

Capital Formation in India: 1901-51

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An attempt is made here to estimate capital formation in India during the period 1901 to 1951 and to calculate the changes in the proportion of capital formation to national income.

Aggregate capital formation is broken down into (i) construction, and (ii) machinery and other equipment, and changes in the relative proportion of the two are examined.

AVAILABILITY of dependable estimates of national income and capital formation is the essential prerequisite for estimating the proportion of capital formation to national income. While considerable amount of fruitful work has been done by several scholars to arrive at a reliable series of long-term estimates of national income in India, specially for the period comprising the first half of 20th century, the field of capital formation has been comparatively less explored.

Recently some research studies to estimate capital formation have been conducted by the Central Statistical Organisation¹ (C S O), the Reserve Bank of India² (R B I) and National Council of Applied Economic Research³ (N C A E R). Estimates of capital formation released by these institutions cover the period between 1948-49 to 1960-61. But very little information is available about the volume of capital formation and its proportion to national income during the period earlier than 1948-49.

Other Estimates

There have been some noteworthy attempts. First of these was an estimate of capital formation for the whole of India covering the period between 1919 to 1938 by Colin Clark⁴. Clark's was not an original estimate of capital formation. He acknowledged his debt to an unpublished estimate by P J Thomas. He converted Thomas' estimate into international dollar units and, taking account of the balance of payments, he reduced this to internal saving in India. This estimate has been used by Clark in a somewhat adjusted form in his book "Conditions of Economic Progress"⁵. The second estimate is that of public capital formation in India by M J K Thavara⁶. His estimate covered the

period between 1898 to 1938, leaving out the first world war years.

An attempt has been made in the present study to estimate capital formation in India for the period 1901 to 1951 and calculate the long-term movement of the proportion of capital formation to national income. The study covers the whole of India excluding Burma and area covered by Pakistan after 1947.

What Is Capital Formation

Before discussing the methods of estimation, one or two points of reservation may be made. The first relates to definitions. Capital formation as measured here comprises additions to construction (including residential), to producers' durable machinery and equipment, and to business and government inventories. But some western economists are of the opinion that however defined, the customary measures of capital formation tend to underestimate the true volume. They also believe that customary measures exclude most of the investment in clearing land and other improvements made by farmers' own labour, an important component in the earlier period of development and current outlay on research and market promotion, an important component in later periods of development. Further, in a country bent on forcing the pace of economic growth with particular emphasis on industrialisation, residential construction hardly seems to be bonafide capital, comparable with railroad equipment, blast furnaces or even inventories.

However, according to some others, for certain purposes, neither this narrow definition of capital and capital formation nor the one used in here is proper; instead a much wider one is necessary. For example, if a long-term rise in national product per capita or per

worker is taken to describe economic growth, it may be desirable to define capital as the means to such a rise in national product per capita and capital formation as all uses of current product that contribute to such a rise. This controversy may be left at this level; it remains to be noted that the present estimate is based on the customary definition followed by workers in this field in India. The second point of reservation is about the data which are very patchy. Not only in under-developed countries but also in developed ones, long-period data on various channels of domestic financing of capital formation are exceedingly meagre. But the topic must be considered explicitly and whatever data are available must be used so that at least the relevant questions may be dealt with. This may assist future lines of enquiry based on adequately formulated principles.

Before presenting the actual estimate, the methods of estimation and the data used are described briefly. The study is mainly based on import data. For in the earlier period import contributed the major share to accumulation of capital goods. In India, long-period import data is available for as far back as the beginning of the 19th century. On the contrary, production statistics for most of the industries are unavailable for the earlier period. Domestic production statistics of capital goods have also been used whenever available. Discussion of the nature of the data is not attempted here as it will be taken up in a later study.

Estimation Procedures

It should be admitted that the present study has drawn heavily on the estimates of capital formation by the C S O.

Mainly the movements of a few relevant indicators have been used

in estimating the two components of gross fixed capital formation: (a) construction, and (b) machinery and other equipment. In estimating fixed capital formation in construction, the combined weighted indexes of the value of steel, cement and male labour employed in construction have been used. The weights used are the proportions of the value of cement, steel and labour charges in the total value of construction in 1948-49 estimated by the CSO. Base year for these indexes is 1948-49. However, the input proportions of material labour charges in construction given by the CSO widely differ from actual field study data on inputs available from the Perspective Planning Division of the Planning Commission. CSO figures are used here specially for the reason that the present estimate is actually a backward projection of the CSO figures for 1948-49 on the basis of indexes. Indexes of male labour force engaged in construction have been estimated on the basis of census data on labour force employed in construction available from a paper by B R Kalra* for the census years. Gaps between the intercensal years have been filled by geometric interpolation on the basis of census benchmark figures of male construction labour force. National income estimate used here has been obtained from a previous study made by K Mukherjee*. Needless to say, the errors and biases in the above mentioned estimates have influenced the present estimate.

Next, fixed capital formation in machinery and other equipment has been estimated with the help of the index of the value imports of machinery and other equipment obtained from official import statistics. The current price values of imports of machinery and equipment have been brought to constant price values of 1948-49. The index was then worked out by basing the value of machinery and equipment for the year 1948-49. With the help of this index, the value of fixed capital formation in machinery and equipment in 1948-49 given by CSO has been carried backward upto 1900 to get the gross

fixed capital formation in machinery and other equipment during that period.

Net Capital Formation Not Estimated

Estimate of net capital formation is not attempted for many reasons. First, suitable information is lacking about the proportions of depreciation provided in the economy during the past century. Some arbitrary proportions could be fixed. For, the estimates available from other countries¹⁹ show that depreciation proportions changed slowly between a period of 40 years, remaining almost static for a long span of 20 years or more. In this connection the following comments by Kuznets are significant:

"We discuss gross capital formation, in addition to net, for several reasons. First, consumption of durable capital over a year or even over a somewhat longer period is difficult to estimate. This may explain the erratic behaviour of differences in the estimates of consumption among various countries. Second, consumption estimates for the business sector are based upon

depreciation allowances, and to that extent reflect a source of capital formation financing that may or may not be used, depending upon conditions. Third, individual home owners tend to disregard the allowance for depreciation and thus view savings as the gross of that item. To the extent that such practices convert the consumption estimate into a measure of means of financing gross capital formation—means that are indissolubly merged with 'net' savings—a study of gross capital formation and its financing may be more fruitful than one of net. Finally, 'replacement' of a capital good is rarely merely substituting for one tool another of the same quality; after all the price adjustments possible, \$100 in 1929 prices spent in 1939 would have meant better equipment or a suitable structure than \$100 in 1929 prices spent in 1909. For all these reasons the concept of gross capital formation is at least as important as that of net and may even be more useful for some purposes".

It may be that further probing

Table 1: Estimate of Gross Fixed Capital Formation, Proportion of Capital Formation to National Income and Marginal Capital-Output Ratio in India: 1901 to 1951

Years	Gross Fixed Capital Formation	Net National Income	(Rupees in crores at 1948-49 prices; figures in five-year moving averages)	
			Percentage of Gross Fixed Capital Formation to Net Income	Marginal Capital-Output Ratio
(1)	(2)	(3)	(4)	(5)
1900-01	325	5109	6.4	—
1902-03	384	5207	7.3	0.68
1905-06	459	5467	8.6	1.28
1908-09	502	5718	8.8	0.44
1911-12	508	6160	8.2	0.38
1914-15	475	6464	7.3	0.58
1917-18	419	6738	6.2	0.58
1920-21	520	6611	7.9	-1.10
1923-24	583	6906	8.4	0.59
1926-27	611	7196	8.5	0.87
1929-30	669	7540	8.9	0.59
1932-33	694	7871	9.0	1.70
1935-36	766	8041	9.5	0.63
1938-39	803	8370	9.6	0.78
1941-42	744	8689	8.6	0.84
1944-45	745	8860	8.4	1.49
1947-48	801	8763	10.3	-2.61
1950-51	1070	8850	12.1	3.53

into related materials and a few case studies will throw some light on the problem of depreciation in the economy during the period under study. For more or less identical reasons, the estimate of stocks has also been left out of the scope of the present study.

Sectoral Estimates

As sectoral estimates of fixed capital formation are not possible for the time being, sectoral shifts in the investment pattern cannot possibly be studied. At least a rough idea of the overall capital formation in the economy and its proportion to national income may be presented. Table 1 gives the estimate of gross fixed capital formation, the proportions of capital formation to national income and marginal capital-output ratio from 1901 to 1951.

Needless to say, figures in the Table convey only broad indications. Detailed analysis is not possible on the basis of such rough approximations. Much more related materials must be in hand for that purpose. It is obvious from Table 1 that the rate of growth of national income was much slower than the rate of growth of investment and capital formation from

1901 to 1911-12. Capital formation increased by 56 per cent but national income only by 21 per cent; that is by less than 2 per cent per year. The average proportion of capital formation to national income was 7.9 and average capital-output ratio was 0.40 during this period.

During the first world war period, the volume of capital formation came down appreciably so also its proportions to national income. The marginal capital-output ratio increased slightly only to decline to—1.10 at the end of the war. This setback was averted immediately during the post-war years. These years marked a period of gradual growth of capital formation in India till the outbreak of the second war in 1939-40. Again, the volume of capital formation declined along with its proportion to national income. The capital-output ratio, which was rising at the outbreak of the war, gradually declined to—2.61 at the end of the war.

Corroborative Evidence

It is necessary that some amount of corroborative evidence in the form of economic indicators over the period under study should be brought out side by side with the

present estimate. This may help to judge the plausibility of the basis of the estimate of capital formation attempted here. For this purpose, the capital formation estimate has been presented along with a few economic indicators of the period in Table 2. The results of the comparisons may now be discussed briefly.

Altogether five indexes have been used. These are indexes of paid-up capital of joint-stock companies, net area sown, net area irrigated, business activity, and absorption of gold and silver. It may be observed from the Table that the estimate of capital formation and other economic indicators has a rising growth trend during the period from 1901 to the outbreak of the first war. The estimate of capital formation recorded a declining tendency both during the first and second war years. This may be explained by the fact of dependence of the country on the imports of iron and steel goods and machinery. This declining trend in the growth rate is also noted in the other indexes. Excepting the business activity index almost all the other indexes came down in and around the two world war periods. Business activity index recorded a gradually rising trend. It declined

Table 2: Estimate of Gross Fixed Capital Formation Compared with selected Economic Indicators

Years	Gross Fixed Capital Formation (rupees crores at 1948-49 prices)	Net national Income (rupees crores at 1948-49 prices)	Indexes of Economic Activities 1948-49=100				
			Paid-up Capital of Joint Stock Companies	Net Area Sown	Net Area Irrigated	Business Activity	Absorption of Gold and Silver
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1900-01	325	5109	27.4	76.1	62.3	22.1	222.8
1902-03	384	5287	31.5	78.6	67.0	25.1	213.4
1905-06	459	5387	32.9	80.9	74.0	30.3	308.5
1908-09	502	5718	37.5	83.9	84.0	35.5	365.5
1911-12	508	6160	45.8	85.0	89.7	44.1	535.6
1914-15	475	6464	45.8	85.0	97.5	51.3	464.3
1917-18	419	6738	40.3	84.4	98.4	56.0	326.9
1920-21	520	6611	56.9	82.6	100.0	64.2	362.3
1923-24	583	6906	60.2	85.3	95.6	73.4	636.7
1926-27	611	7196	108.0	85.6	96.5	80.2	811.3
1929-30	669	7540	138.6	86.0	100.3	83.0	493.2
1932-33	694	7671	182.7	86.5	103.2	82.1	—844.4
1935-36	768	8041	162.3	86.9	110.5	93.3	—545.8
1938-39	803	8370	160.8	93.0	126.3	103.8	—198.7
1941-42	744	8669	132.7	107.9	131.1	105.9	—105.0
1944-45	745	8860	103.8	103.7	108.9	107.7	63.0
1947-48	901	8765	105.9	101.7	102.0	102.1	118.9
1950-51	1070	8850	122.9	119.5	109.4	—	17.8

only after the end of the second war. After examining the above indexes, it may not be unreasonable to think that the trend of the proportion of capital formation to national income brought out here may possibly be on the right lines. It is probable that the outbreak of the first war retarded activities in most of the sectors of the economy and imports also received a setback. This is evident from almost all the indexes presented here as well as from the figures of capital formation and its proportions. With the end of the first war activity was renewed with renewed vigour in most of the economic fields. The growth rate slackened again during the second war.

During the period of the world depression in 1929-30, no marked movement in the indexes is noted except the slight decline in the business activity index. This may be explained by the fact that the depression did not have the same effect in India as it had in many other industrially developed countries of the West. In India, during that period, agricultural prices declined sharply but production of most of the industries did not decline; on the contrary, it increased in some cases. Industries producing finished steel fared well due to government 'protection' which was extended in 1927 and ended in 1934.

It may not be irrelevant here to introduce the estimates of capital formation of Colin Clark and J K Thavaraj and consider them side by side with the present estimate.

Comparison With Other Estimates

As has already been mentioned Clark has improved on Thomas

Table 4: Thavaraj's Estimate of Public Capital Formation in India Compared with the Author's Estimate of Gross Fixed Capital Formation: 1900-01 to 1938-39

(five-year moving averages; rupees crores at 1948-49 prices)

Years	Thavaraj's Estimate of Public Capital Formation	Author's Fixed Capital Formation	Proportion of Gross Fixed Capital Formation to National Income	Proportion of Public Capital Formation to National Income	Percentage Public Capital Formation to Gross Fixed Capital Formation
(1)	(2)	(3)	(4)	(5)	(6)
1900-01	88	325	6.4	1.7	27.1
1902-03	115	364	7.3	2.2	29.9
1905-06	145	459	8.6	2.7	31.6
1909-09	148	502	8.8	2.6	25.5
1911-12	156	508	8.2	2.5	30.7
1920-21	128	520	7.9	1.9	24.8
1923-24	139	583	8.4	2.0	23.8
1926-27	171	611	8.5	2.4	28.0
1929-30	204	669	8.9	2.7	30.5
1932-33	187	694	9.0	2.2	24.1
1935-38	149	766	9.5	1.9	19.4

figures and so only Thomas' figures are presented here. Another reason for doing this is that his other estimate needs adjustment of the international exchange of dollars with rupees. In Table 3 the estimate is presented in quinquennial averages.

It is interesting to note from the Table above that Thomas' figures converted at 1948-49 prices show very reasonable comparability to the author's figures. Thomas' figures are for net total investment, that is minus the depreciation allowances and plus the increase in stocks. These figures show a proportion to national income ranging from 4 to 7 per cent in the available years. If the author's figures of gross fixed capital formation

could be reduced to net, assuming a depreciation allowance at the rate of average 50 per cent per year, and the increase in stocks added, it would give very nearly the same results. So, probably the present estimate may not be very far from the actual performance of capital accumulation in the period studied.

Next, Thavaraj's figures are presented on a comparable basis with the author's estimate in Table 4. It may be observed from the table that public capital formation estimated by Thavaraj giving a roughly 2 per cent proportion to national income per year is similar to the estimate released by CSO in 1948-49. Thavaraj's estimate of public capital formation forms roughly 25 per cent on average, of the author's total estimate (public and private). This seems plausible against CSO's figures which show public capital formation as 20 per cent of total capital formation. For, in the early 20th century, with the government's active interest in construction of railways and other public works, public capital expenditure probably was somewhat more than private capital formation.

International Comparison

A comparative study of long-term changes in the proportion of fixed

Table 3: Thomas' Estimate of Net Investment in India Compared with the Author's Estimate (Figures are in quinquennial averages)

Years	Thomas' Estimate Quoted by C Clark (rupees crores at current prices)	Figures in Col 2 of 1948-49 Prices (rupees crores)	Net National Income	Author's Estimate of Gross Fixed Capital Formation (rupees crores at 1948-49 prices)	Percentage of Gross Fixed Capital Formation to National Income	Thomas' Estimate of Investment to Net National Income
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1919-23	150	301	6611	520	7.9	4.6
1924-28	140	326	7017	589	8.4	4.8
1929-33	114	361	7591	671	8.8	4.8
1934-38	139	563	8041	766	9.5	7.0

Table 5: Comparative Study of Long-Term Trends of the Proportions of Equipment and Construction to Gross Fixed Capital Formation
(Constant price figures)

Countries	Periods	Share in Gross Fixed Capital Formation	
		Construction	Equipment
(1)	(2)	(3)	(4)
USA	1869-88	76.1	23.9
	1889-1913	74.8	25.2
	1919-38	61.6	38.4
	1946-55	50.2	49.8
Canada	1870, 1890, 1900	76.9	23.1
	1900, 1910, 1920, 1929	62.8	37.2
	1929, 1934, 1951-53	54.1	45.9
India	1900-01-02	75.9	24.1
	1921-21-30	67.7	32.3
	1931-51-58	66.0	30.4
	1958	66.8	31.2

capital formation in different countries has been presented in Table 5. The figures for USA and Canada have been obtained from Kuznets' paper on long-term trends of change in the proportion of different components of capital formation.

It will be noticed from the Table that the proportion of machinery and equipment and construction did not fluctuate much over a long-period which witnessed growth of capital formation. It can also be observed that of the two components of fixed capital formation, the proportion of construction to total fixed capital is higher in the initial stages of growth. But it decreases steadily. The movement in the proportion of equipment to total capital formation is opposite to this. Of course, there are exceptions to this, but they are indeed very few in number.

It is apparent from Table 5 that the proportions of construction and equipment to fixed capital formation as estimated in the present study, compare favourably with the figures of developed countries like USA and Canada. Another point in favour of the present estimate is that long-period trends of the proportions of both these components are similar to the trends in most developed countries. The proportion of construction gradually decreased and that of equipment increased during the period 1901 to 1951.

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