
1923								estimate 50
1924	24.0	23.8	10.0	22.1	1.5	2.6	16.1	51.9
1925	24.0	27.3	9.9	23.4	1.1	2.2	12.1	54.6
1926	24.8	23.7	8.5	24.7	2.1	2.3	13.9	52.9
1927	23.8	20.7	9.3	22.7	1.5	2.5	19.5	48.5
1928	20.9	24.8	10.2	29.5	1.7	1.9	11.0	49.3
1929	14.8	31.2	9.8	24.2	2.5	1.8	15.7	50.3
1930	15.6	38.4	7.2	19.4	3.2	2.2	14.0	59.4
1931	11.6	32.7	7.4	23.0	3.3	2.6	19.4	50.2
1932	10.6	28.4	7.3	30.3	2.8	1.7	18.9	43.5
1933	17.9	27.2	10.2	37.5	4.9	2.4	9.9	42.4
1934	10.5	26.0	10.8	32.9	2.3	4.3	13.2	43.1
1935	8.1	26.9	10.2	34.7	2.6	2.2	15.3	39.8
1936	7.4	31.6	15.0	23.4	4.9	2.5	15.2	46.5

Sources : "Seitetsugyō Sankōshiryō" (Reference Data on the Iron Industry)

Table 6. *Consumpsion of Lumber in Japanese Mainland by Different Uses (1919)*

◉ building	21,882	agricultural implements and rice-rack	604	wood shavings (chips)	70
◉ mining	6,107	○furniture and fixtures	545	excelsior	37
pulp	2,116	for cultivating mushrooms	536	wooden pattern	24
packing	1,779	match stick, casket	258	pencil	24
cask and pail	1,302	lacquer ware	236	◉ wooden pipes of water-works	24
vessels	1,184	vehicles	233	float of fishing-net	22
◉ telegraph pole	1,010	×military purposes	203	for sports	13
◉ railroad tie	970	bobbin	174	bent frame	13
clogs	778	woods for camphor	110	for measuring	6
◉ public works, bridges	727	funerals and festivals	70	others	415
				Total	41,472

(1) Source : Teikoku Shinrinkai, "Teikoku Ringyō Sōran" (Japanese Forestry Association, "Survey of Japanese Forestry")

(2) ◉=74.1 %, ◉+×=74.6 %, ◉+×+○=75.9 %

Table 7. *Net Construction Materials and Investment for Construction*

	Construction materials consumed (gross) (a)	Lumber for non-construction use (b)	Rolled steel for non-construction use (c)	Others for non-construction use (d)	Net construction materials (e)	Freights and distributive margins (f)	Value added by construction (g)	Value of investment for construction (e+f+g) (h)
1914	118,701	1,224	28,336	2,039	87,102	13,065	80,434	180,601
1919	625,327	22,693	146,682	15,930	440,022	66,003	406,338	912,363
1920	691,252	29,927	164,974	12,830	483,521	72,528	446,507	1,002,556
1921	651,663	39,108	121,729	17,907	472,829	70,924	436,634	980,387
1922	707,201	42,699	106,947	27,182	530,373	79,556	489,773	1,099,702
1923	815,816	57,347	103,038	39,047	616,384	92,458	569,200	1,278,042
1924	940,915	62,402	143,255	38,602	696,656	104,498	643,327	1,444,481
1925	779,062	44,897	101,072	39,809	593,284	88,993	547,868	1,230,145
1926	898,446	53,702	108,460	50,436	685,848	102,877	633,346	1,422,071
1927	857,683	52,003	116,191	49,534	639,955	95,993	590,966	1,326,914
1928	940,290	52,911	134,254	56,144	696,981	104,547	643,627	1,445,155
1929	952,063	45,758	142,865	56,448	706,992	106,049	652,872	1,465,913
1930	666,019	32,122	74,736	49,668	509,493	76,424	470,400	1,056,317
1931	553,125	29,708	60,132	42,796	420,489	63,073	385,258	868,820
1932	653,743	27,664	113,524	49,668	462,887	69,433	436,531	968,851
1933	911,877	31,404	198,652	60,825	620,992	93,149	543,312	1,257,453
1934	1,114,116	34,202	267,615	78,087	734,212	110,132	650,888	1,495,232
1935	1,271,670	37,399	308,297	102,581	823,393	123,509	700,872	1,647,774
1936	1,336,469	41,382	250,726	115,318	929,043	139,356	1,004,041	2,072,440

Unit : thousand yen
Note : (a)=Table 4. (h)

Compared with the total value of construction materials, lumber, rolled steel and cement occupy fairly large proportions. Among these, almost all of the cement is put into construction, according to this statistics. On the other hand, we are well-informed on the details of allocation of rolled steel between different uses since 1924, by the "Seitetsugyō Sankōshiryō" (Reference Data on the Iron Industry). We assume that the portion of total rolled steel devoted to the use of railroads (inclusive of electric railroads), cages for construction, petroleum, gas, water works and mining, is for construction use, on the one hand, and assume that those for the use of shipbuildings, machinery and iron industry and others are for non-construction use. Table 5 indicates the percentages of rolled steel consumed in the form of various construction materials since 1924, but as to the period before 1923, we apply the same 50%, taking into consideration the trend of these percentages.

Next is the problem of lumber. Unfortunately we have no annual statistics in regard to its uses. But, on the "Teikoku Ringyō Sōran" (Survey of Japanese Forestry) (1924), we find a table on the consumption of lumber through different uses in 1919. (See Table 6). By this, we estimate the percentage of lumber allotted to the use of construction is 74%. On the other hand, Mr. Katsukichi Tanaka's *Saishin Mokuzai no Yōto* (*Recent Uses of Lumber*) estimated the proportions of different uses of lumber in 1939, including colonial lands. According to this, the proportion of lumber used for construction is 70%, and it is supposed that owing to the increase for military purposes it decreased gradually during the war. Consequently, we have estimated the percentage of lumber for construction purpose as 75%.

We, furthermore, have deducted one third of the values of cement products, furniture and fixtures, on the ground that there are duplications between the aboves and cement and lumber. Furthermore, tin plates, galvanized sheets, industrial explosives, asbestos products, paints, wanisher, "Urushi", bolts, nuts, etc., are deducted by particular rates, taking into consideration U. S. examples of them. It is assumed that one third of repairs and contract works of the metal industry are used for construction. Based on these assumptions, the total figure for non-construction use except steel and lumber is aggregated on the (d) column of Table 7. On this table freights and distributive margins are assumed to be 15%.

There is an estimate of value added by construction activities in 1930 by the Cabinet Bureau of Statistics, and the National Income Research Section of the Economic Counsel Board extrapolated it till the war-time period. We find some defects in these results, but we use them as preliminary figures of the value added by construction. In 1929, we can derive 80.3% as a ratio between the value added by construction and the net construction materials plus freights and distributive margins, and we apply

this constant ratio before 1928, thus estimating the annual value added. The income ratio (ratio between net income and gross output) is then postulated as 44.5% before 1928. The value of construction is finally determined after these process of estimation is ended. (See Table 7, where we can easily follow the course of estimation). The above estimate does not take account of those portions of special steel and non-ferrous metals (such as copper and brass) which are allocated into construction works. With the view of offsetting these parts as far as possible, we have not deducted a tomb-and monumental stone from stones in general. Even this will not be sufficient. Meanwhile, the output of construction materials by household industry and government and municipal factories will not always be covered in full. Generally speaking, estimates of construction as well as producers' durable equipment seem to be an underestimate rather than otherwise. But without further research in the future, we should not run into a hasty conclusion as to how much they are underestimated.

There remains a few additional words on the problem of freights. Our assumption was that freights and distributive margins is 15% in construction as well as in producers' durable equipment, and yet that this percentage is constant however severe fluctuations the economy may undergo. This

Table 8. *Freight Component in Prices*

	Proportion of freights in stone prices (a)	Proportion of freights in price of round timber of "Akita" cedar in Tokyo (b)	Proportion of freights in brick price (c)	Proportion of freights in total cost of ballast (d)
1914	12.3 %	15.7 %	— %	— %
1915	11.1	17.1	—	—
1916	10.9	16.0	—	—
1917	9.4	11.8	—	—
1918	9.7	8.5	—	—
1919	9.1	7.5	—	57.6
1920	9.8	5.5	9.9	58.9
1921	11.1	7.4	12.2	61.5
1922	11.5	7.4	13.7	62.3
1923	11.0	8.7	13.5	58.9
1924	11.2	9.2	22.1	59.5
1925	—	10.4	—	—

Source : Seibi Hijikata, *Studies in the Japanese Economy* (in Japanese) vol. 1, pp. 397-409.
Note : (a) is the average of five kinds of stones; "Inadaishi" (price at Akihabara), "Ōya-ishi" (price at Sumidagawa), "Mikage-ishi" (price at Iidamachi), "Kampū-ishi" (price at Akita) and "Hirafumachiishi" (price at Otaru).
(b) belongs to relatively low ratio group. In case of Hokkaidō lumber, freight component is about 40 %.
(c) is the average of four places; Banyū-gawa, Omoi-gawa, and Yūbari-gawa.

assumption, however, is very unrealistic. As freights are inflexible in general, compared with general price level, the proportion of freights in total cost is expected to rise in depression, and vice versa in prosperity. On the other hand, what kind of law prevails in reference to the behavior of distributive margins, is not accurate, but it could not be a constant ratio to total cost in this case too. Furthermore, the basic raw materials for construction is generally heavier and bulkier considering their prices than the producers' durable equipment, and so the proportion of freights may be higher in the construction than in producers' durable equipment, especially in ballast, building stones, cement and lumber. Consequently it appears to be somehow higher than 15%.

At least, a scattered (but a partial) data indicates that the ratio of freights is very high and very volatile in construction materials. Table 8 is an example. If we take into consideration the proportion of freights of "Hokkaido" lumber etc. (40% and thereabouts) besides Table 8, 15% (including distributive margins) may be an underestimate.

But, as a first approximation to an estimation of construction, we shall maintain this preliminary ratio of 15%. If we can get more detailed data, we may be in a position to add accuracy to our estimate.

3. *Some Analysis*

The investment for construction and producers' durable equipment does not cover the total of gross capital formation. In the present stage of our research, however, the overall estimate of another component 'changes in inventories' has to be postponed into the future. We cannot get, therefore, the true ratio of gross capital accumulation, if the sum of construction and producers' durable equipment is compared with GNP or national income. But, on Table 9, this kind of preliminary ratio is computed. It is inevitable for us to compare gross capital formation (inclusive of both private and public one) with national income, because in Japan the series of national income itself seems to have as much statistical error as the difference between GNP and national income.

We deflate the current series of national income and investment for producers' durable equipment by the wholesale price index with 1921-23 as a base, on the one hand. We deflate, on the other hand, the current values of investment for construction by using the price index with 1921-23 as a base derived by a simple arithmetical average of particular price indices of lumber, iron, nail, copper, stones, brick, roofing tile, cement, "Tatami mats" and plate glass. Thus, we get Fig. 2, which compares real capital formation (real producers' durable equipment plus real construction) with real national income.

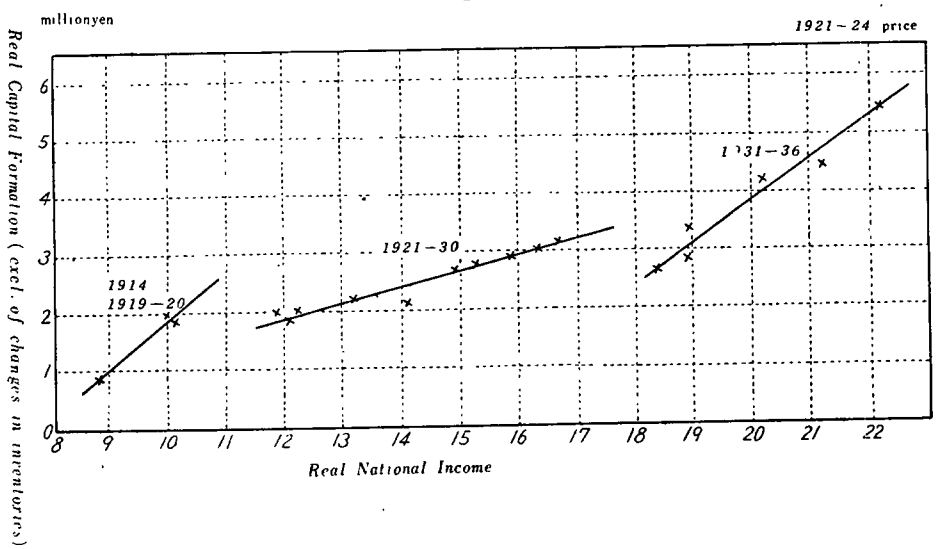
According to Fig. 2, the gradients of investment curves in 1914-20 and 1931-36 (both in the period of price-rise) are relatively steep, and that of

Table 9. *Capital Formation (exclusive of change in inventories)*

	Producers' durable equipment (a)	Construction (b)	(a+b) (c)	National income (d)	(c÷d) (e)	Real producers' durable equipment (f)	Real construction (g)	(f+g) (h)
1914	267	181	448	4,241	10.6	555	386	941
1919	1,213	912	2,126	12,834	16.6	1,021	834	1,855
1920	1,547	1,003	2,550	13,154	19.4	1,184	732	1,916
1921	1,085	980	2,065	12,055	17.1	1,074	977	2,051
1922	940	1,100	2,040	12,107	16.8	952	1,110	2,062
1923	691	1,278	1,969	12,117	16.2	688	1,208	1,896
1924	793	1,444	2,237	13,702	16.3	762	1,480	2,242
1925	754	1,230	1,984	14,304	13.9	742	1,452	2,194
1926	822	1,422	2,244	13,344	16.8	912	1,805	2,717
1927	856	1,327	2,183	13,051	16.7	1,000	1,810	2,810
1928	922	1,445	2,367	13,404	17.6	1,083	1,877	2,960
1929	1,090	1,466	2,556	13,941	18.3	1,302	1,901	3,203
1930	896	1,056	1,952	11,245	17.4	1,300	1,751	3,051
1931	619	869	1,488	10,678	13.9	1,062	1,583	2,645
1932	763	969	1,732	11,591	14.9	1,245	1,634	2,879
1933	1,065	1,257	2,322	12,963	17.9	1,557	1,838	3,395
1934	1,380	1,495	2,875	13,670	21.0	2,038	2,186	4,224
1935	1,441	1,648	3,089	14,952	20.7	2,041	2,478	4,519
1936	1,787	2,072	3,859	16,645	23.2	2,376	3,065	5,441

Unit: million yen

Fig. 2



1921-30 (in the period of price-fall) is less steep. The marginal propensity to invest (although it is an *apparent* one) is 0.7-0.8 in the former period and 0.3 in the latter period.[3] And yet in the latter period the intercept of curve appears to be conspicuously small. This is a first consequence of our research. Then what is the cause of a difference of curves according to a price-rise or price-fall period? We must not run to a sweeping conclusion, but try to analyse the main cause as far as possible.

First, if we take into consideration the relative rigidity of freights compared with the general price level, at least a part of difference of curvatures may disappear, since the proportion of freight component in price will be larger in the depression and smaller in the prosperity. If we consider this neglected fact into our process of estimation, a difference of curves will further be reduced. Secondly, in the period of price fall in prewar Japan, labor's relative share in the value added by manufactures increased, and the profit rate decreased, with the probable consequence of relative tempo of investment decreasing as compared with national income. On the contrary, in the prosperity period when the labor's relative share decreased and the profit rate increased, the slope of investment curves is expected to have been steeper and the average propensity to invest would probably have been larger. Lastly, in Japan where the relative importance of agriculture is rather high, it may be expected that fluctuations of the propensity to invest are more violent than any other industrialized countries.

The second conclusion of our statistical research is as follows: As seen from Table 9, investment for producers' durable equipment declined sharply in the price-fall period after 1920, not only in its current values but also in its real value. Investment for construction, however, was increasing rapidly just during the period of price-fall, as if it was an offsetting movement. Thus it played an important role in supporting the increase of industrial production just in the depth of the price fall. The major reason why producers' durable equipment declined so much, is due to the fact that an extraordinary rapid expansion of shipbuilding during the 1st Great War showed a drastic decline. Table 10 indicates the sharp decline of the price of ships and charterage (one tenth decline from 1918 to 1925!!), consequently, a heavy fall of shipbuilding. Furthermore the fact that from 1920 to 1923, the value of shipbuilding declined by ¥ 400 million in contrast to a decrease of machinery production ("Census of Manufactures") of about ¥ 500 million during the same period. Table 10 only shows the price of ships and charterage, but the decline of ocean freights was also conspicuous, and this very factor which depressed shipbuilding, in its turn, prompted the import of

[3] It is not correct to call this ratio the marginal propensity to invest, because it is the result of comparison between gross investment and net national income. Moreover, the whole of investment cannot be an induced investment. It is merely an 'observable' ratio, and not a 'schedule' ratio.

lumber. This is a very remarkable fact. The import of lumber increased cumulatively from ¥ 23.5 million in 1920, to ¥ 43.5 million in 1921, ¥ 84.8 million in 1922, ¥ 89.5 in 1923, and finally to ¥ 129.1 million in 1924. Influenced by these effects, the quantum volume of import of construction materials increased. Furthermore, the output of domestic construction materials increased owing to the rising demand which is accentuated by their relatively low prices, the advance of public investment, and the influence of the "Kantō-earthquake" in 1923.[4] The brisk increase of construction, notwithstanding the price-fall and decline of producers' durable equipment, formed an important basis for supporting the rapid growing trend of the prewar Japanese economy. This is a vital point which we must not neglect, together with the effect of export increase in our textile goods.

The third conclusion is that: When we observe the ratio of gross capital formation to national income, we are in a position to confirm that the investment ratios were almost in the range of 16-23 %, except in such extraordinary years as 1914, 1925, 1931-32. And a half of the years on Table 9 are within 16-17 %. Since the figures of our investment include public construction, it may appear that these ratios are rather small, but this is due at least in part to our underestimate as already pointed out, e.g. the probable underestimate of freights and distributive margins in construction, the assumption of equivalent productivity between private and govern-

[4] Our estimate of construction will be checked by tax statistics as follows: The "Shuzeikyoku Tōkei Nempōsho (Annual Report of the Bureau of Tax on Tax Statistics) enumerates as amounts of contracted works of contracting business which paid the "Eigyō-zei" (Business Tax), ¥ 118 million in 1914, and ¥ 402 million in 1920, ¥ 801 million in 1923, and ¥ 877 million in 1926. According to *Wagakuni no Doboku Kenchiku Jugyō* (*Construction Works in Our Country*) edited by the Japan Construction Contractors Association, however, the Bureau of Tax figure has the following limitations. (1) The amount of contracted works is not always limited to construction. (2) It may involve double countings due to the existence of subcontracts. These two will help over-estimating. On the other hand, there are some reasons which promote underestimation. (3) Tax evasion. (4) The existence of tax exemption point. (5) The exclusion of directly managed or controlled works by government. (6) The neglect of supplies of construction materials by government. *Construction works in our country* concludes that the construction works in the early years of the "Shōwa" era (from 1926 on) would have overrun about one billion yen (in pp. 124-128), but our estimate is 1.2 billion in 1925, and 1,4 billion yen in 1926, which seem to be a good approximation.

Table 13. *"Contracted Works" from the Bureau-of-Tax Statistics*

	thousand yen		thousand yen
1912	113,006	1920	401,954
1913	123,976	1921	543,916
1914	118,026	1922	646,134
1915	109,664	1923	800,613
1916	107,168	1924	832,563
1917	123,215	1925	877,191
1918	166,918	1926	876,705
1919	242,347		

ment machinery factories, and the neglect of the small-scale factories of less than five workers. Beside the above, we must bear in mind that our estimate of capital formation does not include investment for inventories.

Table 10. *Role of Shipbuilding in the Variation of Machinery Production*

	Output of machinery (a)	Output of Vessels (b)	$\frac{b}{a}$ (c)	Vessel price, median type, per ton, (new shipbuild.) (d)	Charterage (ditto) (e)
	mill. yen	mill. yen	%	yen	yen
1914	111	14	12.3	* 65	1.81
1918	—	—	—	725	23.09
1919	716	312	43.6	325	12.73
1920	888	468	52.7	320	7.18
1921	568	198	34.9	* 110	2.88
1922	545	146	26.8	85	2.17
1923	392	73	18.6	* 102	2.66
1924	447	74	16.6	* 82	2.14
1925	459	66	14.4	* 77	2.00
1926	539	63	11.7	—	2.32

Note : (a) is the value of output by private factories whose manual workers are more than 5 men.
(d) (e) are quoted from Hijikata, *ibid.* Vol. 2, p. 1263.
* in (d) column indicates an estimate.

It is logical to expect that in the rapidly developed Japanese economy the normal inventory coefficient (compared with sales) might have surpassed the world standard. A preliminary computation of inventory-sales ratio, from the Mitsubishi Economic Institute, "Hompō Jigyō Seiseki Bunseki", (Analysis of Japanese Business Achievements), and the derivation of changes in inventories adjusted by price changes is shown on Table 11, 12. There, the amount of production in the manufacturing industry (inclusive of those in government factories) are multiplied by the inventory coefficients in order to derive changes in inventories. The (f) column on Table 12 is the result of computation and indicates a rather severe fluctuation. Especially remarkable are the relatively large amounts in 1933 and 1934, i. e., ¥ 560 million and ¥ 366 million respectively. If these amount are added to the figures of producers' durable equipment plus construction, and compared with national income, the gross investment ratios are raised from 17.9 % and 21 % (in case that changes in inventories are not included) to 22.2 % and 23.7 % respectively. If inventory changes in commerce, mining and

Table 11. *Inventory Coefficient (Manufacturing)*

	Sales	inventories	inventories (l.h.) ÷Sales (f.h.+l.h.)
	thousand yen	thousand yen	%
1929 l.h.	1,190,—	767,—	
1930 f.h.	1,068,—	736,—	
l.h.	872,277	529,046	27.3
1931 f.h.	846,720	512,838	
l.h.	775,405	456,978	28.2
1932 f.h.	818,972	515,927	
l.h.	901,828	497,609	28.9
1933 f.h.	1,013,048	563,591	
l.h.	1,183,918	600,019	27.3
1934 f.h.	1,247,779	665,481	
l.h.	1,464,949	749,729	27.6
1935 f.h.	1,580,526	808,486	
l.h.	1,651,312	869,025	26.9
1936 f.h.	1,826,247	980,603	
l.h.	1,889,951	1,049,262	28.2

Table 12. *A Computation of Changes in Inventories (Mfg)*

	Wholesale price index		$\left(\frac{\text{mfg. output}}{\text{inventory coefficient}}\right)^{*}$	$\frac{c}{a}$	$\Delta\left(\frac{c}{a}\right)$	e×b
	December (a)	Yearly Average (b)	(c)	(d)	(e)	(f)
			million yen	million yen	million yen	million yen
1930	160.8	181.0	1,743	1,084		
1931	151.0	153.0	1,587	1,051	— 33	— 50
1932	184.6	161.1	1,891	1,024	— 27	— 43
1933	175.5	179.5	2,345	1,336	312	560
1934	181.1	177.6	2,788	1,539	206	366
1935	191.9	185.5	3,035	1,582	43	80
1936	214.9	197.5	3,588	1,672	93	178

* Inventories at the term end. Mfg. output include that of government and municipal factories and repairs and servicings but not that of factories, workpeople of which were below 5.

agriculture are included, the contribution of the addition of inventory changes in raising the gross investment ratios will be expected to be conspicuous. Therefore the figures and ratios on Table 9 are not the one which deny the high rate of capital formation in Japan.[5]

[5] Some held that in prewar Japan the investment ratio was about 20 % according to the estimate from the statistics of national wealth. This sort of estimate, however, is sometimes accompanied with a few defects as follows: Firstly, it excludes only land from total wealth, but not such non-reproducible wealth as mineral deposits, harbours and so on. Secondly, it includes the increment of consumers' durable goods too. Thirdly, the prewar national wealth estimate is not entirely reliable from the viewpoint of evaluation. The truth seems to be that the nation-wide capital coefficient would not have exceeded 4, and the net investment ratio would, on the average, have been around 15 % in the prewar period. Of course, our estimate of gross investment ratio is not feasible to be close to the net ratio, without an accurate estimate of capital consumption or depreciation. Recently in the U. S. A., the ratio of gross capital formation (inclusive of public construction) to GNP is about 20 % (and the ratio of net investment to NNP is about 15 %), and so apparently it cannot be said that the rate of capital accumulation in Japan was especially high. But the next three propositions must be considered in deriving the net investment ratio. First, Japan had imitated quite rapidly the highly advanced productive technique which has developed in Western countries with so many forward years, since the Meiji era, and therefore the capital consumption by obsolescence in Japan was far less than in U. S. A. Consequently, even if the gross investment ratio were 20 % as high as in U. S. A., the net investment ratio in Japan might be expected to be much higher. Secondly, in Japan, capital coefficient is said to be higher than that in the U. S. A., but we sometimes come across such a phenomenon as in Table 14, i. e., where physically computed capital intensity in the cotton textile industry of Japan is smaller than in any other country. This might be due to the fact that in Japan the relatively thick yarn was produced compared with U. K. and U. S. A., but, beside this, indicates that the physical capital coefficient in cotton spinning industry in Japan was comparatively low, thus facilitating the rapid expansion of output with a relatively small increment of capital stock. Thirdly, it must be taken into consideration that, even if the same ratio of gross capital accumulation prevailed as in U. K. and U. S. A., capital would have been invested more intensively and concentrated into the sector of manufacturing and construction in such a economy as Japan where the proportion of agriculture was very high. In this case, the aggregate growth rate include even the increase of growth rate due to the changing industrial structure.

Table 14. *Spindle-Raw cotton consumed Ratio*

	The number of spindle (a)	Raw cotton consumed per annum (b)	$\frac{a}{b}$
	thousand	thousand bales	
U. S. A.	37,585	6,395	5.9
U. K.	57,286	3,022	18.9
Japan	5,573	2,816	2.0
China	3,436	2,064	1.7
India	8,510	1,755	4.8
Russia	7,246	1,752	4.1
France	9,511	1,179	8.1
Germany	10,480	1,148	9.1
Italy	4,833	1,037	4.7

Sources: "Menshi Bōseki Jijō Sankōsho" (Reference Book on the Cotton Spinning Situation), 1926

IV. *Postwar Capital Formation* (1950)

As there is no more enough space owing to our detailed exposition of prewar capital formation, we shall leave for the future the presentation of our thorough-going studies in postwar capital formation. Here, we must be satisfied with a brief exposition of a result of estimation in 1950 only. The data used is: "Kōgyō Tōkeihyō" (Census of Manufactures) 1950, Vol. 1 as production statistics, "Nihon Gaikoku Bōeki Geppō" (Monthly Bulletin of Japanese Foreign Trade) as foreign trade statistics, "Tōyōkeizai Tōkei Geppō" (Monthly Oriental Economist Bulletin of Statistics) as procurement demand statistics, "Seitetsugyō Sankōshiryō" (Reference Data on the Iron Industry) 1949-1950 in order to determine rolled steel consumed as construction materials, and Rinsōkyō's "Supply and Demand of Lumber" in order to determine lumber consumed as construction materials. Moreover, we assume that as for producers' equipment, the ratio of freights and distributive margins unto the stage of wholesalers is 10 % and after that stage 7 % is needed as freights and installment cost (in this respect there is a difference from the prewar computation). Concerning construction materials, the ratio of freights and distributive margins is assumed to be 15 %. Thus, we shall compute at first the total product of producers' durable equipment and construction materials respectively. As to the postwar data, the statistics not only regarding factories of more than 4 but also those of less than 3 workers are available. The classification is different from the prewar one, but we tried to assort the two as far as possible.

Why is one half of procurement demand contract (from June 26 to December 24 in 1950) deducted, in Table 15 with regard to producers' durable equipment and construction respectively? This is because the amount settled was 39.7 % of the contract in 1950, but the supplies of goods would appear to have been even larger than the settled amount. So, 50 % will be probably adequate. Capital formation thus computed is the gross figure, inclusive of both public and private, but exclusive of changes in inventories. If the latter is included, the ratio to GNP will surpass 20%.

The estimate of capital formation in postwar period, officially announced by the National Income Research Section of the Economic Counsel Board, has weakness especially in the fact that changes in inventories are not adjusted by price changes. This is why changes in inventories amount to a high ratio of 54 % compared with private capital formation as a whole. As it were, inventory investment was, in estimation, swollen by inflationary effect, but even if this inventory investment had been estimated at its minimum level, gross investment ratio in the postwar period, nevertheless, would remain very high. This high rate of capital accumulation characterized the remarkable recovery process of the postwar Japanese economy.

Table 15. *Capital Formation in 1950*

—inclusive both public and private capital formation—

unit : million yen

(a) Producers' durable equipment		(b) Construction		Total	
Output	281,138	Output of Constr. Materials	392,795	(a) Producers' durable equipment	279,237
×1.10	309,252	×1,15	451,714		
-Excess export	38,615	-Excess export	31,586	(b) Construction	357,203
-{1/2 of procurement demand contract}	9,668	-{1/2 of procurement demand contract}	6,436	Total	636,440
				GNP	3,759,583
	260.969		413,692	Ratio of (a+b) to GNP	16.9%
×1.07	279.237	-Non-construction use	193,241		
			220,451	If income ratio in construction works is assumed to be 1/2, the above ratio become 19.2 %.	
		Added value*	136,752		
			357,203		

Note : (1) Added value * in construction industry is quoted from estimates by the National Income Research Section of the Economic Counsel Board.

(2) There is a difference regarding assumption of freights and distributive margins. 17 % of producers' durable equipment is due to the unpublished data of the National Income Research Section.

(3) According to the Economic White Paper, the direct investment for construction by government was ¥ 163.87 billion in the fiscal year of 1950 (about 46 % of total construction), but in it the expenses of constructive works charged to local governments do not appear to be involved. But the half seems to be public construction. If we assume investment for inventories was ¥ 133 billion and *private* capital formation exclusive of investment for inventories was ¥ 458 billion, then the ratio of private capital formation to GNP will be 15.7 %.