STAFF STUDY No. 5

Business Investment to 1970 by Derek A. White



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prepared for the Economic Council of Canada

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BUSINESS INVESTIGENT TO 1970

by

Derek A. White

Staff Study No. 5 Economic Council of Canada December 1964



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BUSINESS INVESTMENT TO 1970

I - INTRODUCTION

This paper has three main purposes: first, to highlight, in a systematic and comprehensive way, some important facts of recent Canadian investment experience; second, to undertake some preliminary analysis of the factors underlying the relatively high levels of Canadian business investment; and, finally, to make a rough projection of the levels of investment consistent with a high rate of GNP growth to 1970. The latter parts of the exercise are necessarily tentative and preliminary. A number of major features of past investment cannot be fully explained and there are both conceptual and practical difficulties in the way of producing adequate data for analytical purposes. Further, there have been limitations on the time available to assemble data and explore the relations between certain categories of investment and possibly related variables. It has therefore been necessary to rely, for some projections, upon crude extrapolation of past investment trends, plus some judgment. The main initial tasks have been to establish, as far as possible, the major facts of recent Canadian investment experience, to develop views on, and estimates of, investment in the dominant area of private investment under high growth conditions, and to provide a statistical and analytical basis for further work.

Familiarity with the meaning of certain terms and the coverage and origin of some published statistical material will greatly facilitate understanding of the contents of this paper. A brief description of sources and a few definitions are accordingly provided as a starting point.

The Canadian National Accounts, developed and published by the Dominion Bureau of Statistics, provide widely used current estimates of Gross National Product and Expenditure. The information provided in this form depends upon, and integrates, a vast array of economic statistics. This form of economic accounting is also a convenient framework for evolving and presenting economic analysis and projections. Much of the analytical material provided below is taken from the National Accounts and our projections are designed to fit into the conceptual and accounting framework which the National Accounts provide. In the Accounts, investment by the three levels of government is included under the heading "Government Expenditure on Goods and Services"; the remainder of investment appears under the two headings "Business Gross Fixed Capital Formation" and "Value of Physical Change in Inventories". The terms "Investment" and "Capital Formation" are generally used interchangeably, but it should be noted that, in the National Accounts, these terms relate to expenditures on physical assets and not to the portfolio transactions in the financial sphere which are often a concomitant of such expenditures. "Business Gross Fixed Capital Formation" includes, in addition to business investment, housing, the investment of nongovernment public institutions and the investment of government-owned enterprises. $\frac{1}{2}$

Although this paper is primarily concerned with private capital formation, it has been considered useful to look for some purposes at total private and public investment. The Department of Trade and Commerce publication "Private and Public Investment in Canada" (henceforth termed PPI) provides estimates of total private and public capital expenditures in current dollars and furnishes a reconciliation statement showing the derivation of the National Accounts breakdown between the government and business sectors. It provides, however, considerably greater detail than is given in the National Accounts, and some charts and tabular material in this paper accordingly list PPI as a source and give a breakdown of PPI totals, which include government gross fixed capital formation. The term "fixed" is used to distinguish investment in housing, plant, machinery and equipment from investment in inventories. The term "gross" signifies that, in computing investment expenditures, no deduction is made in respect of the depreciation of previously produced capital goods.

Investment measures the <u>flow</u> of capital goods being added during a specified period to the <u>stock</u> of capital goods previously in existence. The capital stock at a given time may be measured in either net or gross terms. The gross capital stock measure is the estimated value of the capital stock when the <u>undepreciated</u> value of each capital asset is included in the total until such time as the asset is deemed to have been scrapped, abandoned or replaced, and is thus written off. The net capital stock measure is the estimated value of the stock of capital after allowances have been made for depreciation of each asset included in the total.

To permit analysis of past investment trends and to provide a basis for conditional projections of future investment, gross capital stock estimates in individual industry sectors have been related to corresponding estimates of real Gross Domestic Product (GDP) at factor cost.^{2/} The ratio of gross capital stock (in 1949 dollars) to GDP at factor cost (in 1949 dollars) is referred to as the gross capital-output ratio.

^{1/} The housing market and outlook are discussed in Wolfgang M. Illing, <u>Housing Demand to 1970</u>, Staff Study No. 4, Economic Council of Canada, Ottawa: Queen's Printer, 1964.

^{2/} Aggregate GDP at market prices measures the flow of final goods produced in Canada. It is thus a geographical concept. To derive GNP at market prices (the national concept) income paid to non-residents is deducted and income received from non-residents is added. For a reconciliation of GNP at market prices and GDP at factor cost, see <u>National Accounts</u> Table 4.

II - RECENT CANADIAN INVESTMENT PATTERNS

During the period since the end of the Second World War, Canada has experienced an investment programme of impressive dimensions. Between the end of 1945 and the end of 1963, about \$111 billion in current dollars was devoted to various forms of business and government fixed investment out of a cumulated Gross National Product of \$484 billion. The contribution of each major fixed investment component to GNP, cumulated over the years 1946-63 inclusive, is set out in Table 1.

Table 1

Cumulated 1946-63 Fixed Investment and GNP

	GNP	Gross Fixed Capital Formation					
		Total	Housing	Non-Residential Construction	Machinery and Equipment		
		(1	lillions of cur	rent dollars)			
Business Government Total	483,999	91,629 19,211 110,840	21,362 427 21,789	33,685 16,880 50,565	36,582 1,904 38,486		
			(Per cent	of GNP)			
Business Government Total	100.0	18.9 4.0 22.9	4.4 .1 4.5	7.0 3.5 10.5	7.6 .4 8.0		

Note: Components may not add to totals because of rounding.

Source: National Accounts, Dominion Bureau of Statistics

This post-war record of business and government investment is placed in longer

term perspective by Chart 1, which also reveals the changing distribution over time of BILLIONS



* Excludes investment in inventories.

Source: Based on data from <u>National Accounts</u>, Dominion Bureau of Statistics, and estimates by Economic Council of Canada. 4 spending in these two major investment categories, expressed in 1949 constant dollars. $\frac{1}{}$

Worthy of note in this Chart are the volatility of total business investment and the relatively stable growth of total government investment, except during periods of war, accelerated defence expenditure, $\frac{2}{}$ or acute depression. During the years 1926 to 1929 inclusive, a period of business expansion at the start of the period covered by the Chart, government investment was about 13 per cent of the total. Between 1954 and 1957, a comparable period of business expansion towards the end of the period covered, government investment comprised about 16 per cent of the total (all comparisons based on 1949 dollar figures).

A breakdown of the major forms of investment over the same time-span is provided by Chart 2.



Source: Based on data from <u>National Accounts</u>, Dominion Bureau of Statistics, and estimates by Economic Council of Canada.

It is clearly apparent here that non-residential construction has become the dominant form of investment in the Canadian economy during the post-war years. Real residential investment, although providing visual evidence of enormous growth in the form of postwar additions to the nation's housing stock, is actually the smallest of the three major forms of investment in terms of its contribution to total demand or the absorption of factors of production. The impact of construction expenditures on domestic activity is nonetheless very concentrated, however, as a consequence of the high domestic content of

^{1/} Charts 1 to 4 and 9 to 12 inclusive use arithmetic scales. These permit ready comparison both of the relative magnitudes and the time-paths of the series plotted, but do not permit easy comparison of their relative rates of growth.

^{2/} Government investment includes defence expenditures on construction but excludes defence purchases of machinery and equipment.

such expenditures. Business investment in machinery and equipment, on the other hand, has a high import content and the effects of variations in such spending on Canadian domestic activity are, as a result, considerably diluted.

Chart 3 gives a breakdown of non-residential construction investment between the government and business sectors.





Features of this Chart worth noting are the marked post-1957 decline in business nonresidential construction investment, following a massive upsurge in 1956 and 1957, and the rise, over the period as a whole, in the relative importance of government investment. The latter rose from roughly 26 per cent of the total over the years 1926-29 inclusive to about 32 per cent of the total from 1954 to 1957 inclusive. Also of interest is a comparison of the 1926-29 build-up in investment and the 1954-57 upsurge. The recent period of slow growth and the 1929-33 depression were both preceded by unsustainable growth in investment.

Chart 4 provides a similar split of the machinery and equipment investment total between the business and government sectors. Although government purchases of machinery and equipment have grown absolutely and relatively over the 1926 to 1963 period, they are still very small in relation to the total; the bulk of machinery and equipment purchases are made by the business sector.



Source: Based on data from <u>National Accounts</u>, Dominion Bureau of Statistics, and estimates by Economic Council of Canada.

It was noted above that total business investment has, in the past, been highly volatile. Charts 5, 6 and 7 permit a visual assessment to be made of the extent of this variability in relation to that of total GNP (which, of course, includes investment as one expenditure component) over the 1926-63 period. Chart 5, being drawn against a ratio scale, permits ready comparison of the <u>percentage changes</u> in investment and GNP and clearly shows the markedly greater relative volatility of the former.





Source: Based on data from National Accounts, Dominion Bureau of Statistics.

Chart 6 shows the swings in total and fixed investment as a percentage of GNP in relation to periods of cyclical expansion and contraction.



7

Note: "Fixed investment" comprises residential and non-residential construction plus machinery and equipment expenditures, excluding those undertaken by governments. "Total investment" comprises fixed investment plus the value of the physical change in nonfarm business inventories.

The shaded bars on the Chart represent periods of cyclical recession. "P" indicates the peak of the business cycle and "T" the trough.

Source: Based on data from National Accounts, Dominion Bureau of Statistics.

It will be noted that, except for the minor fluctuation in 1948-49, cyclical downturns have usually occurred during periods of pronounced decline in the ratio of fixed capital formation to GNP.^{1/} Total private investment (i.e., fixed investment plus inventory change) tends to decline even more sharply, in relation to GNP, than does fixed investment. This implies that cyclical inventory movements tend to reinforce the corresponding fixed investment swings. The fairly close correspondence between downswings in inventory investment and cyclical recessions is clearly shown in Chart 7. Comparison of Charts 6 and 7 reveals that massive swings in total investment, primarily reflecting the behaviour of fixed investment, occur over substantial periods of time, but that shorter term cyclical fluctuations, dominated by inventory swings, are, as it were, superimposed upon these underlying movements of fixed investment.

^{1/} The association between cyclical recessions and declines in the investment/GNP ratio becomes even closer if recessions are defined by declines in the index of industrial production or real GDP rather than by reference to a wider range of indicators. On this basis, there was no interruption in the rise of aggregate activity between 1948 and 1949.





Source: Based on data from National Accounts, Dominion Bureau of Statistics.

It is of some interest to ascertain whether the longer term movements of nongovernment fixed investment arise from similar movements among the three major forms of investment; namely, residential, and non-residential construction, and machinery and equipment. Chart 8 indicates that these three components do show similar movements, but that housing expenditures have fluctuated rather less vigorously in relation to GNP





than have non-residential construction and machinery and equipment expenditures. On the other hand, there does not seem to be much to choose between these latter two fixed investment sectors. Both are highly volatile; but it is of interest to learn that, during the post-war years, the build-up of fixed investment to a peak in 1957 was primarily attributable to the performance of non-residential construction. New machinery and equipment spending rose precipitously from 1943 to 1947, stayed more or less on a plateau until 1957, and has since declined considerably.

A somewhat different perspective on Canadian post-war investment patterns is afforded by Chart 9, depicting components of total capital expenditure, including government investment, in current dollars. In broad terms, this Chart shows that, apart from their performance in the early post-war years, housing and "other business" demands for capital have not fluctuated much, relatively to GNP, although both categories declined slowly after 1957 or 1958. Resource development and related expenditures. on the other hand, rose rather erratically to a very pronounced peak in 1957 and fell sharply in 1958 and 1959. In 1962, the percentage of GNP devoted to resource development expenditure was virtually the same as in 1949. The final category, social capital, has risen over most of the post-war years and its proportion of GNP is now over double the early post-war value. As a very broad generalization, therefore, one can say that, except for the early post-war years, the rising trend in the ratio of investment to GNP was heavily influenced by social capital spending, while the fluctuations through time were strongly affected by the distribution of resource development expenditures over the period. A major problem in evaluating the probable magnitudes of private investment over time is thus likely to be that of forming an estimate of the probable variations in levels of resource-related expenditures. The latter, in turn, depend very heavily on the performance of, and expectations concerning, the United States economy, or, more generally, the over-all international economy.

It appears worthwhile to look at post-war resource-related capital expenditures in a little more detail. In particular, it is of interest to discover the industrial basis of the surge of investment in the resource industries culminating in 1957.

Chart 10 depicts the components of resource-related investment. Since the total of resource-related investment dominated the fluctuations over time in total investment and thus, to an important extent, the performance of total national expenditures over the post-war years, it is evident that Chart 10 lays bare much of the skeleton of Canadian post-war economic history. As proponents of the "staple theory"











of Canadian economic development have long pointed out, the Canadian economy is highly sensitive to the exploitation of a small range of primary commodities. What Chart 10 shows very clearly is that this exploitation today calls for massive amounts of investment. Comparison of Chart 10 (p. 11) with Chart 17 (p. 28) shows that the resource industries, with the one exception of Forestry, require a far larger capital stock for a given value of output than the balance of the economy; hence, their tremendous leverage on the Canadian economy during periods of development in response to expected increases in United States and world demands for raw and semi-processed materials. Worthy of particular note in Chart 10 is the important role played in the economy by expenditures on electric power development. Such expenditures have, in the post-war years, averaged between 1-1/2 and 2 per cent of GNP; their distribution over time thus has significant implications for the performance of the entire economy.

A further outstanding feature of Chart 9 was the growth of expenditures for social purposes. Chart 11 provides a breakdown of these expenditures with the exception of direct capital spending by government departments. Most of the school and some of the hospital expenditures fall within the National Accounts definition of government spending, but total school and hospital expenditures are shown in Chart 11 to provide a comprehensive picture of over-all developments in these areas. The sharp increase in school expenditures after 1961 appears to be largely the result of the federal government programme to stimulate the construction of technical and vocational schools. School construction has, of course, been a dominant influence on social capital acquisition over most of the post-war years. More recently, investment in universities has climbed sharply and is expected to assume an even larger role in the future.

This short review of the highlights of recent Canadian investment experience may be concluded with a brief reference to the regional distribution of capital expenditures. Chart 12 presents total government and business investment, by region, from 1948 to 1964. An arithmetic scale has been employed in order to permit assessment of the relative sizes of the regional investment programmes, as well as comparison of their time-patterns. It is worth noting that the imprint of the "resource boom" and its aftermath was particularly marked on Ontario and British Columbia. Quebec's investment has shown more sustained growth but nevertheless was on a plateau from 1957 to 1961, implying a decline in real terms. Quebec's expected 1964 level involves a pronounced jump from recent values.



* All components of social capital except direct spending by government departments.

Source: Based on data from <u>Private and Fublic Investment in Canada</u>, Dominion Bureau of Statistics and Department of Trade and Commerce, (see Appendix Table B-2(a)).





III - CANADIAN INVESTMENT IN INTERNATIONAL PERSPECTIVE

It will be noted from Table 1 (p. 3), which provides cumulated investment data, that Canadian business investment in current dollars has amounted to more than 18 per cent of GNP over the post-war years. It is important to know how Canadian investment experience compares with that of other countries. Chart 13 compares 1950-62 investment as a percentage of GNP in the United States, the United Kingdom, Canada and the EEC countries. $\frac{1}{}$



Source: See footnote $\frac{1}{2}$ and Appendix Tables B-7 and B-8.

It can be seen that, until very recently, Canada's investment programme was apparently proportionately far larger than those being undertaken in the major western countries. The reasons for this are not completely understood, but a significant contribution seems to have been made by the heavy investment associated with resource

^{1/} The data underlying the Chart were taken from <u>General Statistics</u>, OECD, November, 1953 (1954 price base data) and <u>Statistics of National Accounts</u>, 1955-62 Supplement, OECD, April, 1964 (1958 price base data). These figures pertain to "domestic gross fixed capital formation" which includes government nondefence capital expenditure. It will be observed from Chart 13 that changing the price base changes the proportion of capital formation to GNP. (In the Canadian case, the 1958-based estimate is above the 1954-based estimate; this is because the prices of investment goods rose more rapidly than the prices of most other final products between 1954 and 1958.) A factor complicating international comparisons of this sort is the effect of differences in the structure of prices between various countries. If, for example, investment goods are cheaper relatively to other goods in country A than in country B, a given proportion of investment in physical terms would comprise a lower proportion of GNP in Λ than in B. These considerations mean that comparisons between Europe and North America are subject to distortion. On the other hand, Canada - United States comparisons are probably not so seriously affected. For further discussion, see <u>Some Factors in Economic Growth in Europe during the 1950's</u>, United Nations (Geneva, 1964), Chapter 2, Annex B, pp. 44-46, and <u>Comparative National Products and Price</u> Levels, Milton Gilbert and Associates, OEEC, (Paris, 1958).

development in Canada. This appears, in turn, to be related to Canada's continuing historical evolution as a resource-oriented complement to the populous manufacturing complexes of the United States, the United Kingdom, Europe and Japan. It is instructive to look at the relative performances of Canada and the United States in rather more detail. Chart 14 provides data for the United States comparable with those provided in respect of Canada in Chart 8.





Source: Based on data from <u>Survey of Current Business</u>, United States Department of Commerce.

Comparison of the two charts reveals markedly higher levels of both machinery and equipment and non-residential construction in Canada than in the United States. The differences between the relative levels of non-residential construction spending in the two countries are especially pronounced: the United States series manifests a remarkable degree of stability at somewhat under 4 per cent of GNP over the post-war years, whereas the Canadian proportion rises from a low point of 2.3 per cent of GNP in 1945 to a high peak of 8.8 per cent in 1957, at which it is more than double that in the United States. Despite this difference and the earlier tapering-off in the relative importance of machinery and equipment spending in the United States, data for both countries reveal similar broad movements. These were associated with the depression of the 1930's, the

recovery after 1933, the war years and the immediate post-war capital replacement and expansion boom.

Although Canada's investment programme appears high in relation to those of the major western countries, it was not abnormal by comparison with those of certain other specialized northern countries -- particularly Norway, which is in some respects in a similar position. $\frac{1}{2}$

Table 2

Domestic Gross Fixed Capital Formation

As a Percentage of GNP, Canada and Norway, 1955-62

(Based on 1958 prices)

	1955	1956	1957	1958	1959	1960	1961	1962
Canada	22.7	25.5	26.6	25.2	23.7	22.4	21.6	21.1
Norway	30.9	29.6	29.9	31.4	28.8	27.5	29.1	30.5

Source: Based on data from Statistics of Mational Accounts, 1955-62, OECD, April, 1964.

The Norwegian investment programme² was influenced by certain special factors, such as the modernization of the shipping fleet, the development of northern Norway and the construction of manufacturing facilities embodying excess capacity for future expansion.³ Further, a high savings and investment rate was a declared object of government policy.⁴ On the other hand, there were certain interesting parallels between Norway and Canada. In both countries there was a progressive mechanization of agriculture.³ Also, a United Nations study notes that the average capital-output ratio in Norway is high, this being "... related to the special geographical and climatic conditions of the country, its natural resources environment and the low population density." The study continues:

3/ Some Factors in Economic Growth in Europe During the 1950s, United Nations, Geneva, 1964.

^{1/} Finland, too, has experienced a high ratio of investment to GNP in recent years, viz., 1949-53, 28.4 per cent; 1954-58, 31.7 per cent. Canada, Norway, Finland and Iceland experienced the highest investment to GNP ratios among the twenty-two western countries both in the 1949-53 and the 1954-58 periods. See Some Factors in Economic Growth in Europe during the 1950s, United Nations, Geneva, 1964, Chapter II, Table 7.

^{2/} As background to the ensuing discussion, it may be noted that Norway's GNP is about one sixth that of Canada and that Norway has about one fifth of Canada's population. This size disparity might appear to invalidate the comparison but it should be remembered that the United States is far larger in relation to Canada than Canada is in relation to Norway.

^{4/} See Norway, Economic Surveys by the OECD, Paris, July, 1963, p. 14.

These conditions required a comparatively large proportion of highly capital-intensive investment in such sectors as transport and energy supply as a condition of industrial development and the acceptance both of relatively high unit construction costs in some fields (dwellings and some other construction) and/or a relatively low degree of utilization of large indivisible capacities for a long period after completion. $\frac{1}{2}$

Similar factors are stressed by the OECD 1964 survey of the Norwegian economy. Commenting upon Norway's policy of high rates of investment, it states:

> This policy of high investment and capital imports reflects, in part at least, structural factors related to the pattern of the country's natural resources and to the shipping sector. Norway's large hydro-electric power resources, and its relatively low prices of electric energy, have favoured the development of energy-intensive industries, such as electro-chemicals and various base metals, including aluminum, steel, nickel and copper. The need for their rapid development has been intensified by the fact that the expansion of some of the traditional export industries (notably whaling, fisheries and forestry) has been hampered by limitations of the basic natural resources involved. Given the capital-intensive nature of energy-intensive industries, and of the hydro-electric power production on which they are based, their development has required a high level of investment.

The importance of the industrial structure -- particularly the influence of hydro-electric power development and the growth of energy-using industries -- in explaining the high rates of Norwegian investment is of considerable interest, since, as was shown in Charts 9 and 10, Canada's high post-war investment may, in part, be similarly explained. Some aspects of the latter are considered further in the following pages.

... It might be argued that Norway, an industrialized country with a high level of per capita income, should finance investment by her own savings. But, given the special structure of the economy, particularly the large shipping sector and the capital-intensive nature of its industrial expansion, this would clearly be unrealistic. The expansion and structural change of the merchant fleet requires large amounts of capital, and it would seem reasonable to take advantage of the existing possibilities of financing this to a large extent by foreign capital. And if domestic savings, although relatively high, are unlikely to be sufficient to achieve a further rapid development of the country's natural resources, it would seem appropriate to maintain some borrowing abroad. The resulting increase in the foreign debt should not be a matter of concern if the corresponding investment projects are sufficiently profitable to service the debt incurred without placing an additional burden upon the rest of the economy...it is clearly important that the size of the capital imports aimed at should not be such as to entail major difficulties in borrowing it on reasonable terms....

^{1/} Some Factors in Economic Growth in Europe During the 1950s, United Nations, Geneva, 1964, Chapter 6, p. 22.

^{2/} Norway, Economic Surveys by the OECD, June 1964, p. 7, par. 6. It is also worth noting at this point that Norway, as well as having a relatively large investment programme, is similar to Canada in another respect, namely, in being a large-scale borrower on world capital markets. (See "Where will all the Borrowers Go?" Economist, August 8, 1964.) This has given rise to some debate as to whether reliance upon capital inflows is appropriate. In this connection, the survey concludes (pp. 12-13):

IV - CANADIAN BUSINESS INVESTMENT - SOME PRELIMINARY ANALYSIJ

Introduction

A description such as is contained in the previous two sections, while providing useful perspective and background information on past developments, furnishes only partial answers to some fundamental questions concerning the operation of the Canadian economy. Two related matters requiring clarification are the factors underlying the high levels of investment during periods of prosperity and the circumstances producing a higher ratio of business investment to GNP than in most other countries -- the United States in particular. This latter phenomenon has many important consequences. One of them is that despite a higher national savings ratio in Canada than in the United States, there still tends to be a persistent net capital inflow into Canada from the United States. Large capital inflows during periods of prosperity tend to be accompanied by substantial merchandise trade deficits in which imports of machinery and equipment and other investment goods play a conspicuous role. Canada's entire balance of payments position is heavily influenced by the size of the investment programme and it is thus important both for current analysis and the projection of future developments to understand the underlying determinants of the size of the programme.

A number of explanations have been advanced at various times to explain the high relative level of Canadian investment. Factors stressed have included the need for more expensive buildings and other investment necessitated by the extreme winter alimate; the size and formidable geographical features of the country, the east-west orientation of its communications networks, and the sparseness of the population; the relative "immaturity" of the country and its need for development; the relative inefficiency of Canadian manufacturing production resulting from the combination of the employment of large-scale United States production methods and technology and the short runs associated with small-scale operation within limited, tariff-protected Canadian markets; the effects of Canadian tax policies encouraging faster depreciation of capital assets; and the heavy investment arising from the exploitation of resource staples. All of these explanations possess a priori plausibility and some have a good deal of empirical support. Insufficient evidence is available, however, to permit estimates to be made of the relative quantitative significance of the various factors involved. Not all of the explanations noted are logically separate, of course. There is some overlapping; and varying degrees of generality are involved.

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A Framework for Analysing Canadian Business Investment Experience

Although the above discussion suggests useful avenues of enquiry into the question of why the relative level of Canadian investment should be so high, none of these approaches provides a basis for a comprehensive study of such investment. Further, a number of potentially important contributing factors were not covered in the above discussion. For a more complete, though less direct, approach, it is necessary to focus attention on some fundamental relationships implied by the theory of production.

In the production of a single commodity under conditions of given technology, constant returns to scale and fixed factor prices, the need for the services of capital varies directly and linearly with the volume of output. If the degree of utilization of the stock of capital is constant, the requisite capital stock will similarly vary with the volume of output. Different products will require different amounts of capital stock per value unit of output. Thus, the capital stock required for the production of a basket of goods of given value will depend upon the particular assortment of commodities included. The capital stock (in constant dollar units) may be measured in either gross or net terms. Which measure on average reveals the closest relation to output is an empirical guestion. 1/ If we can assume that the estimated gross capital stock provides an adequate measure, then (assuming there are no lags involved in adjusting the capital stock to output changes) the amount of investment in any period will be that required to raise the value of the gross capital stock to the level dictated by the size and composition of output. One may conceive a continuous stream of discards from the gross capital stock occurring through time as certain items wear out, others become obsolete, and others still are abandoned because of poor location and so on. Even if output were not expanding, a certain amount of investment would be required to maintain the gross capital stock at a given appropriate level. In the normal situation in which growth is taking place, investment during any period (ignoring lags) will be the sum of that required to replace discards and that required to raise the stock from the initial level to the level dictated by the size and composition of output.

Over time, one would expect changes in the organization and/or technology of production, changes in scale of production, or significant changes in the cost of labour

^{1/} It should be emphasized that this observation relates to <u>actual estimates</u> of the stock of capital. Conceptually, of course, a net stock measure which took account of the changing productivity of capital would be most closely related to the supply of capital services.

relative to capital, to vary the equilibrium capital-output ratio. One would also expect any over-all capital-output ratio to vary as the commodity composition of output changed in response to changing demand and supply conditions. In practice, also, one would expect variations to occur in the degree of utilization of the capital stock, both as a result of short-term factors -- such as cyclical expansions and contractions, lags in the adjustment of the capital stock to changed output expectations, or the effects of the "lumpiness" of some capital goods -- and as a result of longer term factors, such as a permanent shift in the intensity of use of an industry's capital facilities caused by a permanent changeover from single-shift to double-shift operation. Further factors affecting any aggregate capital-output ratio will be resource discovery and the introduction of new products. Some of these influences on commodity and aggregate capitaloutput ratios will of course tend to offset one another over time.

A logical extension of the concepts discussed above indicates a possibly useful framework for analysis of the relatively high level of Canadian investment. It was noted above that different commodities required varying amounts of capital stock per dollar of output. Electricity and iron-ore, for example, require a higher capital stock per dollar of output produced than do clothing and aircraft. Thus, the over-all capitaloutput ratio in any country is partly the result of the goods and services mix of its output. Although Canada is an entity in the political and geographic senses, it is in economic terms, merely one sector of the world economy, although most of Canadian trade is with the United States. Despite the combined effects of the United States and Canadian tariffs in diversifying the range of Canadian manufacturing output, the Canadian economy remains highly specialized largely by virtue of the continuing major role of the resource-based industries in Canadian goods production. Evidence of this specialization is the fact that roughly 50 per cent of the value of Canadian goods production is exported. The specialized nature of a considerable portion of Canadian goods output vis-à-vis that of the United States, together with the variation in capital requirements per dollar of output for different goods, suggest that the higher investment ratio in Canada than in the United States may be partly attributable to the effects of the different output mixes in the two countries.

Ideally, perhaps, a study of the reasons for the different relative levels of investment in Canada and the United States would examine; first, differences in the aggregate rates of output growth in the two countries; second, differences in capitaloutput ratios and discard or depreciation patterns in the production of individual commodities; and third, the effects of differences in the commodity mix of output in the

two countries. In addition, it would be necessary to examine the effects of <u>changes</u> in capital-output ratios and <u>shifts</u> in the composition of output in the two countries. Within this framework, the effects, for example, of Canada's extreme winter climate would show up, other things equal, in higher construction capital stock-to-output ratios in Canada in the production of identical commodities. The effects of short runs and low volume production would show up in higher machinery and equipment-to-output ratios in certain manufacturing industries. The effects of Canada's assumed relatively high need for development capital would be manifest in relatively high capital-output ratios in such basic areas as transportation and communication.

We do not have any detail on the capital associated with the production of individual commodities. In any case, joint production of many goods and the enormous number of different goods produced render this approach impractical. Neither do we have, as yet, closely comparable United States and Canadian data on capital-output ratios pertaining to individual sectors or industries. We must therefore confine our attention to such inferences as we can make from the Canadian industry data which the Dominion Bureau of Statistics has recently made available. $\frac{1}{2}$

Canadian Capital-Output Ratios

(a) The estimates

The Canadian capital stock data made available by the Dominion Bureau of Statistics cover the period from 1926 to 1959 or 1960. Gross stock estimates were available for 24 industry groups plus agriculture (machinery and equipment

^{1/} The capital stock figures used in this study are those developed by Mr. T. K. Rymes (now at Carleton University) while working with the Dominion Bureau of Statistics. Selected detail from these estimates was published in Supplement -2 to the DBS <u>Daily</u> <u>Bulletin</u>, Dec. 22, 1964. It is understood that a comprehensive monograph providing considerable detail and a review of concepts, sources and methods is in the course of preparation. The interested reader is referred, in the interim, to the excellent short article appearing in the <u>Canadian Statistical Review</u> (July, 1964) entitled "The Measurement of the Stock of Fixed Capital by Industry in Canada, a Progress Report". This provides details of the "perpetual inventory" method used in preparing the stock estimates and briefly discusses some of the conceptual and practical difficulties encountered in estimating capital stocks.

The original estimates of the Canadian capital stock, prepared by the "perpetual inventory" method and drawing upon investment data from a number of sources, were developed by Professor Anthony Scott. These figures formed the basis for the investment sector projections embodied in the Gross National Expenditure estimates prepared for the Royal Commission on Canada's Economic Prospects. See Wm. C. Hood and Anthony Scott, <u>Output</u>, <u>Labour and Capital in the Canadian Economy</u>, Queen's Printer, 1957, Chapter 6 and Appendices thereto.

stock only) covering the entire economy with the exception of the following:

- 1. Public Administration and Defence
- 2. Finance, Insurance and Real Estate
- 3. Community and Recreation Services
- 4. Agriculture (Construction only)

The staff of the Royal Commission on Taxation, who updated most of the DBS estimates to 1963, kindly made their figures available to us. We have worked with the data expressed in 1949 constant dollars. In order to derive estimates of capital-output ratios, by industry, it was necessary to divide the capital stock figure for each industry by an estimate of the corresponding output, expressed in 1949 dollars. The output measure employed was Gross Domestic Product at factor cost.

Gross Domestic Product at factor cost data, by industry, in 1949 dollars, were derived by applying indexes of real domestic product by industry¹/ to the respective estimates of 1949 GDP at factor cost. The GDP estimates cover the period from 1935 only; hence, our capital-output ratio estimates are restricted to the 1935-63 period. Because of certain conceptual and practical problems involved in the measurement of output in the Water and Sanitary Services and Commercial Services sectors, capital-output ratios for these sectors were not computed. Thus, our basic capital-output ratio data covered completely 22 industries (including 13 within manufacturing) which in 1963 produced 77 per cent of the 1949 constant dollar output of the private, nonagricultural sector of the economy and accounted for over 80 per cent of business non-residential investment. In addition, we were able to compute the portion of the total capital-output ratio in agriculture relating to stocks of machinery and equipment.

(b) Movements of Capital Stock and Output Over Time

Charts 15 and 16 show the relationships between aggregate net and gross capital stock and output in the 22 industries over time. Chart 15 compares the rates of growth in moving averages through these variables and Chart 16 compares the gross and net stock capital-to-output ratios. From Chart 15, it may be observed that the rate of growth of output was well in excess of that of the capital stock (in either net or gross terms) from 1934 until after the Second World War. During most of the 1950's, on the other hand, the rates of capital stock growth were in excess of the rate of growth of output. This was particularly apparent in the case of the net stock

^{1/} See Indexes of Real Domestic Product by Industry of Origin, 1935-61, (Catalogue No. 61-505 occasional) Dominion Bureau of Statistics, May, 1963.







Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada.

measure. The divergences between the rate of output growth and the rates of growth of both capital stock measures were especially pronounced following the mid-fifties. During the current expansion, the rate of output growth has outstripped the rate of growth of the capital stock.

The divergences in the growth of the capital stock and output, as revealed by Chart 15 and as reflected in the simple total capital-output ratios of Chart 16, appear to result from a rather complex set of factors. The very high rates of output growth featuring the late 'thirties and early war years appear partly to have been made **pos**sible by use of capacity which had stood idle during the depression and partly by more intensive use of all capital facilities. During the war, also, machines and structures which would otherwise have been scrapped as technically obsolete or worn out were kept in service and maintained. In the early post-war years, competing strong consumption, investment and export demands under conditions of post-war reconversion produced inflationary pressures, which were subsequently reinforced by the inventory accumulation and increased military expenditures in Canada and the United States associated with the Korean War. These conditions made it difficult to effect very rapid replacement of capital goods.

It appears likely that, because of the necessity to postpone replacement investment during and immediately after the war, a higher than normal proportion of the investment occurring subsequently was used to replace facilities being retired. It is assumed in the procedures employed in computing the perpetual inventory of the capital stock, however, that replacement of discards from the gross stock is related to the time-pattern of previous investment and the assumed service lives of capital assets. Thus, it appears that some of the movements of the capital stock relative to output reflect the assumptions of the method of computation and it is plausible to assume that some of the apparent divergences between capital stock and output growth are in fact exaggerated. This would be particularly true in relation to the net stock estimates, since assumed depreciation would have reduced the estimated net stock to a very low level by the end of the war. Subsequent investment would thus appear to be adding to the net stock at a very high rate.

Examination of the underlying data indicates that, in the late 'fifties, the rates of increase in the machinery and equipment net and gross stock were beginning to decline, but that rates of increase in the construction net and gross stocks were rising, and, for the first time in 20 years, clearly exceeding growth rates in output, Part

of this movement was probably attributable to replacement of various forms of construction, but a large part was clearly attributable to expansion of the capital stock in the water transportation, hydro-electric, pipe-line and mining fields. A considerable proportion of this investment was of the "lumpy" variety resulting in a substantial addition to output capacity. Examples are the development of iron-ore mining and handling facilities, the St. Lawrence Seaway, the expansion of hydro-electric power for aluminum smelting, and oil-field installations. In some of these areas there are now indications that excess capacity has been absorbed, but, in some others, further marked expansion of output without large-scale additions to the stock of capital appears feasible. However, the recent pattern of rates of over-all output growth far in excess of rates of aggregate capital stock growth and the accompanying significant decline in aggregate capital-output ratios appear unlikely to persist for long.

In addition to the dynamic developments discussed above, account must also be taken of certain longer run influences upon the behaviour of the capital stock relative to output. It is shown later $\frac{1}{}$ that part of the increase occurring between 1949 and 1963 in the aggregate machinery and equipment gross stock-to-output ratio arose from shifts from low to high capital-output ratio industries. Inter-industry shifts were also responsible for more than 25 per cent of the rise in the aggregate construction gross stock over the same period. Despite the strong effects of these shifts, declines in the construction capital stock-to-output ratios in individual industries were so pronounced that the aggregate gross construction stock-to-output ratio declined significantly over the period. In the case of the machinery and equipment capital stock, the effects of shifts were reinforced by trends in capital-output ratios in individual industries. The latter contributed almost 30 per cent of the capital stock change over the period. It has already been observed that part of the increase in the early years was possibly more apparent than real. In the latter part of the period, however, substantial increases in the ratio of machinery and equipment to output occurred in a number of industries, although declines have been predominant again during the current expansion. It is possible that some of the increases in industry machinery and equipment capital-output ratios during the late 'fifties were symptomatic of the emergence of excess capacity. However, the short life of machinery and equipment implies that situations of excess capacity may quickly be corrected (during periods of sústained output growth) by not replacing worn-out or obsolete assets. If the average service

 $\frac{1}{}$ See Tables 3 and 4.

life of machinery is 15 years, a 20 per cent over-capacity situation may be corrected on average, under stationary conditions, by foregoing the replacement of discards for a period of two and a half years. $\frac{1}{2}$

An additional feature of Charts 15 and 16 is worthy of comment. It will be noted that the net capital stock figures exhibit greater volatility than the gross stock data. This appears partly attributable to the fact that the net stock comprises a smaller base from which to compute percentage increases and partly to the fact that the higher the gross stock, the higher is the level of depreciation and thus the greater is the tendency for the net stock to decline during a period of reduction in the level of gross investment.

(c) Industry Capital-Output Ratio Comparisons

Chart 17 depicts the gross capital-output ratios of the 22 industries computed for the year 1959. As may be observed, there is a remarkable diversity in the ratios for different industries. It is of interest to compare this chart with Chart 10 and note that the industries responsible for the resource boom are also among those with the highest capital-output ratios. Clearly, any expected expansion in the demand for the output of these industries is likely to exert tremendous leverage on the over-all Canadian business investment programme -- unless the initial situation is one of considerable excess capacity.

A note of caution is, however, appropriate in relation to the problems of measurement underlying such comparisons and other uses of the capital stock estimates. The perpetual inventory method of computing gross stocks proceeds by cumulating the constant dollar value of gross investment in each type of capital good over a period equal to the estimated average economic life of the good in question. Although considerable effort has been exerted to select appropriate service lives for this purpose, accurate and detailed information is difficult to obtain. Since the level of the estimated capital stock in an industry is a function of the assumed service lives of the capital goods used in that industry, it is evident that any inappropriateness in the service life assumptions is likely to be reflected in biases affecting the levels, and probably the time-patterns, of the capital stock estimates. The capital-output ratios depicted on Chart 17 pertaining to manufacturing reflect a choice from among five different available sets of capital stock estimates for manufacturing industries, each set being based upon different assumed service lives.

1/ 20 : 120 15


Source: Based on Dominion Bureau of Statistics data and estimates by Economic Council of Canada (Appendix Tables B-9 (a), (b)&(ci).

Additional reservations must also be borne in mind concerning the appropriateness of the assumption of any service life fixed in terms of years. The life of an old capital asset may be prolonged by maintenance if economic circumstances are not propitious. Conversely, when market circumstances are favourable, older assets may be replaced before being entirely worn out or becoming completely obsolete. Also, it is evident that assets wear out more quickly during periods of more intense use. It is also apparent that new products and processes contributing to the obsolescence of older capital goods are not introduced continuously, but in spurts correlated with periods of rapidly expanding output. Thus, the effective life of an asset appears likely to be influenced by fluctuations in economic activity. Other factors affecting the life of an asset will be the invention of new products and processes, the discovery of new resources and the expansion or contraction of markets in response to shifts in tastes and demand.

A further bias in the capital stock estimates may arise from inadequate deflation data, particularly in relation to structures. As a result of the lack of homogeneity in industrial structures, it is difficult to obtain unit prices at different points in time which would permit the construction of price indexes suitable for deflating current dollar data. Recourse is had to deflation of current dollar data by indexes of weighted input prices. Since these do not incorporate allowances for productivity changes the increase in unit prices tends to be overstated and estimates of the volume of constant dollar investment subject to error. Capital stock estimates pertaining to structures are thus probably biased to an unidentified extent. $\frac{1}{2}$

An additional qualification of a different sort is in order. Even assuming that the capital stock has been correctly estimated, there is no guarantee that the measured value at any particular time is an equilibrium value in relation to output. Expected output in an industry may not have materialized, so that excess capacity exists. Conversely, output may have exceeded expectations so that the capital stock is below the equilibrium level. Additions to capital in some industries may take place in discontinuous lumps rather than as a smooth flow of investment, so that the equilibrium capital-output ratio is rarely attained. For these reasons, then, the capital-output ratio comparisons afforded by Chart 17 should not be given too precise an interpretation. In particular, it should be noted that the estimates for industries outside manufacturing are still preliminary and subject to significant revision. However, it appears

^{1/} The estimates are expressed in terms of 1949 dollars. An upward bias in the trend of the prices of construction-type goods means that the investment data underlying the gross capital stock estimates will be underdeflated for the pre-1949 period and overdeflated for the post-1949 period.

unlikely that the broad patterns revealed by Chart 17 would be drastically altered by further refinements and revisions although some differences in the ranking of industries compared with those of Chart 17 could well emerge.

Analysis of Aggregate Gross Capital Stock Changes

Although, as noted, the capital stock estimates in a number of industries are preliminary and subject to revision, it nonetheless appeared worthwhile to explore some interesting questions in a preliminary way with the aid of the available data. Under the procedures currently employed in calculating the capital stock by the perpetual inventory method, the effects of wear and obsolescence are, as was observed above, related to time only. Estimated discards, therefore, represent the sum of variously lagged components of the gross investment of earlier years. Investment, after deduction of estimated discard replacement investment, represents an estimated increment to the gross capital stock. Increments to the capital stock make up the bulk of Canadian investment. It is thus worthwhile finding out to what extent past additions to the capital stock have been related to additions to output, on the one hand, and to a change in the aggregate capital-output ratio, on the other. Further, it is of interest to ascertain the extent to which a given change in the aggregate capital-output ratio reflects shifts in the relative importance of component industries and changes in the ratios of capital to output in these industries.

In our analysis, the capital stock changes to be considered pertain to the aggregate gross capital stock of the 22 industries referred to earlier. It will be recalled that these industries accounted for over 80 per cent of 1963 private non-residential fixed investment. The results shown in Table 3 were obtained in breaking down the 1949-63 additions to the aggregate gross machinery and equipment and structures stocks. $\frac{1}{2}$

^{1/} For a more complete statement of the components into which constant dollar gross capital formation may be resolved, see Appendix A. This also provides, for the years 1946-59, an annual breakdown of total capital stock changes into the components shown above which facilitates analysis of the stock changes occurring over various time periods.

Table A-1

Analysis of Annual Additions to Aggregate

Gross Capital Stock of 22 Industries, 1946-59

(1949 dollars)

	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59
1. $\bigtriangleup o_t^T (\underbrace{f}_{t-1}^{M_{t-1}} \mathbb{R}_{t-1}^{1})$	2,261	690	892	1,677	1,861	1,297	I,491	- 187	3,172	3,441	2,290	1,818	506
2. $o_{t-1}^{T} \xrightarrow{t} w_{t-1}^{i} \Delta R_{t}^{i}$	-1,377	-1,592	- 283	- 464	- 922	252	542	1,746	-1,791	-1,164	2,189	1,157	1,614
3. $O_{t-1}^{T} (\sum_{t-1}^{1} (\sum_{t-1}^{1} \triangle W_{t}^{1}))$	0 1	88	- 890	- 34	474	20	- 285	- 385	620	96	282	2,917	94
4. $O_{t-1}^{T} (\frac{1}{2} \bigtriangleup R_{t}^{1} \bigtriangleup W_{t}^{1})$	- 41	2,516	678	- 23	- 60	34	63	- 98	86	- 34	D	-1,659	-1,774
$s_{\bullet} \bigtriangleup O_{t}^{T} \mathrel{\mid} \underbrace{f}_{t-1}^{\mathtt{i}} \bigtriangleup R_{t}^{\mathtt{i}})$	- 136	- 46	- 10	- 30	- 64	12	27	- 10	- 170	- 114	13	52	18
$\epsilon \cdot \bigtriangleup o_t^T \underbrace{ \sum_{k=1}^{1} R_{t-1}^1 \bigtriangleup w_t^1 }_{t})$	- 1	9	- 31	- 2	33	1	14	c) I	59	6	2	132	- 1
$7. \bigtriangleup_0^T \underbrace{ \underbrace{ f^{\underline{i}}}_{2} \bigtriangleup_R \underbrace{ f^{\underline{i}}}_{2} \bigtriangleup_R \underbrace{ f^{\underline{i}}}_{2} \bigtriangleup_H \underbrace{ f^{\underline{i}}}_{2})$	4	73	24	-	4	2	en	1	0 1	1	0	- 75	- 20
Total $(\bigtriangleup k_t^T)$	693	1,732	379	1,123	1,318	1,617	1,826	1,835	1,782	2,231	2,716	4,343	250

Note: Components may not add exactly to totals because of rounding.

Source: Economic Council of Canada estimates based on data from Dominion Bureau of Statistics.

Table 3

Analysis of Additions to Aggregate Gross Capital Stock

of 22 Industries, 1949 to 1963

(Millions of 1949 dollars)

	Attributable to:	Machinery and Equipment	Construction	Total
	Change in total output			
	(ratios and weights held constant)	7,054.8	14,009.3	21,064.1
	Changes in industry ratios			
	(output and weights held constant)	2,003.2	- 2,647.5	- 644.3
3.	Changes in industry weights			
	(output and ratios held constant)	814.4	1,525.5	2,339.9
1.	Changes in weights x changes in ratios			
	(output held constant)	- 252.1	483.2	231.1
	Change in output x changes in ratios			
	(weights held constant)	1,738.0	- 2,297.0	- 559.0
	Change in output x changes in weights			
	(ratios held constant)	706.6	1,323.5	2,030.1
	Change in output x changes in weights	010 7	410.0	200 6
	x changes in fatios	- 218.7	419.3	200,6
	Total	11,846,2	12,816.3	24,662.5

These data may, of course, be assembled in different ways to throw light on particular questions. One interesting question worth pursuing is that of the various results that might have been experienced in the event of no output changes, no weight shifts or no industry capital-output ratio changes (see Table 4).

Table 4

Estimated 1949-63

Capital Stock Changes Under Various Assumptions

(Millions of 1949 dollars)

	Machinery and Equipment	Construction	Total
. Zero output change			
(weights and ratios allowed to vary)	2,565,5	- 638,8	1,926.7
. Zero weight change			
(output and ratios allowed to vary)	10,796.0	9,064.8	19,860.8
. Zero capital-output ratio change			
(output and weights allowed to vary)	8,575.8	16,858.3	25,434.1
. Actual	11,846.2	12,816.3	24,662.5

It will be observed that, had the structure-to-output ratios in a number of industries not been declining, the capital stock change would have been significantly larger than it actually was. Particularly worthy of note, however, are the effects of shifts in output upon the total capital stock change. Had there not been a shift in output favouring industries with high capital-output ratios, the increase in the stock would have been about 20 per cent smaller than it was.¹/ Summarizing the results of this exercise, it may be noted that output changes appear to have accounted for most of the change observed in the gross stock and that inter-industry output shifts have also contributed significantly to the total change. Variations in the individual industry capital-output ratios have been of considerably less importance over the period, but this has resulted largely from the offsetting effects of movements in the machinery and equipment-to-output and structure-to-output ratios. The significance of these results for projections of future capital stock changes is that some attempt should be made, if possible, to incorporate in such projections estimates of shifts in the industrial composition of output.

Investment and Industrial Structure in Canada and the United States

We may now revert to the problem of explaining relative differences in the size of Canadian and United States investment. It is evident, to begin with, that, in examining some of the factors underlying the Canadian programme, we have also implicitly indicated possible sources of the Canadian-United States divergences. Thus, it is possible, for example, that inter-industry shifts favouring the high capital-output ratio industries were less pronounced in the United States than in Canada or that industry capital-output ratio declines have exerted a stronger negative effect than in Canada. These possibilities cannot, unfortunately, be explored at this stage. It is also possible that the rate of output growth has been higher in Canada. This possibility can be verified and its effects estimated.^{2/} Had the United States growth rate been

^{1/} The relative effects of shifts in output between industries revealed by this exercise appear somewhat larger (20 per cent versus 8 per cent) than those estimated in the Gordon Commission study <u>Output Labour and Capital in the Canadian Economy</u>, (Table 6.7, p. 268). However, the coverage, time period and fineness of the sector breakdown are different in the two cases. The finer the sectoring, the higher the proportion of the aggregate capital-output ratio change which is likely to be identified as attributable to <u>inter</u>-industry (as opposed to <u>intra</u>-industry) shifts.

^{2/} Between 1949 and 1963, United States GNP in constant (1954) dollars grew at a compound rate of 3.8 per cent per annum. Canadian GNP in constant (1949) dollars grew, over this period, at a rate of 4.3 per cent. Constant dollar GDP at factor cost in the 22 Canadian industries included in the analysis of the previous section (these 22 industries, it will be recalled, accounted for almost 80 per cent of private, nonagricultural output) grew at a rate of 4.6 per cent per annum. The ratio of the United States real GNP growth rate to that of the Canadian was approximately .86. Applying this to the growth rate of 4.6 per cent in the 22 industries yields an estimated rate of 3.9 per cent. This represents an approximate estimate of the rate of growth that would have been experienced in the 22 industries had the over-all Canadian growth rate been the same, between 1949 and 1963, as that in the United States. Taking into account the various interactions discussed in the previous section, this rate of output growth implied a change in the gross capital stock of \$21,390.6 million compared with the \$24,662.5 million actually experienced -- i.e., the change would have been roughly 13 per cent smaller had the over-all Canadian growth rate been equal to that of the United States (other things equal). Since the capital stock change is only part of gross investment, the lower growth rate would only have reduced gross investment by about 10 per cent. Allowing for the fact that investment in the 22 industries is approximately 80 per cent of total investment, investment in the economy as a whole would have been about 8 per cent lower.

experienced in Canada, the share of business fixed investment (excluding housing) in GNP would have been reduced from 14.3 per cent of $GNP^{1/}$ to about 13.2 per cent of GNP. Since actual United States fixed investment was only 9.4 per cent of GNP over this period, it appears that the slightly lower United States growth rate over the period examined is capable of explaining only a small part of the difference in the proportion of investment to GNP in the two countries.

The combined effects of a higher Canadian growth rate and possibly more pronounced inter-industry output shifts, favouring industries with high capital-output ratios appear unlikely to explain all of the higher Canadian proportion of investment to output. Further possibilities of considerable potential importance, however, are that:

(a) Canada <u>consumes</u> more capital per unit of output than does the United
 States -- if this were true, investment would have to be relatively higher in Canada to produce a given, fixed amount of output on a continuing basis;

(b) Canada <u>requires</u> more capital per unit of output expansion, because of a higher aggregate capital-output ratio in Canada. The difference between these two concepts may be illustrated by a simple numerical example. Assume that two countries, under stationary (no growth) conditions, produce a billion dollars' worth of output each -- 'A' producing only cars, with a capital-output ratio of 2; and 'B' producing only fish, with a capital-output ratio of 3. If the units of equipment used in car production require replacement after an average life of twenty years but the boats and gear used in fishing have an average life of forty years, we have the following situation:

	Country A	Country B
	(Millions of	dollars)
Output (fixed) per annum	1,000	1,000
Capital stock	2,000	3,000
Average capital consumption per annum	100	75

Since there is no growth, there is no change in the capital stock. Investment is equal to depreciation and A's investment exceeds B's. Suppose, now, that output is expanded by 5 per cent or \$50 million in each country. 'A' will have to expand its capital stock by \$100 million; 'B', by \$150 million. If we assume there is no depreciation on the new additions to the capital stock during the first year, we have total investment in A during the first year of \$200 million and total investment in B of \$225 million. Thus, although B consumes less capital per unit of output value produced because of the durability of its stock, its investment relative to output may be higher beyond a certain

^{1/} This estimate is based upon cumulated investment and GNP expressed in 1954 dollars to permit comparison with the United States ratio based on cumulated 1954 dollar data.

rate of expansion because its capital-output ratio is higher. It is evident that the higher the rate of equal output expansion in the two countries, the greater the divergence becomes.

We do not, of course, have information on United States capital consumption allowances and aggregate capital-output ratios closely comparable with the available Canadian data. However, any aggregate ratio may be regarded as an output-weighted sum of the component industry ratios and we can construct some broadly comparable information on Canadian and United States output weights. If, then, we can assume that United States capital consumption-to-output or capital stock-output ratios, by industry, are equal to, or a uniform proportion of, the corresponding Canadian ratios, we can test the effects of applying, in turn, the United States and Canadian output weighting patterns to the ratios. If our assumption is broadly valid, this tells us if the industrial structure of output in one country, relative to the other, favours industries using or requiring high levels of capital in relation to output. This experiment was conducted with the 22-industry aggregate for the year 1960 using GDP at factor cost in 1949 dollars industry weights for Canada and current dollar income originating by industry weights for the United States. 1/ The capital consumption-to-output ratios were based upon Canadian 1955-59 industry averages, 2/ The net capital stock-to-output ratios were based on 1960 Canadian data. The results were as follows:

Aggregate Capital Consumption-to-Output Ratios

(Based on Canadian industry ratios and Canadian and United States weights)

	Canadian weight basis	United States weight basis
Machinery and Equipment Construction	.05379 .03570	.05066 .02966
Total	.08949	.08032

Aggregate Net Capital Stock-to-Output Ratios

(Based on Canadian industry ratios and Canadian and United States weights)

	Canadian weight basis	United States weight basis
Machinery and Equipment	.74941	.70570
Construction	1.05748	88980
Total	1.80689	1,59550

1/ In three cases, data pertaining to two industries had to be combined to permit the comparison to be carried out. Thus, the experiment was conducted using 19 comparable industry groups.

2/ The capital consumption allowances used were those yielded by the application of straight-line depreciation to the gross stock data computed by the perpetual inventory method, as distinct from estimates such as those provided by the <u>National</u> Accounts, based upon taxation statistics.

These surprisingly unanimous results suggest that the structure of Canadian industry is more capital-intensive than that of the United States and that this structure of production is also such as to result in the consumption of more capital per unit of output. In addition, the results suggest that, during periods of rapid growth, the ratio of capital formation to GNP would be higher in Canada than in the United States and that the disparity would be particularly marked in the non-residential construction sector. These implications are in accord with the facts of experience.

The differences between the Canadian and United States aggregate ratios observable in the above comparisons are not large, but there are some grounds for believing that a similar exercise carried out at a finer level of industry detail would result in greater differences. In the comparisons actually carried out, for example, the Canadian and United States paper products industries were assumed to have identical capital-output ratios for lack of more specific data, although highly capital-intensive pulp and newsprint production bulks more largely in the Canadian paper products industry than in the United States industry. Similarly, nonferrous metal smelting and refining is relatively more important in the Canadian than in the United States nonferrous metal products industry. $\frac{1}{2}$

Summary and Conclusions

This section has indicated that the level of investment in a country may be regarded as the sum of two components:

- 1. The flow of replacements of discards from the gross capital stock; and
- 2. Changes in the gross capital stock.

The size of the second component may in turn be regarded as dependent upon:

- 1. The size of the initial aggregate gross capital-output ratio;
- 2. The extent of the rise in output;
- 3. The magnitude of the change in the aggregate capital-output ratio; and
- 4. Interactions between the output change and the capital-output ratio change.

^{1/} Pulp and paper constituted a 1949 industrial production index weight of 6,537 out of a total weight for the Canadian paper products industry of 8,217. In the United States, pulp and paper accounted for a 1957 industrial production weight of 1,63 out of a total weight for the paper and products industry of 3,27. The Canadian non-ferrous metal smelting and refining industry had a 1949 industrial production index weight of 3,192 out of a total weight for nonferrous metal products of 4,969. In the United States, primary nonferrous metals comprised a 1957 industrial production index weight of .47 out of a total weight of 1,62 for nonferrous metals and products. See Revised Index of Industrial Production,1935-57 (Cat. No. 61-502 occasional) cominion Bureau of Statistics (Queen's Printer, 1959) and Industrial Production 1959 Revision, Board of Governors of the Federal Reserve System, Washington, July, 1960.

Finally, the change in the aggregate capital-output ratio may be regarded as arising from:

- 1. The change in individual industry capital-output ratios;
- 2. Inter-industry shifts in the product mix of output; and
- Interactions between changes in industry ratios and shifts in the output mix.

It has been shown that that part of the Canadian investment programme comprising changes in the gross capital stock, while primarily attributable to the change in total output, would have been about 16 per cent smaller had it not been for shifts in the output mix between the 22 industries.¹/₂ Also, it was estimated that the Canadian programme, other things equal, would have been roughly 8 per cent lower than it was had Canada experienced the United States growth rate. In examining the reasons for the higher Canadian than United States investment rate over a given period,²/₂ it is necessary to take into account also either the initial aggregate capital-output ratios in the two countries, or -- what amounts to the same thing -- the initial capital-output ratios in individual industries and the industry structure of output.

Although fully comparable United States and Canadian capital-output ratio data by industry are not presently available, such evidence as can be adduced points to average Canadian capital-output ratios being higher than in the United States, $\frac{3}{}$ both on account of the industrial structure of output⁴ and on account of individual industry differences.⁵ It should be remembered, in relation to the distinction

^{1/} This estimate of 16 per cent is derived by multiplying the 20 per cent difference between the "actual" and "zero weight shift" estimates of the 1949-63 capital stock change (supra, Table 4) by the 80 per cent coverage of total investment represented by the investment of the 22 industries.

^{2/} The United States proportion of investment to GNP was 34 per cent lower than the Canadian proportion over the 1949-63 period.

^{3/} See, for example, "A Summary Survey of National Wealth Estimates", <u>The Measurement of National Wealth</u>, Income and Wealth Series VIII, ed. Raymond Goldsmith and Christopher Saunders, Bowes and Bowes, 1959, Table VII, p.32. Here, the ratio of combined enterprises' and governments' reproducible assets to national income at factor cost in 1955 is given as 2.9 for the United States and 2.8 for Canada. When adjusted to exclude inventories, housing, government capital stocks and agricultural assets, the figures become respectively 1.02 and 1.08. The comparability of the two sets of estimates is open to some question. Other evidence would suggest the Canadian-United States difference could be significantly greater.

^{4/} See supra, p.33.

^{5/} See D. J. Daly, <u>Business Finance</u> (Ottawa: mimeo, 1963) footnote 1, p.4, which notes, in part, that "Data show the book-value of plant and equipment (both before and after depreciation) is currently appreciably larger in relation to the value of output in Canada than the United States for a number of major industries. In manufacturing in 1960, for example, the capital-to-output ratio was 34 per cent higher in Canada than in the United States. This estimate is based on taxation statistics for both countries (buildings and equipment after depreciation) and Gross Domestic Product in manufacturing. The data are fully comparable and large differences are found for other years and for more detailed industrial categories."

between the latter two factors, that the finer the breakdown of industries available, the greater is likely to be the influence of structure in relation to the influence of industry ratio differences.

The differences between the Canadian and United States 1949-63 investment programmes may thus be partly explained by:

- Higher initial Canadian capital-output ratios in individual industries;
- Heavier initial emphasis in the Canadian industrial structure upon high capital-output ratio industries;
- 3. Greater Canadian growth;
- Possibly greater Canadian inter-industry output shifts favouring high capital-output ratio industries.

A comparative analysis of United States industry data along similar lines to that undertaken above with the Canadian data would throw useful additional light on the relative importance of the various factors involved.

Assumptions and Methods

The availability of capital stock data for most major industry groups, the facility with which estimates of capital formation based upon capital-output ratio projections may be adjusted to different output growth assumptions, and the analytical uses to which the capital-output ratio calculations could be put determined the approach which was followed in projecting non-residential fixed investment to 1970.

The implications of several different growth rate assumptions were pursued, utilizing capital-output ratio projections based upon different degrees of aggregation of the capital stock and GDP data for the 22 industries. Further, the implications of varying assumptions concerning the future behaviour of the capital-output ratios were also explored. It was found that our estimates of future investment were highly sensitive to the latter, the reason being that these assumptions affected the estimated capital stock, and thus the investment required to continue production of existing levels of output as well as that required to produce the expected increments to output. A particular finding of some interest was that simple extrapolation of the post-1950 trends in the capital-output ratios resulted in estimates of future investment levels, which, in relation to estimated GNP, would have been well above any previously experienced, even at evidently unsustainable cyclical high points.

Our major purpose, however, was to compute the level of investment to 1970 which would be consistent with the 5.5 per cent^{1/} rate of growth in aggregate real GDP estimated to be involved in the movement of the economy from the 1963 actual level of output to the 1970 "potential" level. One of the findings of Section IV above was that aggregate capital-output ratio changes were partly the result of changes in the mix of output. It thus appeared desirable to incorporate into our projections any information available as to the prospective future mix. Broad estimates of the trends in output in a number of major industry groups, consistent both with growth in total GDP from 1963 to 1970 at 5.5 per cent per annum and with various sector output projections, provided such information and accordingly were selected as the most appropriate basis for our projections. Since these estimates did not break down manufacturing into its component industries, the capital stock data for the 13 manufacturing industries were combined to yield

^{1/} For the derivation of this estimate, see B.J. Drabble, Potential Output, 1946 to 1970, Staff Study No. 2, Economic Council of Canada, Ottawa: Queen's Printer, 1964.

stock estimates for total manufacturing. The next task was that of projecting capitaloutput ratios for, and estimating investment in, the following ten major industry groups: Manufacturing; Mining, Quarrying and Oil Wells; Forestry; Fishing and Trapping; Construction; Transportation; Storage; Communication; Electric and Gas Utilities; and Trade.

The detailed estimating procedure for each industry was as follows:

- Project 1963 GDP at factor cost in 1949 dollars to 1970 using the estimated growth rate for that industry consistent with a growth rate of 5.5 per cent in total GDP.
- Project the industry capital-output ratios for machinery and equipment and construction to 1970.
- Compute the mid-year capital stock levels implied by 1 and 2.
- 4. Centre to yield end-year estimates.
- 5. Compute the annual gross stock changes, 1964-70.
- Assemble data on expected discards requiring replacement, 1965-70.
- Gross investment in 1949 dollars is the sum of discard replacements and gross capital stock changes.

Establishment of the trends in the capital-output ratios in each industry was accomplished by graphic methods, $\frac{1}{}$ judgment being employed to avoid embodying, as far as possible, the influence of the immediate post-war and Korean war distortions and the magnifying effect upon the ratios of the output declines featuring the depression and the post-war recessions. However, recent trends were not in all cases assumed to continue unchanged until 1970. Firstly, some allowances had to be made in manufacturing both for the possible effects of economies of larger-scale operations in some industries and of an expansion of output in some of the less capital-intensive industries consistent with the assumption of full employment of an enlarged labour force. Secondly,

^{1/} The historical data on capital-output ratios used as a basis for these graphic projections are given in Appendix Tables B-9(a),(b)&(c).

allowances had to be made for the fact that, during recent years, capacity has been expanded a great deal in some industries and output could be increased considerably without necessitating large further additions to the capital stock. Thirdly, a recent tapering-off in the growth of the ratios was evident in some cases. It was not considered desirable, in view of the relative shortness of the period to 1970, to project longer term trends which implied that 1963 ratios were substantially below trend.

In order to complete the estimates of non-residential business fixed capital formation, it was necessary to project the investment of the following additional sectors:

- 1. Agriculture;
- 2. Finance, Insurance and Real Estate;
- 3. Community and Recreation Services;
- 4. Water and Sanitary Services.

The availability of estimates of the stocks of machinery and equipment in agriculture meant that it was possible to use the methods described above in projecting agricultural machinery and equipment investment. Here, projection of the capital-output ratio trend was based upon some judgments regarding the developments producing past trends and an estimate of their future impact and that of additional developments. In the case of agricultural construction, it was necessary to make a projection directly from deflated gross investment figures. $\frac{1}{2}$ In the remaining industry groups, it was also necessary to project investment directly from deflated gross investment data, 2/ Again, graphic methods were used to project, in most cases, log-linear trends through the data, some judgment being used in fitting the lines either to avoid incorporating distortions into the trend estimates or to utilize information related to the levels of future investment. The use of these methods precluded explicit incorporation of the effects of the assumption of a high growth rate. Fortunately, the sectors involved are apparently among the least sensitive in the economy to variations in investment in response to changes in output: this fact and their small weight in total investment imply that the total potential output investment estimates are not seriously affected by the different estimating procedures employed in these industries.

^{1/} The historical data used as a basis for these projections are given in Appendix Table B-10.

 $[\]frac{2}{1}$ The historical data used as a basis for these projections are given in Appendix Tables B-ll(a) $\delta(b)$.

Results

Since the preparation of the various investment estimates involved a considerable volume of worksheet detail, it is not feasible to present the findings in a manner permitting detailed scrutiny. Further, since both the output and the capitaloutput ratio projections, by industry, were necessarily rather arbitrary, the industry figures are likely to involve larger margins of error than those pertaining to larger aggregates. However, a summary of the results is provided in Tables 5, 6, 7 and 8, and Charts 16 to 21 inclusive permit some visual assessment to be made of the plausibility both of the underlying assumptions and of the results.

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Projected Investment in Machinery and Equipment

and Non-Residential Construction, 1966-70

(Millions of 1949 dollars)

	1963	1966	1967	1968	1969	1970
		Machi	nery a	nd Equipment	<u>t</u>	
Agriculture	320	460	437	347	368	377
10-industry aggregate	1,351	2,299	2,397	2,609	2,773	2,963
Financial and commercial						
services	148	177	186	196	208	220
Social capital	37	49	54	59	65	72
Total	1,856	2,984	3,074	3,211	3,415	3,632
			Constru	uction		
			CONBELL	decion		
Agriculture	112	127	132	136	141	145
10-industry aggregate Financial and commercial	1,186	2,092	2,227	2,309	2,423	2,522
services	185	265	283	301	320	339
Social capital	209	290	312	336	364	396
Total	1,692	2,774	2,953	3,083	3,247	3,401
		Total	Fixed	Investment		
Agriculture	432	587	568	483	509	522
10-industry aggregate Financial and commercial	2,537	4,391	4,623	4,918	5,196	5,485
services	333	442	469	497	528	559
Social capital	246	339	366	396	429	468
Total	3,548	5,758	6,026	6,294	6,662	7,033
Estimated GNP from 1963						
to 1970 potential	29,380	34,488	36,382	38,379	40,486	42,709

Notes: (a) Components may not sum to totals because of rounding.

(b) The figures provided in this table do not constitute a forecast of future actual investment. They are conditional projections based upon the estimated growth rate of total output from 1963 actual to 1970 potential.

Table 6

Projected Investment in Machinery and Equipment

and Non-Residential Construction, 1966-70

	()	dillions c	of 1963 do	llars)			
	1963	1966	1967	1968	1969	1970	
		Mach	inery and	d Equipmen	nt		
Agriculture	514	738	701	557	591	604	
10-industry aggregate Financial and commercial	2,168	3,690	3,847	4,187	4,451	4,756	
services	238	283	298	314	334	353	
Social capital	59	79	87	95	105	116	
Total	2,979	4,790	4,933	5,153	5,481	5,829	
			Constru	ction			
Agriculture	186	211	218	226	233	241	
10-industry aggregate Financial and commercial	1,970	3,475	3,698	3,836	4,025	4,188	
services	307	440	471	500	532	562	
Social capital	347	481	517	558	604	658	
Total	2,810	4,607	4,904	5,120	5,394	5,649	
		Tota	al Fixed	Investment	<u>t</u>		
Agriculture	700	949	920	783	825	845	
10-industry aggregate	4,138	7,165	7,545	8,023	8,475	8,945	
Financial and commercial							
services	545	724	768	814	866	915	
Social capital	407	560	604	654	709	774	
Total	5,790	9,398	9,837	10,274	10,875	11,479	
Estimated GNP from 1963							
to 1970 potential	43,007	50,491	53,263	56,187	59,272	65,525	

Notes: (a) Components may not sum to totals because of rounding.

> (b) The figures provided in this table do not constitute a forecast of future actual investment. They are conditional projections based upon the estimated growth rate of total output from 1963 actual to 1970 potential.

In 1963 dollars, the 1966 total would be about \$9.4 billion, roughly 62 per cent above the actual 1963 level of \$5.8 billion and 50 per cent above the 1964 level of \$6.3 billion anticipated by the mid-year Private and Public Investment in Canada survey. The 1970 figure would be about \$11.5 billion in 1963¹ dollars, about 22 per cent above the 1966 level and 98 per cent above the 1963 level. The sharp jump from the 1963 actual level to the 1966 projected level, resulting in a pronounced rise in the proportion of investment to GNP, arises from the behaviour of investment in the 10industry aggregate covering the major commercial sectors of the economy.

 $[\]frac{1}{1}$ This total is slightly higher than the total of \$11.3 billion shown in Tables 17 and 26 of the <u>First Annual Review</u> of the Economic Council of Canada. The change arises from further refinements to the estimates to make them accord more closely with the output growth estimates embodied in the Review.

43 Table 7

Projected Investment in Machinery and Equipment

		(1949 001	lar basis	1			
	1963	1966	1967	1968	1969	1970	
		Mach	inery and	l Equipmer	<u>it</u>		
Agriculture 10-industry aggregate Financial and commercial	1.09 4.60	1.33 6.67	1.21 6.59	.90 6.80	.91 6.85	.88 6.94	
services Social capital Total	.50 .13 6.32	.51 .14 8.65	.51 .15 8.45	.51 .15 8.37	.51 .16 8.43	.52 .17 8.50	
			Construc	tion			
Agriculture 10-industry aggregate Financial and commercial	.38 4.04	.37 6.07	.36 6.12 78	.35	.35 5,98	• 34 5•90	
Social capital Total	.71 5.76	.84 8.04	.86 8.12	.87 8.03	.90 8.02	.93 7.95	
			Total	-			
Agriculture 10-industry aggregate Financial and commercial	1.47 8.64	1.71 12.73	1.56	1.26	1.26	1.22 12.84	
services Social capital Total	1.13 .84 12.08	1.28 .98 16.70	1.29 1.00 16.56	1.29 1.03 16.40	1.30 1.06 16.46	1.31 1.10 16.47	

and Non-Residential Construction as a Percentage of GNP, 1966-70

Note: The figures provided in this table do not constitute a forecast of future actual investment. They are conditional projections based upon the estimated growth rate of total output from 1963 actual to 1970 potential.

As is emphasized in the footnotes to Tables 5, 6 and 7, the figures provided in the above tables do not constitute a forecast of future actual investment. They are conditional projections based upon the estimated growth rate of total output from 1963 actual to 1970 potential. It is evident from the historical data presented in Section II that the path of investment expenditure has been markedly cyclical. No attempt has been made to incorporate cyclical influences into our projections. In consequence, even if the assumed average rate of output growth is, in fact, realized, we should not expect investment to follow the time-path implied by our projections.

Charts 18 to 23 summarize the relationship of these results to the historical record. Chart 18 portrays actual agricultural investment in 1949 dollars from 1951 to 1963 and projected agricultural investment from 1964 to 1970. The machinery and equipment component of this projection shows a marked hump between 1964 and 1968. This is attributable to the influence of estimated discard replacements in the investment total, in turn related to the assumed service lives of classes of agricultural machinery and



CHART 18 INVESTMENT IN AGRICULTURE (1949 DOLLARS)

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada.

the pattern of past expenditures. The estimate of total machinery and equipment investment is thus consistent with the assumption of smooth underlying growth in the output of this sector. Chart 19 shows the combined results of the projections of 1949 constant dollar investment in individual components of social capital. The total is necessarily in line with recent trends, since the components were projected on the basis of these trends. This is also true of the projections pertaining to the finance, insurance and real estate and commercial services sectors recorded on Chart 20, although here, a curve was drawn through the total finance, insurance and real estate industry investment and projected to 1970.

Since the estimate of investment on the 10-major-industry aggregate was made by projecting industry capital-output ratios, it was deemed appropriate here to depict the aggregate capital-output ratios implicit in these industry projections in





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relation to their past values. This is done in Chart 21. It will be noted that our projection of the machinery and equipment-to-output ratio implies some modification of the strong upward post-war trend in the ratio, for the reasons discussed earlier under the heading "Assumptions and Methods". Thus, with the decline envisaged for the construction ratio, the total exhibits a very slight decline.



----- Projected

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada.

One major modification was made to the results obtained by the methods described. In order to arrive at gross fixed capital formation, estimates of changes in the gross capital stock were added to estimated replacements of discards. Examination of the discards data covering the 1965-70 period indicated that a substantial portion represented replacement of engineering construction in the transportation industry. This represented lagged gross investment from 1910-15, a period of heavy railroad construction. A high proportion of such investment would doubtless have represented the cost of levelling and laying railroad bed and similar work. In the preparation of the capital stock estimates, such engineering construction had been assigned an average service life of 55 years and hence was assumed to require replacement between 1965 and 1970. This seemed unrealistic. Hence, the estimated value of railroad engineering construction discard replacements was subtracted from the estimated total value of discard replacements in the ten industries.

It is felt that the problem encountered in this case is somewhat unusual, although not unique. In some areas of social capital investment, appropriate maintenance may prolong the lives of certain assets for very long periods of time or, in a few cases, almost indefinitely. Fortunately, within the 10-industry aggregate covered by estimates based on capital stock data, the conceptual and practical difficulties involved in capital stock estimation appear less severe than in the case of social capital. However, it should be noted that problems raised by the assumption of a fixed service life appear generally more serious in relation to the projection of construction-type investment than in relation to the projection of machinery and equipment purchases.

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Table 8

Components of Projected Investment,

<u>10-Industry Aggregate, 1966-70</u> (Millions of 1949 dollars)

		1966	1967	1968	1969	1970	
Machinery & Equipment							
Discard replacements		619.1	598.9	684.3	714.2	760.4	
Change in gross capital	stock	1,679.9	1,798.1	1,924.6	2,058.8	2,203.0	
Total		2,299.0	2,397.0	2,608.9	2,773.0	2,963.4	
Construction							
Discard replacements		247.7	278.9	252.3	250.3	227.4	
Change in gross capital	stock	1,844.5	1,947.6	2,057.0	2,172.7	2,294.2	
Total		2,092.2	2,226.5	2,309.3	2,423.0	2,521.6	
Total Investment							
Discard replacements		866.8	877.8	936.6	964.5	987.8	
Change in gross capital	stock	3,524.4	3,745.7	3,981.6	4,231.5	4,497.2	
Total		4,391.2	4,623.5	4,918.2	5,196.0	5,485.0	
			Percei	ntages			
Machinery & Equipment							
Discard replacements		26.9	25.0	26.2	25.8	25.7	
Change in gross capital	stock	73.1	75.0	73.8	74.2	74.3	
Total		100.0	100.0	100.0	100.0	100.0	
Construction							
Discard replacements		11.8	12.5	10.9	10.3	9.0	
Change in gross capital	stock	88.2	87.5	89.1	89.7	91.0	
Total		100.0	100.0	100.0	100.0	100.0	
Total Investments							
Discard replacements		19.7	19.0	19.0	18.6	18.0	
Change in gross capital	stock	80.3	81.0	81.0	81.4	82.0	
Total		100.0	100.0	100.0	100.0	100.0	

Note: The figures provided in this table do not constitute a forecast of future actual investment. They are conditional projections based upon the estimated growth rate of total output from 1963 actual to 1970 potential.

Table 8 breaks down the investment projections for the 10-industry aggregate into the two components: discard replacements (after the adjustment noted above) and gross capital stock changes. Total discard replacements average about 19 per cent of projected gross investment in the ten industries over the 1966-70 period. The smallness of this proportion is partly a reflection of the high estimates of the change in the capital stock associated with high output growth. It is interesting to note that the proportion of discards to estimated gross investment is considerably higher for machinery and equipment than for construction investment. This is attributable to the relatively short average service lives of machinery and equipment in comparison with structures and the secular growth of output.

Chart 22 provides a visual representation of the levels of investment relative to GNP implied by our estimates. Increases in the importance of both machinery and equipment and construction investment are envisaged. The former would return to relative levels very slightly higher than those experienced from 1947 to 1953 and again from 1956 to 1957. Construction would not quite regain the relative levels of 1956 to 1958.



Note: Actual 1926-63; Forecast 1964; Projected 1965-70.

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada.

Finally, Chart 23 depicts the projected levels of investment and GNP in 1949 dollars in relation to the historical record of these aggregates.



Notes: (a) "Fixed investment" comprises residential and non-residential construction plus machinery and equipment expenditures. "Total investment" comprises fixed investment plus the value of the physical change in nonfarm business inventories.

(b) Actual Forecast Projected

Appraisal of Results

It will be apparent that the projections made are dependent not only upon the validity of the capital stock and output estimates, but also upon the various projections of industry capital-output ratios. In making the latter, as in projecting deflated investment data, subjective judgments are necessarily involved and little independent information is available to permit evaluation of the validity of such judgments. However, the analysis of the 1949-63 gross capital stock changes in Section IV above indicated the change in output to be the major determinant, followed in importance by inter-industry output shifts. The combined effects of changes in industry capital-output ratios were of considerably less importance. The investment projections provided above similarly depend primarily upon the output change assumed and incorporate the effects of projected inter-industry output shifts. The implicit aggregate combined machinery and equipment and construction capital-output ratio declines very slightly over the 1965-70 period.

The projections show a significantly higher ratio of investment to GNP than has characterized the post-war years as a whole. The projected ratio of non-residential business fixed investment to GNP averages about 16.5 per cent compared with 13.5 per cent over the 1946-63 period (all estimates on a 1949 dollar basis). The projected

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada.

1966 ratio is 16.7 per cent compared with the 12.1 per cent actually realized in 1963.

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It appears worthwhile to examine the causes of this marked projected rise in the proportion of investment in some detail. As was noted earlier, the increase is primarily attributable to the behaviour of investment in the 10-major-industry aggregate. This investment estimate may be regarded as deriving from the assumed rate of growth of aggregate output in the ten industries and the implicit projected (almost stable) aggregate gross capital output ratio for plant and equipment combined. Similarly, the low recent proportion of investment was evidently likely attributable either to a lower rate of actual total output growth than that projected, or to a significantly declining gross capital-output ratio, or to some combination of the two. The estimate of average real GDP growth between 1963 and 1970 underlying our estimates is 5.5 per cent (or 5.9 per cent in the nonagricultural sector). However, since 1961, real nonagricultural GDP at factor cost has been growing at about 5.3 per cent per annum -- not too far below the rate underlying our estimates. The capital-output ratio for the 10industry aggregate has been declining significantly, as expected, but this would appear to be largely the result of a lag in the response of the gross capital stock and investment to the increase in output which has occurred since 1961.^{$\frac{1}{2}$} In the immediately preceding period, between 1957 and 1961, the growth rate of nonagricultural GDP was only 2.6 per cent per annum.

Under conditions of a roughly stable longer run ratio of gross capital stock to output, changes in the rate of growth of output may exert (with a lag) tremendous leverage on the level of investment and its proportion of GNP. A sustained rise in the growth rate of output from 3 per cent to 5 per cent per annum would, under the assumption of a fixed gross capital-output ratio, require investment net of discards to rise by 66-2/3 per cent, raising the proportion of such investment to GNP by the same percentage. As may be observed in Chart 15, current rates of capital stock growth are substantially below the current growth rate of output and also well below the projected growth rate of nonagricultural GDP. A significant rise in the growth rate of the capital stock is inevitable under current and projected high growth conditions if our projection of an almost stable gross capital-output ratio (under equilibrium conditions) is broadly realistic. As has been shown above, this necessarily involves a strong rise

^{1/} The existence of substantial lags in the response of investment to changes in sales or output has been established by a number of comprehensive empirical enquiries. See, for example, Robert Eisner, <u>A Distributed Lag Investment Function</u>, Cowles Foundation Paper No. 143 (New Haven, 1960).

in the proportion of investment to GNP. Support for such an interpretation arises from the substantial increase in expected investment for the year 1964 reported in the midyear Private and Public Investment Outlook, and from the further substantial increases planned for 1965 and 1966 (and the following years) by respondents to the Economic Council's survey of the longer range investment outlook. $\frac{1}{2}$

It will be apparent that, in the circumstances indicated, return of investment to the levels required to re-establish a growth rate in the gross capital stock similar to that in output -- which is itself projected to rise at a more rapid rate than the recent high percentage -- will require a major shift in the level of investment and thus very high average growth rates of investment over the period in which such an adjustment occurs. It is evident, of course, that these high average rates of investment are not indefinitely sustainable and arise from disequilibrium initial rates of gross capital stock, output and investment growth in relation to the projected rate of output growth in the 1963-70 period. Our projection assumes $\frac{2}{}$ that, between 1963 and 1966. investment will reach the level at which the projected (almost stable) implicit aggregate gross capital-output ratio is being realized at the projected GDP growth rate of 5.5 per cent. Following the initial rise in investment necessary to meet these requirements, the further rise from 1966 to 1970 is quite modest, resulting in a growth rate for total investment slightly below that for total output. Table 9 provides estimates of the rates of growth of actual or projected output, gross and net capital stocks and capital formation, and capital consumption allowances, for the ten major industries plus agriculture, covering various sub-periods between 1946 and 1970. It is of interest to note the widely fluctuating rates of investment -- particularly estimated net investment -- the high current rates of capital consumption and, related to this, the perhaps surprisingly slow relative growth of the estimated net capital stock between 1963 and 1970.

^{1/} See B.A. Keys, Special Survey of Longer Range Investment Outlook and Planning in Business, Staff Study No. 6, Economic Council of Canada, Ottawa: Queen's Printer, 1964.

^{2/} Admittedly, this may be an unrealistic assumption. The object of our exercise was, however, to indicate the average proportions of investment compatible with the output growth assumptions and not to attempt to predict the precise time-path of investment.

Table 9

Estimates of Percentage Growth Rates in Capital Stock,

Capital Formation and Output of Major Industries*,

	Gross Fixed Capital Stock	Net Fixed Capital Stock	Gross Fixed Capital Formation	Net Fixed Capital Formation	Capital Consumption Allowances	Output
1946-57	5.7	7.3	10.7	16.7	6.1	4.8
1957-63	4.3	3.4	-4.4	-14.7	4.2	3.4
1963-70	5.8	5.7	10.3	18.2	5.8	5.7

Selected Periods, 1946-70

* Total economy excluding the following sectors: (1) finance, insurance and real estate; (2) public administration and defence; and (3) community, recreation, business and personal service.

Source: Based on data from Daily Bulletin Supplement 2, Dec. 22, 1964, Dominion Bureau of Statistics, Table 11, p. 11 and estimates by Economic Council of Canada.

It is important to recognize that the average rate of output growth projected for 1963-70 is itself a rate which is not indefinitely sustainable -- given the productivity growth assumptions -- combining, as it does, both the growth in output required to lift the economy to the "potential" level and the growth of "potential output" itself.¹/ Further, the high projected rates of labour force growth underlying the "potential" rate will also give way to more moderate percentage increases after 1970 as the population "bulge" is fully absorbed into the labour force. Since the high ratios of investment to GNP implied by our estimates are directly related to the high projected total output growth rate, it is evident that the period of such high investment proportions will be similarly limited.²/ Thus, the high rates of investment growth and the high levels of investment and savings³/ relative to total output projected are not to be regarded as characterizing the long-run performance of the economy, but merely the period of adjustment of the economy to the high growth accompanying a return to potential and an abnormal expansion of potential in line with the expected rapid rise of the labour force.

^{1/} The growth rate of potential total output from 1963 to 1970 is estimated at 4.6 per cent (4.8 per cent in the nonagricultural sector). See B.J. Drabble, op. cit., Table 17, p. 45.

^{2/} To simplify the exposition, no explicit cognizance has been taken in this context of the possible impact of "shifts" of output between commodities or industries or of changes in production functions affecting the relations between capital and output.

^{3/} For a statement of the savings -- investment identity at potential output in 1970 (in 1970 dollars), see Frank Wildgen, <u>National Saving at Potential Output to 1970</u>, Staff Study No. 10, Economic Council of Canada, Ottawa: Queen's Printer, 1964.

VI - CURRENT BUSINESS INVESTMENT PLANS

The previous section examined the investment implications of a rate of growth of output consistent with the achievement of potential output in 1970. However, whether the economy in fact will achieve this high rate of growth depends partly upon the dynamics of the relation between investment and other expenditure categories. The survey of the 1964-70 investment plans of larger corporations undertaken by the Economic Council was devised to provide some idea of the magnitude and direction of future investment as $planned^{1/}$ at the time of the interviews.

Altogether, 86 firms were included in the survey. The 78 firms included in the 1963 total were responsible for about 50 per cent of total business capital investment (excluding that in agriculture and fishing^{2/}). Forty-nine of the eighty-six firms -- or 57 per cent -- provided forecasts through 1970, although, as Fr. Keys' study indicates, most concerns considered only the forecasts covering the first three years to be reasonably firm. The sample was not intended to be fully representative, being directed specifically towards the larger concerns.

Variable coverage indexes (1963=100) were computed^{$\frac{3}{2}$} to summarize the total quantitative implications of the individual forecasts, with the results shown in Table 10.^{$\frac{4}{2}$}

^{1/} See B. A. Keys, <u>Special Survey of Longer Range Investment Outlook and Planning in Business</u>, Staff Study No. 6, Economic Council of Canada, Ottawa: Queen's Printer, 1964.

	Non-residential Construction	Machinery <u>and Equipment</u> (millions of dollar	Total
1963 Business Gross Fixed			- ,
Capital Formation (ex. Housing) per National Accounts	2,811	2,979	5,790
less Agriculture and Fishing	(186)	(558)	(744)
Institutional Services	(744)	(112)	(856)
Sub-total	930	670	1,600
equals	1,881	2,309	4,190
1963 Capital Formation of	1,167	767	1,934
Firms included in Survey			2,113*
Percentage coverage	62.0	33.2	46.2
			50.5*

 $\frac{2}{}$ The relationships with National Accounts totals were as follows:

* The total 1963 capital spending of some firms could not be allocated between machinery and equipment and construction spending.

- 3/ Because not all firms provided estimates for every year, and since the number of firms covered in the later years fell off considerably, an index of the simple yearly totals would have been biased. To overcome this problem, two totals were constructed for each year, one covering the same firms as in the corresponding total for the previous year and similarly for the following year. The relation of each total to the corresponding total of the preceding year=100). These overlapping index numbers were then re-expressed to the base 1963=100.
- 4/ Some estimates of total investment were allocated between machinery and equipment and construction on the basis of the firm's historical record of the distribution between the two forms of investment.

17-1-1-	10
1970PT	10

(1963=100)									
	1963	1964	1965	1966	1967	1968	1969	1970	
Machinery and Equipment Construction Total	100.0 100.0 100.0	136.3 119.1 123.9	161.5 124.0 144.1	162.5 121.9 151.0	154.1 117.3 135.9	146.1 117.8 131.7	143.5 102.0 121.0	146.2 103.8 123.8	
Covered by Index	78	78	81	78	73	69	57	49	

Indices of Investment Planned by Business Concerns, 1963-70

These results indicate considerable potential short-term strength in Canadian business investment, particularly the machinery and equipment category, although the survey's coverage of total business investment is lower in the case of machinery and equipment than in the case of construction. The gradual falling-off after 1966 reflects partly the difficulties involved in making firm plans beyond a horizon of about three years in many industries and partly the fact that the nature of investment in a number of areas is such that the formulation of plans for the period beyond two or three years ahead is considered unnecessary. Given the characteristics of the business environment, there may be very real difficulties in extending the useful horizon of the forecast much beyond three years. Generally, as attempts are made to extend plans further into the future, the less firm these become and the more contingent upon certain events, government policies, economic conditions and technological change.

For these reasons, as is emphasized in Mr. Keys' study, the trailing-off of the magnitudes of planned investment in the later 1960s should be regarded as reflecting the uncertain nature of the forecasting exercise rather than as indicating any real possibility of such a decline's actually occurring.

The strength in planned business investment to 1966 is encouraging in relation to the output growth targets established by the Economic Council, although it is not, of course, by itself, sufficient to guarantee the realization of a high rate of output increase through 1966. Since 1961, the growth of total output in the Canadian economy has been very slightly below that estimated by the Economic Council as required to achieve potential output by 1970, but the ratio of investment to output has been markedly lower than that suggested by the projections of Section V as appropriate to such a rate of growth in output. The substantial upward revision of planned investment is thus in accordance with theoretical expectations and empirical evidence of lags in the adjustment of investment to output change. The time-path of realized investment is likely to diverge substantially, however, from the time-path indicated in our projections, which, as was noted earlier, abstract from dynamic investment-output interactions. APPENDIX A

A NOTE ON THE ANALYSIS OF GROSS FIXED CAPITAL FORMATION

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A NOTE ON THE ANALYSIS OF GROSS FIXED CAPITAL FORMATION

Part of gross investment may be considered to be required to replace 1. items discarded from the gross stock. The remainder will then constitute an addition to the gross stock. Thus, we may write

 $I_t = D_t + \Delta K_t$

where $I_{+} = \text{gross}$ investment from mid-year of year t-1 to mid-year of year t $D_{+} = discards$ from mid-year of year t-1 to mid-year of year t and $\Delta K_t = K_t - K_{t-1}$ where K_t is

defined as mid-year gross capital stock in year t and K_{t-1} is

the gross capital stock at the middle of the previous year.

The capital stock in any period is equal to the level of output multiplied by the capital-output ratio. For example,

 $K_{t} = \frac{O_{t}}{O_{t}} \frac{K_{t}}{O_{t}}$

where O_{\pm} is defined as the output produced during the year t.

Thus,
$$\Delta K_{t} = (O_{t-1} + \Delta O_{t}) (\frac{K_{t-1} + \Delta K_{t}}{(O_{t-1} + \Delta O_{t})} - O_{t-1} \frac{K_{t-1}}{O_{t-1}}$$

$$= {}^{0}_{t-1} \left(\frac{(K_{t-1} + \triangle K_{t})}{(O_{t-1} + \triangle O_{t}} - \frac{K_{t-1}}{O_{t-1}} \right) + {}^{\triangle O_{t}} \left(\frac{(K_{t-1} + \triangle K_{t})}{(O_{t-1} + \triangle O_{t}} \right) \right)$$

$$= {}^{0}_{t-1} \left(\frac{(K_{t-1} + \triangle K_{t})}{(O_{t-1} + \triangle O_{t}} - \frac{K_{t-1}}{O_{t-1}} \right) + {}^{\triangle O_{t}} \left[\frac{K_{t-1}}{O_{t-1}} + \frac{(K_{t-1} + \triangle K_{t})}{(O_{t-1} + \triangle O_{t}} - \frac{K_{t-1}}{O_{t-1}} \right) \right] \cdots I$$

i.e. $K_{+} = Base-period$ total output times the change in the capital-output ratio; plus the change in total output times the base-period capital-output ratio; plus the change in output times the change in the capital-output ratio. The change in the total capital-output ratio may be written

$$\frac{\mathbf{x}_{t-1}^{\mathrm{T}} + \triangle \mathbf{x}_{t}^{\mathrm{T}}}{\mathbf{o}_{t-1}^{\mathrm{T}} + \triangle \mathbf{o}_{t}^{\mathrm{T}}} - \frac{\mathbf{x}_{t-1}^{\mathrm{T}}}{\mathbf{o}_{t-1}^{\mathrm{T}}}$$

where the superscript T refers to some total. This may also be written

$$\frac{\frac{1}{\Sigma}(\kappa_{t-1}^{i}+\Delta\kappa_{t}^{i})}{\frac{1}{\Sigma}(\sigma_{t-1}^{i}+\Delta\sigma_{t}^{i})} - \frac{\frac{1}{\Sigma}\kappa_{t-1}^{i}}{\frac{1}{\Sigma}\sigma_{t-1}^{i}} \dots \Pi$$

where the superscripts i refer to the individual industries included in the total.

2.

3.

II may be written as follows, without changing its value, by subtracting and

$$\begin{split} & \operatorname{adding} \quad \sum_{i=1}^{i} \left[\frac{k_{t-1}^{i} + (O_{t-1}^{i} + \Delta O_{t}^{i})}{O_{t-1}^{i} \sum_{i} (O_{t-1}^{i} + \Delta O_{t}^{i})} \right] : \\ & \frac{i}{2} \left[\frac{k_{t-1}^{i} + \Delta K_{t}^{i}}{O_{t-1}^{i} + \Delta O_{t}^{i}} \frac{O_{t-1}^{i} + \Delta O_{t}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t}^{i})} \right] - \sum_{i=1}^{i} \left[\frac{k_{t-1}^{i} + (O_{t-1}^{i} + \Delta O_{t}^{i})}{O_{t-1}^{i} + 2(O_{t-1}^{i} + \Delta O_{t}^{i})} \right] + \sum_{i=1}^{i} \left[\frac{k_{t-1}^{i} + \Delta O_{t}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t}^{i})} \right] \\ & - \sum_{i=1}^{i} \left[\frac{k_{t-1}^{i} + \Delta K_{t}^{i}}{O_{t-1}^{i} + \Delta O_{t}^{i}} - \frac{k_{t-1}^{i}}{O_{t-1}^{i}} \right] \left[\frac{O_{t-1}^{i} + \Delta O_{t}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t}^{i})} \right] \\ & + \sum_{i=1}^{i} \left[\frac{k_{t-1}^{i} + \Delta K_{t}^{i}}{O_{t-1}^{i} + \Delta O_{t}^{i}} - \frac{k_{t-1}^{i}}{O_{t-1}^{i}} \right] \left[\frac{O_{t-1}^{i} + \Delta O_{t}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t-1}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t}^{i})} \right] \\ & + \sum_{i=1}^{i} \left[\frac{k_{t-1}^{i} + \Delta A_{t}^{i}}{O_{t-1}^{i} + \Delta O_{t}^{i}} - \frac{k_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t}^{i})} \right] \\ & = \sum_{i=1}^{i} \left[\frac{(k_{t-1}^{i} + \Delta A_{t}^{i}}{(V_{t-1}^{i} + \Delta O_{t}^{i})} - \frac{(O_{t-1}^{i} + \Delta O_{t}^{i})}{(V_{t-1}^{i} + \Delta O_{t}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i} + \Delta O_{t}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i})} \right] \\ & + \sum_{i=1}^{i} \left\{ \frac{k_{t-1}^{i}}{(V_{t-1}^{i} + \Delta O_{t}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i})} \right] \\ & + \sum_{i=1}^{i} \left\{ \frac{k_{t-1}^{i}}{(V_{t-1}^{i} + \Delta O_{t}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i})} - \frac{O_{t-1}^{i}}{\frac{1}{2}(O_{t-1}^{i})} \right] \right\} \dots IIII$$

In III,
$$\frac{\kappa_{t-1}^i + \bigtriangleup \kappa_t^i}{o_{t-1}^i + \bigtriangleup o_t^i} - \frac{\kappa_{t-1}^i}{o_{t-1}^i}$$
 is the change

in the industry capital-output ratio, which may be written $\bigtriangleup R_{t}^{i}$

and
$$\frac{O_{t-1}^{i} + \triangle O_{t}^{i}}{\sum_{t=0}^{i} (O_{t-1}^{i} + \triangle O_{t}^{i})} - \frac{O_{t-1}^{i}}{\sum_{t=0}^{i} O_{t-1}^{i}}$$
 is the change

in the industry GDP weight, which may be written \bigtriangleup_{t}^{i}

Thus, III may be rewritten

 $\sum_{t=1}^{i} W_{t-1}^{i} \triangle R_{t}^{i} + \sum_{t=1}^{i} R_{t-1}^{i} \triangle W_{t}^{i} + \sum_{t=1}^{i} \triangle R_{t}^{i} \triangle W_{t}^{i}$

and I may be rewritten

$$\begin{split} & \bigtriangleup_{\mathbf{K}_{t}} = \bigtriangleup_{\mathbf{0}_{t}^{\mathrm{T}}}^{\mathrm{T}} \left(\sum_{k=1}^{i} \mathbb{W}_{t-1} \ \mathbb{R}_{t-1}^{i} \right) + \mathbb{O}_{t-1}^{\mathrm{T}} \left(\sum_{k=1}^{i} \mathbb{W}_{t-1}^{i} \bigtriangleup \mathbb{R}_{t}^{i} + \sum_{k=1}^{i} \mathbb{R}_{t-1}^{i} \bigtriangleup \mathbb{W}_{t}^{i} + \sum_{k=1}^{i} \mathbb{E}_{t-1}^{i} \bigtriangleup \mathbb{W}_{t}^{i} \right) \\ & + \bigtriangleup_{\mathbf{0}_{t}^{\mathrm{T}}}^{\mathrm{T}} \left(\sum_{k=1}^{i} \mathbb{W}_{t-1}^{i} \bigtriangleup \mathbb{R}_{t}^{i} + \sum_{k=1}^{i} \mathbb{R}_{t-1}^{i} \bigtriangleup \mathbb{W}_{t}^{i} + \sum_{k=1}^{i} \mathbb{E}_{t-1}^{k} \bigtriangleup \mathbb{W}_{t}^{i} \right)$$

In this form, it is readily seen that the total change in the capital stock may be regarded as the sum of:

- the change in total output (industry capital-output ratios and weights held constant);
- (2) the effects of changes in individual industry capital-output ratios, industry weight shifts and interactions between the two (total output held constant); and
- (3) the change in output times the change in industry capital-output ratios (weights held constant); plus the change in output times the change in weights (capital-output ratios held constant); plus the change in output times the change in ratios times the change in weights.

APPENDIX B

BASIC STATISTICAL TABLES

-									_
_		1946	1947	1948	1949	1950	1951	1952	_
1.	Housing expenditure	407	526	635	822	923	947	971	
2.	Social capital expenditures	292	380	537	597	678	871	1,176	
3.	Resource development and related capital expenditure								
	ment)(1)	225	376	549	667	762	1,008	1,302	
4.	Agriculture and fishing	185	278	352	443	482	525	562	
5.	Other business capital expenditures ⁽¹⁾	566	880	1,015	1,011	1,091	1,387	1,481	
	Total	1,675	2,440	3,088	3,540	3,936	4,738	5,492	
Tot	al excluding rounding error	1,674	2,440	3,087	3,539	3,936	4,739	5,491	
	GNP	11,850	13,165	15,120	16,343	18,006	21,170	23,995	

Table B-1

Components of Total Capital Expenditure, 1946-64 (Millions of current dollars)

Table B-1 (cont'd)

1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963(P)	1964(F)
1 100	1 990	1 207	1 647	1 4 20	1 700	1 759	1 455	1 467	1 507	1 71 0	2 015
1,199	1,238	1,397	1,04/	1,430	1,782	1,/52	1,430	1,40/	1,58/	1,/13	2,015
1,152	1,153	1,254	1,485	1,633	1,712	1,864	1,932	1,938	2,156	2,210	2,424
1,297	1,182	1,370	2,232	2,676	1,993	1,673	1,646	1,705	1,727	1,856	2,293
557	400	426	488	434	465	539	550	576	663	744	785
1,781	1,748	1,797	2,281	2,544	2,411	2,590	2,677	2,487	2,583	2,791	3,295
5,976	5,721	6,244	8,033	8,717	8,363	8,418	8,261	8,173	8,716	9,314	10,812
5,976	5,721	6,244	8,034	8,717	8,364	8,417	8,262	8,172	8,715	9,312	10,811
											(2)
25,020	24,871	27,132	30,585	31,909	32,894	34,915	36,287	37,391	40,339	43,007	46,345(2)

(P) Preliminary
(F) Forecast mid-year (as at mid-year, 1964)
(1) 1946-60 data not strictly comparable with 1960-63 data because of changes in the Standard Industrial Classification

(2) Based on estimate implying a 1963-64 GNP increase of 7.8 per cent

Source: Private and Public Investment in Canada, Department of Trade and Commerce

		1946	1947	1948	1949	1950	1951	1952
	Housing expenditure	3.4	4.0	4.2	5.0	5.1	4.5	4.0
	Social capital expenditures	2.5	2.9	3.6	3.7	3.8	4.1	4.9
	Resource development and related capital expenditure (ex. agricultural investment)	1.9	2.9	3.6	4.1	4.2	4,8	5.4
•	Agriculture and fishing	1.6	2.1	2.3	2.7	2.7	2.5	2.3
	Other capital expenditure	4.7	6.7	6.7	6.2	6.0	6.5	6.2
	Total	14.1	18.6	20.4	21.7	21.8	22.4	22.8

Table	B-1((a)
Contraction of the local division of the loc	The second value of the se	the second day of the second d

Components of Total Capital Expenditure, 1946-64 (Percentages of GNP)
1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 (I	P) ₁₉₆₄ (F)
4.8	5.0	5.1	5.1	4.5	5.4	5.0	4.0	3.9	3,9	4.0	4.3
4.6	4.6	4.6	4.9	5.1	5.2	5.3	5.3	5.2	5.3	5.1	5.2
5.2	4.8	5.0	7.3	8.4	6.1	4.8	4.5	4.6	4.3	4.3	4.9
2.2	1.6	1.6	1.6	1,4	1.4	1.5	1.5	1.5	1.6	1.7	1.7
7.1	7.0	6.6	7.5	7.9	7.3	7.5	7.4	6.7	6.4	6.5	7.1
23.9	23.0	22.9	26.4	27.3	25.4	24.1	22.7	21.9	21.5	21.6	23.2

Table B-1(a) (cont'd)

(P) Preliminary
(F) Forecast mid-year (as at mid-year, 1964)

Source: Table 1.

Table B-1(b)

Components of Total Capital Expenditure, 1946-64 (Percentages of Total Capital Expenditure)

		1946	1947	1948	1949	1950	1951	1952	
1.	Housing expenditure	24.3	21.6	20.6	23.2	23.5	20,0	17.7	
2.	Social capital expenditures	17.4	15.6	17.4	16.9	17.2	18.4	21.4	
3.	Resource development and related capital expenditure (excluding agricultural investment)	13.4	15,4	17.8	18.8	19.4	21.3	23.7	
4.	Agriculture and fishing	11.0	11.4	11.4	12.5	12.2	11.0	10.2	
5.	Other business capital expenditures	33.8	36.0	32.8	28,6	27.7	29.3	27.0	
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 ^{(P}) 1964 ^(F)
19.9	21.6	22.4	19.3	16.4	21.3	20.8	17.6	17.9	18.2	18.4	18.6
19.3	20.2	20.1	18.5	18.7	20.5	22.1	23.4	23.7	24.7	23.7	22.4
21.7	20.7	21.9	27.8	30.7	23.8	19.9	19.9	20.9	19.8	19.9	21.2
9.3	7.0	6.8	6.1	5.0	5.6	6.4	6.7	7.1	7.6	8.0	7.3
29,8	30,5	_28.8	_28.3	29.2	28.8	30.8	32.4	30.4	29.7	30.0	30,5
00.00	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table B-1(b) (cont'd)

(P) Preliminary
(F) Forecast mid-year (as at mid-year, 1964)

Source: Table 1.

		1946	1947	1948	1949	1950	1951	1952
	Chur ches	6.2	10.9	23.6	33.4	32.5	32.1	27.0
	Universities	12.4	13.5	12.3	11.9	14.0	14.0	13.1
	Schools	27.4	31.3	53.4	74.2	89.2	112.4	146.3
	Hospitals	28.3	33.1	55.6	71.4	73.0	79.0	93.3
•	Other ⁽¹⁾	1.6	1.9	3.1	4.2	4.2	4.5	5.4
0	tal institutional services (items 1 to 5)	76	91	148	195	213	242	285
0.	vernment departments	208	279	375	384	439	594	846
iu	nicipal water works	8	10	14	18	26	35	45
0	tal social capital expenditures	292	380	537	597	678	871	1,176

Table B-2

Components	of	Social	Ca	apital	E	penditure,	1946-64
	(Mil	lions	of	currer	nt	dollars)	

Tabl	e B-2	(con	t'd
			the second se

1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 ^(P)	1964 ^(F)
27.7	33.8	38.1	46.6	56.5	58.4	57.6	62.2	62.1	56.5	48.3	51.1
17.0	20.0	25.2	26.3	42.5	63.3	81.5	87.3	111.6	114.9	132.4	180.4
134.4	155.0	188.4	189,9	217.2	222.7	235.1	255.5	253.0	451.2	476,1	346.5
118.3	121.6	146.2	128.7	130.8	161.5	151.9	155.9	177.8	198.2	180.0	203.7
5.2	7.8	10.3	9.9	7.7	8.8	13.3	12.0	11.9	13.4	18.8	24.3
303	338	408	402	454	514	536	573	617	834	856	806
800	756	796	1,012	1,110	1,118	1,236	1,274	1,247	1,258	1,295	1,506
49	59	50	71	69	80	92	85	74	64	59	112
1,152	1,153	1,254	1,485	1,633	1,712	1,864	1,932	1,938	2,156	2,210	2,424

(P) Preliminary
(F) Forecast, mid-year
(1) Includes privately-operated social and welfare institutions

Source: Private and Public Investment in Canada, Department of Trade and Commerce

Ta	bl	е	B-	21	(a)	
	_			-			

Components	of	Social	Capit	al	Expenditure	1946-64
		Percent	tages	of	GNP)	

		1946	1947	1948	1949	1950	1951	1952	
1.	Churches	.052	.083	.156	.204	.181	.152	.113	
2.	Universities	.105	.103	.081	.073	.078	.066	.054	
3.	Schools	.231	.238	.353	.454	.495	.531	.610	
4.	Hospitals	.239	.251	.368	.437	•405	.373	.389	
5.	Other	.014	.014	.021	.026	.023	.021	.022	
6.	Total institutional services (Items 1 to 5)	.641	.691	.979	1.193	1.183	1.143	1 . 188	
7.	Municipal water works	.068	.076	.092	.110	.144	.165	.187	
8.	Subtotal	.709	.767	1.071	1.3 <mark>03</mark>	1.327	1.308	1.375	
9.	Government departments	1.755	2.119	2.480	2.350	2.438	2.806	3.526	
10.	Total social capital expenditures	2.464	2.886	3,551	3,653	3,765	4,114	4.901	

Table	B-2(a)	(cont'd)
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1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	P)1964(F)
.136	.140	.152	.177	.177	,165	.171	. 166	.140	.112	,111
.080	.093	.086	.133	.192	.233	.241	,299	.285	.308	.390
.623	,694	.621	.681	.677	.673	•704	.677	1,118	1.107	.749
.489	.539	.421	.410	.491	.435	.430	.476	.491	.419	.441
.031	.038	.032	.024	.027	.038	.033	.032	.033	.044	.052
1.359	1.504	1.314	1,423	1,563	1,535	1,579	1,650	2.067	1,990	1.743
.237	.184	.232	.216	.243	.263	.234	.198	.159	.137	.242
1,596	1.688	1.546	1,639	1,806	1.798	1,813	1.848	2.226	2,127	1.985
3.040	2,934	3,309	3.479	3.399	3.540	3.511	3.335	3.118	3,011	3.257
4,636	4.622	4,855	5,118	5.205	5.338	5,324	5.183	5.344	5,138	5.242
	1954 .136 .080 .623 .489 .031 1.359 .237 1.596 3.040 4.636	1954 1955 .136 .140 .080 .093 .623 .694 .489 .539 .031 .038 1.359 1.504 .237 .184 1.596 1.688 3.040 2.934	1954 1955 1956 .136 .140 .152 .080 .093 .086 .623 .694 .621 .489 .539 .421 .031 .038 .032 1.359 1.504 1.314 .237 .184 .232 1.596 1.688 1.546 3.040 2.934 3.309 4.636 4.622 4.855	1954 1955 1956 1957 .136 .140 .152 .177 .080 .093 .086 .133 .623 .694 .621 .681 .489 .539 .421 .410 .031 .038 .032 .024 1.359 1.504 1.314 1.423 .237 .184 .232 .216 1.596 1.688 1.546 1.639 3.040 2.934 3.309 3.479 4.636 4.622 4.855 5.118	1954 1955 1956 1957 1958 .136 .140 .152 .177 .177 .080 .093 .086 .133 .192 .623 .694 .621 .681 .677 .489 .539 .421 .410 .491 .031 .038 .032 .024 .027 1.359 1.504 1.314 1.423 1.563 .237 .184 .232 .216 .243 1.596 1.688 1.546 1.639 1.806 3.040 2.934 3.309 3.479 3.399 4.636 4.622 4.855 5.118 5.205	1954 1955 1956 1957 1958 1959 .136 .140 .152 .177 .177 .165 .080 .093 .086 .133 .192 .233 .623 .694 .621 .681 .677 .673 .489 .539 .421 .410 .491 .435 .031 .038 .032 .024 .027 .038 1.359 1.504 1.314 1.423 1.563 1.535 .237 .184 .232 .216 .243 .263 1.596 1.688 1.546 1.639 1.806 1.798 3.040 2.934 3.309 3.479 3.399 3.540	1954 1955 1956 1957 1958 1959 1960 .136 .140 .152 .177 .177 .165 .171 .080 .093 .086 .133 .192 .233 .241 .623 .694 .621 .681 .677 .673 .704 .489 .539 .421 .410 .491 .435 .430 .031 .038 .032 .024 .027 .038 .033 1.359 1.504 1.314 1.423 1.563 1.535 1.579 .237 .184 .232 .216 .243 .263 .234 1.596 1.688 1.546 1.639 1.806 1.798 1.813 3.040 2.934 3.309 3.479 3.399 3.540 3.511	1954 1955 1956 1957 1958 1959 1960 1961 .136 .140 .152 .177 .177 .165 .171 .166 .080 .093 .086 .133 .192 .233 .241 .299 .623 .694 .621 .681 .677 .673 .704 .677 .489 .539 .421 .410 .491 .435 .430 .476 .031 .038 .032 .024 .027 .038 .033 .032 1.359 1.504 1.314 1.423 1.563 1.535 1.579 1.650 .237 .184 .232 .216 .243 .263 .234 .198 1.596 1.688 1.546 1.639 1.806 1.798 1.813 1.848 3.040 2.934 3.309 3.479 3.399 3.540 3.511 3.335	1954 1955 1956 1957 1958 1959 1960 1961 1962 .136 .140 .152 .177 .177 .165 .171 .166 .140 .080 .093 .086 .133 .192 .233 .241 .299 .285 .623 .694 .621 .681 .677 .673 .704 .677 1.118 .489 .539 .421 .410 .491 .435 .430 .476 .491 .031 .038 .032 .024 .027 .038 .033 .032 .033 1.359 1.504 1.314 1.423 1.563 1.579 1.650 2.067 .237 .184 .232 .216 .243 .263 .234 .198 .159 1.596 1.688 1.546 1.639 1.806 1.798 1.813 1.848 2.226 3.040 2.934 3.309 3.479	1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 .136 .140 .152 .177 .177 .165 .171 .166 .140 .112 .080 .093 .086 .133 .192 .233 .241 .299 .285 .308 .623 .694 .621 .681 .677 .673 .704 .677 1.118 1.107 .489 .539 .421 .410 .491 .435 .430 .476 .491 .419 .031 .038 .032 .024 .027 .038 .033 .032 .033 .044 1.359 1.504 1.314 1.423 1.553 1.579 1.650 2.067 1.990 .237 .184 .232 .216 .243 .263 .234 .198 .159 .137 1.596 1.688 1.546 1.639 1.806 1.798 1.813 1.848 2.226 2.127 3.040 2.934 3

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(P) Preliminary
(F) Forecast mid-year (as at mid-year, 1964)

Source: Table 2.

Table	B-3
CONTRACTOR OF A DESCRIPTION OF A DESCRIP	and the second diversion of

Components of Resource Development and Related Capital Expenditure,

	(Millions of current dollars)												
		1946	1947	1948	1949	1950	1951	1952					
1.	Forestry	13	32	28	26	34	58	39					
2.	Mining, quarrying and oil wells	27	42	70	96	114	164	205					
3.	Electric power	64	119	228	324	372	454	558					
4.	Railway transport (construction only)	34	27	38	54	37	59	92					
5.	Petroleum and natural gas transportation and seaway	6	3	4	8	55	11	95					
6.	Paper products mfg. ⁽¹⁾	55	81	90	82	79	125	130					
7.	Nonferrous metal products mfg. ⁽²⁾	8	16	20	29	22	48	71					
8.	Nonmetallic mineral products mfg.	8	22	28	20	16	30	34					
9.	Prod. of petroleum and coal mfg.	10	34	43	28	33	59	78					
	Total	225	. 376	549	667	762	1,008	1,302					

(Millions of current dollars)

1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 ^(P)	1964 ^(F)
34	46	63	76	48	33	48	54	50	54	60	76
253	278	336	542	606	342	342	400	449	480	503	612
526	445	443	64 7	803	680	574	533	570	583	632	756
107	70	89	155	188	183	235	203	162	139	169	142
80	65	59	225	412	349	90	113	179	80	114	157
104	87	139	257	266	127	127	166	161	173	215	355
79	54	34	117	144	96	61	68	57	100	60	94
32	43	48	120	79	40	74	49	45	52	52	74
82	94	109	93	130	143	122	60	32	66	51	27
1,297	1,182	1,370	2,232	2,676	1,993	1,673	1,646	1,705	1,727	1,856	2,293

Table B-3 (cont'd)

Note: Excluding agricultural investment.

(P) Preliminary
(F) Forecast, mid-year
(1) From 1960 on, under the revised SIC, this category becomes "Paper and Allied Industries"

(2) From 1960 on, under the revised SIC, this category becomes part of "Frimary Metals" and "Metal Fabricating". Figs. from 1960 on relate to "Primary Metals" less "Iron and Steel Mills" and "Steel Pipe and Tube Mills"

Source: Private and Public Investment in Canada, Department of Trade and Commerce

Tabl	e	B-	3	(a)

Components of Resource Development and Related Capital Expenditure, 1946-64 (Percentages of GNP)

		1946	1947	1948	1949	1950	1951	1952
1.	Forestry	.109	.243	.199	.159	.189	.274	.163
2.	Petroleum and natural gas extraction	.031	.076	.263	.275	.300	.340	.429
3.	Other Mining	.194	.243	.235	.312	. 333	.435	.425
4.	Electric Power	.540	.904	1.621	1.983	2.066	2.145	2,325
5.	Railway transportation (Construction only)	. 287	.205	.270	.330	.205	.279	,383
	Petroleum and natural gas transport and seaway	.051	.023	.028	.049	.305	.052	.396
	Paper products, mfg.	.464	.615	.640	.502	.439	.590	.542
	Nonferrous metal products mfg.	.068	.121	.142	.177	.122	.227	.296
	Nonmetallic mineral products mfg.	.068	.167	.199	.122	.089	.142	.142
).	Prod. of petroleum and coal mfg.	.084	.258	.306	.171	183	,279	.325
	Total	1.899	2.856	3,903	4.081	4.232	4.761	5,426

1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	P) ₁₉₆₄ (F)
.136	.185	,232	.248	.150	.100	.137	.149	.134	.134	.140	.164
.432	.543	.752	.860	.852	.675	.619	.631	.693	.508	.630	.561
.579	.575	.486	.912	1.047	.365	.361	.471	.508	.681	.539	.760
2.102	1.789	1.633	2.115	2.517	2.067	1.644	1.469	1,524	1.445	1.470	1.631
.428	.281	.328	.507	.589	.556	.673	.559	.433	.345	.393	.306
.320	.261	.217	.736	1.291	1.061	.258	.311	.479	.198	.265	.339
.416	.350	.512	.840	.834	.386	.363	.457	.431	.429	.500	.766
.316	.217	.310	.383	.451	.292	.175	.187	.152	.248	.140	.203
.128	.173	.177	.392	.248	.122	.212	.135	.120	.129	.121	.160
,328	.378	402	.304	407	.435	.349	.165	.086	164	.118	058
5.184	4.752	5.049	7.298	8.386	6.059	4.791	4,536	4.560	4.281	4.316	4.948

Table B-3(a) (cont'd)

Note: Excluding agricultural investment.

Figures may not add exactly to totals because of rounding.

(P) Preliminary
(F) Forecast mid-year (as at mid-year, 1964)

Source: Table 3.

		1946	1947	1948	1949	1950	1951	1952
1.	Manufacturing, other than resource-related mfg.	257	375	393	378	352	530	661
2.	Utilities (1)	139	251	282	285	269	380	404
3.	Construction	33	52	59	55	71	66	78
4.	Trade	83	119	162	193	234	234	196
5.	Finance, ins., real estate	15	21	33	32	61	69	50
6.	Commercial services	39	62	86	68	104	108	97
	Total	566	880	1,015	1,011	1,091	1,387	1,48]

Table B-4

Components of "Other Business" Capital Expenditure, 1946-64 (Millions of Current Dollars)

1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 (P) ₁₉₆₄ (F)
672	544	567	806	860	688	761	834	791	879	971	1,220
492	525	495	664	836	861	851	838	713	735	848	925
91	97	174	200	158	157	145	130	136	109	116	125
330	368	329	325	370	356	363	381	307	319	312	367
78	107	102	124	136	180	267	279	312	298	256	30 9
	107	130	162	184	169	203	215	228	243	288	349
1,781	1,748	1,797	2,281	2,544	2,411	2,590	2,677	2,487	2,583	2,791	3,295

Table B-4 (cont'd)

Note: Exclude Agriculture and Fishing.

(P) Preliminary
(F) Forecast mid-year
(1) Total utilities less electric power, railway transportation, (construction only) seaway, petroleum and natural gas transportation and municipal water works. Remaining items are: railways and telegraphs, water transport and services, motor carriers, grain elevators, telephones, broadcasting, air transport, warehousing and toll highways and bridges.

Source: Private and Public Investment in Canada, Department of Trade and Commerce.

Table	B-5
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Components of Manufacturing Capital Expenditure,

Other Than Resource-Related, 1946-64

(Millions of current dollars)

		1946	1947	1948	1949	1950	1951	1952
1.	Foods and Beverages	53.1	82.8	88.4	78.7	75.2	79.1	77.3
2.	Tobacco and Tobacco Products	2.1	3.1	2.7	2.0	2.6	2.2	2.3
3.	Rubber Products	7.5	10.2	6.0	6.4	4.7	7.9	10.0
4.	Leather Products	3.2	3.2	3.4	2.7	2.5	2.8	2.3
5.	Textile Products	24.6	36.6	35,6	32.1	27.4	39.1	31.5
6.	Clothing ⁽¹⁾	8.4	14.0	12.3	13.7	11.9	13.2	12.7
7.	Wood Products (2)	20.4	32.1	26.4	26.7	29.4	38.6	31.8
8.	Printing, Publishing and Allied Industries	7.3	13.8	19.4	20.1	19.4	24.3	14.3
9.	Iron and Steel Industries Products(3)	36.9	54.9	56.3	52.3	44.2	97.2	135.9
0.	Transportation Equipment	15.7	14.1	15.4	22.0	27.3	48.9	62.1
1.	Electrical Appliances and Supplies(4)	11.7	15.0	16.7	16.6	13.7	31.9	40.4
2.	Chemical Products	19.6	33.7	41.9	37.8	26.3	57.7	141.0
3.	Miscellaneous	5.6	5.7	6.5	5.9	6.0	7.4	8.8
4.	Capital Items Charged to Operating Expenditures	41.0	56.0	62,0	60,9	61.8	79.6	90.2
	TOTAL	257.1	375.2	393.0	377.9	352.4	529.9	660.6

Tabl	e	B-5	(con	t'd)
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1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	P) ₁₉₆₄ (F)
85.0	104.3	103.7	109.1	117.1	126.2	132.8	151.9	165.0	168.7	155.9	164.6	
3.2	3.1	4.4	8.2	9.1	11.6	8.2	6.9	8.1	6.3	3.6	9.2	
15.2	15.7	15.1	13.9	17.0	8.4	13.2	23.9	16,4	17.0	15.4	25.0	
3.1	2.3	2.3	4.3	3.6	2.4	3.0	3.9	3.8	4.5	4.7	3.9	
27.9	28.5	28.0	38.3	39.3	23.3	22.8	27.1	27.5	36.5	45.0	78.2	
14.4	9.8	9.2	9.7	10.8	8.2	12.5	12.3	13.2	13.8	13.5	11.8	
34.6	32,9	43.0	50.8	39.0	30.9	50.7	48.8	49.3	47.6	57.4	55.1	
16.4	31.4	24.1	25.5	40.1	33.5	40.2	29.1	30.7	36.5	45.5	40.7	
114.0	88.4	95.2	162.5	179.6	126.4	165.7	195.7	129.9	193.0	199.1	274.0	
97.3	65.2	54.3	60.3	62.4	54.3	65.7	48.4	47.1	47.9	75.7	121.3	
36.0	31.7	28.5	41.5	44.3	29.1	30.1	31.8	30.2	40.3	45.1	52.9	
122.3	39.8	56.3	144.9	149.7	116.6	81.0	107.0	125.7	100.0	117.7	174.3	
8.7	7.2	10.8	12.3	15.1	12.0	16.5	20.8	19.8	27.2	24.8	28.2	
93.6	84.1	92.3	124.7	132.5	105.4	118.8	126.4	124.0	139.4	167.1	180.7	
671.7	544.4	567.2	806.0	859.6	688.3	761.2	834.0	790.7	878.7	970.5	1,219.9	

(P) Preliminary

(P) Forecast, mid-year
 (1) From 1960 on, under the revised SIC, this category becomes "Clothing and Knitting Mills".

(2) From 1960 on, under the revised SIC, this category becomes "Wood" and "Furniture and Fixtures".

(3) From 1960 on, under the revised SIC, this category becomes part of "Metal Fabricating" and "Primary Metals" and "Machinery". Figures from 1960 on relate to "Metal Fabricating", plus "Machinery", plus "Iron & Steel Mills", plus "Steel Pipe and Tube Mills".
(4) From 1960 on, under the revised SIC, this category becomes "Electrical Products".

Source: Private and Public Investment in Canada, Department of Trade and Commerce.

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	(Mill	ions of c	urrent do	llars)	_		
	1948	1949	1950	1951	1952	1953	1954
Newfoundland							
Construction Machinery and Equipment Total	N/A	17 14 32	32 15 47	36 27 63	57 30 88	50 30 81	51 22 73
Prince Edward Island							
Construction Machinery and Equipment Total	8 4 12	10 5 16	10 7 16	10 6 16	9 10 18	10 7 17	12 6 18
Nova Scotia							
Construction Machinery and Equipment Total	74 41 115	81 35 117	66 43 109	66 53 119	86 52 138	100 60 161	102 57 158
New Brunswick							
Construction Machinery and Equipment Total	51 33 83	60 35 95	85 32 117	64 49 114	57 49 106	75 36 111	79 42 121
Quebec							
Construction Machinery and Equipment Total	491 304 794	490 303 793	584 287 871	739 371 1,110	898 440 1,338	919 485 1,404	918 426 1,344
Ontario							
Construction Machinery and Equipment Total	682 498 1,179	791 506 1,297	928 561 1,488	1,078 751 1,829	1,202 796 1,998	1,310 876 2,185	1,348 815 2,163
Manitoba							
Construction Machinery and Equipment Total	101 82 183	112 87 199	124 98 222	126 111 237	147 103 250	183 108 291	179 94 273
Saskatchewan							
Construction Machinery and Equipment Total	75 91 165	84 128 212	102 136 239	93 148 241	148 175 323	182 180 362	231 150 381
Alberta							
Construction Machinery and Equipment Total	172 112 284	226 126 351	254 147 402	304 181 485	394 217 611	481 250 731	462 190 652
British Columbia							
Construction Machinery and Equipment Total	224 117 341	243 137 380	268 157 425	353 172 525	436 186 622	445 189 634	359 181 540
Canada							
Construction Machinery and Equipment Total	1,876 1,281 3,157	2,114 1,376 3,490	2,453 1,483 3,936	2,870 1,868 4,738	3,435 2,058 5,493	3,754 2,221 5,975	3,738 1,984 5,722

Investment by Canadian Provinces, 1948-64 (Millions of current dollars)

81 Table B-6 (cont'd)

1955	1956	1957	1958	1959	1960	1961	1962	1963(P)	1964 ^(F)
65	67	69	80	84	113	144	177	161	158
22	29	32	27	31	33	40	84	66	72
88	92	101	107	115	147	104	201	221	230
12	15	14	16	25	24	25	30	29	29
9 21	9 24	8 22	14 30	12 37	13 37	13 38	13 43	16 45	44
104	120	121	120	161	166	151	154	162	163
57	61	67	65	65	68	73	69	84	91
101	181	168	185	220	234	224	443	240	234
120	136	107	132	137	119	115	117	115	141
43 163	186	158	181	203	181	171	179	192	234
1 0.37	1.253	1.377	1.437	1.460	1.327	1.386	1.512	1,569	1,904
473	592	653	617	634	680	622	642	712	782
1,509	1,840	2,029	2,054	2,094	2,007	2,008	2,134	2,201	2,080
1,432	1,778	2,068	2,145	1,905	1,827	1,794	1,936	2,045	2,078
823	2,871	3,265	3,105	2,900	2,855	2,794	3,054	3,205	3,352
190	243	258	275	315	308	283	278	348	337
103	122	112	134	169	179	134	145	166	172
294	303	370	409	404	407	41 \	424	514	203
212	296	279	307	273	293	302	332	353	364
343	483	456	478	468	474	454	513	598	617
534	620	585	655	676	666	722	653	694	693
187	279	249	235	271	280	259	284	293	294
720	833	834	890	947	945	901	937	307	307
463	744	907	663	674	609	596	598	673	798
691	1,084	1,292	262 925	945	895	901	927	1,017	1,171
4,170	5,272	5,785	5,830	5,709	5,453	5,518	5,787	6,149	6,665
2,075	2,762	2,931	2,534	2,709	2,809	2,654	2,928	3,163	3,419

Note: Figures may not add exactly to totals because of rounding.

(P) Preliminary
 (F) Forecast, March 1964
 Source: Private & Public Investment in Canada, Department of Trade and Commerce

Table B-7

Gross Domestic Fixed Capital Formation as Percentage of GNP -

Selected Countries, 1950-61

(1954 price basis)

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	1950	1951	1952	1953	1954	1955	192P	1981	1958	1959	1960	1961
Inited States				(Bil	lions of	1954 Un	ited Sta	ites doll	ars)			
. Gross Domestic Fixed Capital Formation . GNP . Ratio 1:2	56.3 320.0 17.6	56.4 341.5 16.5	56.1 356.0 15.8	58.7 370.7 15.8	60.1 364.8 16.5	66.3 394.0 16.8	67.4 401.5 16.8	67.3 409.8 16.4	62.5 403.3 15.5	68.2 430.1 15.9	69.1 441.2 15.7	68.7 449.4 15.3
nited Kingdom					(Million	s of 195	4 pounds	sterlin	g)			
. Gross Domestic Fixed Capital Formation . GNP . Ratio 1:2	2,104 16,223 13.0	2,103 16,561 12.7	2,113 16,455 12,8	2,346 17,167 13.7	2,542 17,903 14.2	2,661 18,404 14.5	2,808 18,894 14.9	2,953 19,225 15.4	2,977 19,427 15.3	3,200 20,113 15.9	3,528 20,966 16,8	3,778 21,408 17.6
mada					(Million	s of 195	4 Canadi	an dolla	IB)			
Gross Domestic Fixed Capital Formation GNP Ratio 1:2	4,701 21,519 21.8	4,896 22,830 21.4	5,365 24,662 21.8	5,780 25,607 22.6	5,592 24,852 22.5	5,967 26,989 22.1	7,278 29,336 24.8	7,680 29,696 25,9	7,368 30,084 24.6	7,200 30,990 23.2	6,975 31,571 22.1	6,850 32,130 21.3
ropean Economic Community)	Billions	of Unit.	ed State	s dollar	s; 1954	prices,	1958 exc]	nange rat	tes)	
Gross Domestic Fixed Capital Formation GNP Parto 1.0	16.4 90.3	17.1	17.5	19.1	21.2	24.3 121.6	26.2 128.1	27.6 134.9	28.1	30.2	33.3 155.9	36.5 164.1
7:T OTABU	Z°QT	17.b	17.3	17.9	18.8	20.0	20.5	20.5	20.3	20.8	21.4	22.2

Source: General Statistics, OECD, November, 1962

Table B-8

Gross Domestic Fixed Capital Formation as Percentage of GNP -

Selected Countries, 1955-62

(1958 Price Basis)

	1955	1956	1957	1958	1959	1960	1961	1962
United States		(B	illions o	f 1958 Un	ited Stat	tes dollar	(s)	
 Gross Domestic Fixed Capital Formation GNP 	76.8 436.2	78.2	78.1 454.0	72.4	78.6 476.2	80.3 488.3	79.6	85.5 527.6
3. Ratio 1:2	17.6	17.6	17.2	16.2	16.5	16.4	16.0	16.2
United Kingdom			(Million	s of 1958	Pounds s	sterling)		
 Gross Domestic Fixed Capital Formation GNP Ratio 1:2 	3,128 21,881 14.3	3,303 22,367 14.8	3,480 22,743 15.3	3,486 22,968 15.2	3,752 23,789 15.8	4,124 24,870 16,6	4,484 25,683 17.5	4,380 25,746 17.0
Canada			(Million	s of 1958	Canadia	n dollars)		
 Gross Domestic Fixed Capital Formation GNP Ratio 1:2 	6,715 29,521 22.7	8,192 32,088 25.5	8,635 32,482 26.6	8,292 32,906 25.2	8,069 34,008 23.7	7,784 34,781 22.4	7,715 35,667 21.6	8,008 37,871 21.1
European Economic Community	(Billion	us of Unit	ed States	dollars;	1958 pr.	ices, 1956	exchange	: rates)
 Gross Domestic Fixed Capital Formation GNP Ratio 1:2 	28.0 141.8 19.7	30.2 149.2 20.2	32.0 157.6 20.3	32.8 161.9 20.3	35.9 170.8 21.0	40.1 186.5 21.5	43.9 196.6 22.3	46.7 206.6 22.6

Source: Statistics of National Accounts, 1955-62 Supplement, OECD.

Table 8-9(a)

Ratios of Gross Capital Stock to Gross Domestic Product for 22 Industries

(Based on 1949 dollar estimates)

Total: Construction, Machinery and Equipment

		1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
1. E	brestry	.745	.658	-505	.774	.615	.526	-544	.573	-573	- 584	-587	-570	. 555	.629
2. F	Tishing (1)	2.255	2.126	2.195	2.143	2.148	2.148	1.897	2.020	1.959	1.947	1.759	1.887	2.173	2.170
3. P	Mining, quarrying and oil wells	2.484	2.321	2.080	2.059	1.991	1.936	1.901	1.970	2.201	2.449	2.531	2.646	2.547	2.297
4. C	Dustruction	1.075	.916	.737	.727	.616	.462	.330	.327	.375	.497	.523	.460	.441	• 444
5. 1	Transportation	18.916	16.941	15.483	15.948	15.002	11.703	9.277	7.990	7.032	6.909	7.082	7.829	7.270	7.310
6.0	Storage(2)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5.402	5.290	5.819
7. C	Communication (including CBC)	10.691	10.175	9.477	9.393	9.310	8.955	8.280	7.841	7.498	6.941	6.514	6.185	6.093	6.139
8° E	ilectric power and gas utilities	20.012	18.918	17.583	17.905	17.048	15.481	13.908	12.914	12.479	12.482	13.028	12.694	11.655	11.763
9.]	Trade	1.523	1.423	1.335	1.399	1.363	1.272	1.164	1.148	1.130	1.076	1.032	.925	.897	.970
10.	Foods and beverages	2.698	2.423	2.314	2.378	2.298	2.142	1.923	1.848	1.810	1.677	1.702	1.675	1.809	1.932
11.	Tobacco, rubber and leather products	1.307	1.415	1.425	1.598	1.434	1.371	1.146	1.111	1.110	1.105	1.026	1.120	1.115	1.291
12.	Textiles	3.512	3.175	2.957	3.677	2.943	2.198	2.026	1.859	2.014	2.145	2.162	2.170	2.158	2.219
13.	Clothing	1.226	1.127	1.027	1.070	.961	.831	.772	.701	.711	.747	.775	.773	.825	.815
14.	Paper products	7.370	6.581	5.677	7.043	6.074	5.118	4.615	4.657	4.790	4.528	4.199	3.628	3.417	3.348
15.	Printing, publishing and allied														
	industries	3.062	2.912	2.744	2.951	2 . 892	2.945	2.668	2.617	2.633	2.520	2.298	2.019	1.885	1.766
16.	Non-met. min. and prod. of pet. and coal	9.807	8.584	7.209	7.727	7.280	6.144	4.976	4.669	4.473	4.307	4.466	4.139	3.794	3.825
17.	Chemicals	7.756	7.000	5.932	6.116	5.607	4.538	2,965	1.863	1.786	1.708	2.300	2.898	2,923	2.974
18.	Miscellaneous manufacturing industries	2.898	2.608	2.408	2.417	2.312	2.132	1.559	1.123	.911	.913	1.069	1.358	1.346	1.454
19.	Wood products	4.959	4.153	3.522	3.562	3.142	2.496	2.196	2.117	2.217	2.129	2.056	1.803	1.616	L=624
20.	Iron and steel products	3.418	2.826	2.171	2.511	2.342	1.610	1.204	1.015	.961	1.134	1.471	1.809	1.602	1.531
21.	Transportation equipment	4.355	4.211	3.488	4.128	4.304	2.702	1.578	1.109	.910	.762	1.132	2.173	1.783	1.698
22.	Non-ferrous metals and electrical														
	apparatus	1.683	1.459	1.237	1.328	1.316	1.213	1.278	1.462	1.610	1.864	2.428	2.726	2.253	2.120
L	btal manufacturing	3.774	3,380	2.954	3.246	3.006	2.447	1.979	1.722	1.651	1.643	1.917	2.138	2,011	2.012
12	12 Industry aggregate	4.854	4.410	3.920	4.187	3,912	3.339	2.806	2.544	2.456	2.459	2.624	2.667	2.503	2.518

Table B-5(a) (cont'd)

		1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
					4											
-	· Forestry,	S18.	°743	.695	.835	.931	.953	.973	1.007	1.169	1.335	I.209	1.152	1.265	1.194	1.155
2	. Fishing '1'	1.956	1.848	1.914	2.239	2.234	2.091	2.308	2.138	2.338	2.055	2.318	2.450	2.196	2.011	2.253
3	. Mining, quarrying and oil wells	2.164	2.090	2.011	2.107	2.186	2.203	2.121	2.133	2.328	2.594	2.487	2.622	2.661	2.654	2.786
4	. Construction	.439	.452	.475	.456	.467	.511	.538	. 526	.553	.576	.638	.709	.730	.753	.770
S	. Transportation	7.586	7.553	7.050	6.900	7.101	7.767	6.878	6.329	6.738	7.382	6.880	7.009	6.817	6.702	6.412
9	, Storage (2)	5.292	5.388	4.400	3.465	3.570	3.635	3.878	3.392	3.546	3.646	3.806	4.106	4.091	4.888	4.305
2	, Communication (including CBC)	5.996	5.874	5.727	5.770	5.840	5.750	5,629	5.502	5.548	5.762	5.947	5.932	6.057	6.043	6.128
8	. Electric power and gas utilities	12.243	12.004	11.624	11.858	12.456	12.374	11.643	11.221	11.411	11.419	10.842	10.272	10.052	9.850	9.430
6	. Trade	966.	1.004	1.068	1.068	1.079	1.179	1.160	1.126	1.189	1.231	1.219	1.259	1.293	1.262	1.249
10	. Foods and beverages	2.022	2.021	2.030	1.975	1.974	2.008	2.001	1.990	2.037	2.025	2.025	2.066	2.108	2.139	2.186
H	. Tobacco, rubber and leather prod.	1.370	1.328	1.347	1.303	1.249	1.377	1.293	1.248	1.306	1.382	1.305	1.425	1.387	1.303	1.277
12	Textiles	2.268	2.076	2.129	2.422	2.347	2.701	2.251	2.223	2.238	2.389	2.110	2.161	1.962	1.802	1.681
13	. Clothing	.831	.842	.861	.804	.802	.870	.853	.829	.831	.818	.785	.853	.868	.841	.683
14	Paper products	3.287	3.075	2.986	3.270	3.290	3.267	3.249	3.341	3.723	3.944	3.810	3.876	3.882	3.856	3.863
15	. Printing, publishing and allied															
	Industries	1.711	1.745	1.751	1.765	1.660	1.604	1,596	1.516	1.569	1.676	1.616	1.609	1.635	1.623	1.661
16	Non-met. min and prod. of pet. and															
	coal	3.729	3.477	3.339	3.459	3.364	3.454	3.269	3.205	3.506	3.700	3.634	3.762	3.733	3.563	3.381
17.	. Chemicals	3.030	2.925	2.743	2.998	2.987	2.946	2.802	2.849	2.981	2.969	2.962	2.852	2.946	2.897	2.772
18.	Misc. manufacturing industries	1.236	1.217	1.108	1.126	1.006	1.084	1.099	1.067	1.075	1.023	.947	.942	.883	.840	.866
19.	Wood products	1.686	1.584	1.523	1.559	1.480	1.524	1.425	1.465	1.621	1.568	1.547	1.580	1.585	1.490	1.438
20.	Iron and steel products	1.602	1.583	1.436	1.524	1.699	1.954	1.754	1.585	1.767	2.016	1.834	Л.а.	n.à.	n.a.	"Å.
21	. Transportation equipment	1.649	1.534	1.284	1.165	1.104	1.401	1.369	1.290	1.378	1.595	1.643	1.685	1.722	1.456	1.296
22	Non-ferrous metals and electrical															
	apparatus	2.069	1.960	1.874	1.987	1.872	2.007	1.887	1.908	2.163	2.373	2.333	2.290	2.347	2.203	2.159
	Total manufacturing	2.036	1.965	1.881	1.928	1.913	2.067	1.975	1.944	2.106	2.245	2.186	2.243	2.259	2.155	2.071
	22-Industry aggregate	2.545	2.485	2.435	2.463	2.485	2.647	2.533	2.444	2.608	2.776	2.743	2.830	2.859	2.792	2.747
1	(1) In calculating GDP for 1962, 19	63, Index	for Tota	al Fishi	tT bue Bu	apping .	ras used									

(2) GDP at factor cost data available from 1946 only.

Source: Based on data from Dominion Bureau of Statistics and the Royal Commission on Taxation and estimates by Economic Council of Canada.

Table B-9(b)

Ratios of Gross Capital Stock to Gross Domestic Product for 22 Industries

(Based on 1949 dollar estimates)

Construction

	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1
1. Forestry.	. 503	.453	.354	.553	.448	.389	°397	.408	.402	.408	.407	.389	.367	.403	
2. Fishing ⁽¹⁾	. 306	,272	.270	.255	.249	.238	.205	.215	.205	.197	.170	.173	.190	.182	
3. Mining, quarrying and oil wells	1.615	1.534	1.375	1.353	1.302	1.254	1.218	1.249	1.389	1.546	1.604	1.685	1.630	1.489	
4. Construction	.268	.233	161.	.197	.188	.166	.129	.123	.130	.161	.159	.133	.117	.108	
5. Transportation	14.582	13,153	12.025	12.322	11.554	9.044	7.251	6.308	5.558	5.438	5.564	6.148	5.664	5.633	
6. Storage (2)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4.505	4.410	4.853	
7. Communication (including CBC)	5.178	4.991	4.745	4.776	4.756	4.583	4.211	3.940	3.749	3.483	3.312	3.207	3.186	3.201	
8. Electric light, power and gas	13.924	13.182	12.253	12.489	11.925	10.864	9.790	9.114	8.824	8.842	9.277	9.143	8.467	8.600	
9. Trade	1.259	1.185	1.116	1.170	1.138	1.061	.968	.953	.940	.897	.858	.764	.732	.781	
10. Foods and beverages	1.264	1.148	1.107	1.142	1.107	1.035	.928	.892	.875	.810	.825	.820	.887	.935	
11. Tobacco, rubber and leather	.774	.877	.914	1.023	.914	.870	.722	.703	.714	.720	.674	.738	.720	.810	
12. Textiles	1.851	1.660	1.545	1.930	1.557	1.147	1.027	.925	966°	1.050	1.042	1.037	110.1	1.000	
13. Clothing	.927	.858	.785	.820	.731	.618	.567	.513	.514	. 535	.553	.543	.560	.531	
14. Paper products	4.505	4.115	3.588	4.495	3.935	3.304	2.950	2.983	3.061	2.889	2.696	2.358	2.236	2.177	86
15. Printing, publishing and allied									•						>
industries	1.165	1.100	1.040	1.119	1.083	1.085	.976	.964	.985	.955	. 890	.806	.769	.726	
16. Non-met. min. and prod. of pet.															
and coal	7.443	6.577	5.584	6.056	5.770	4.886	3.932	3.660	3.481	3.325	3.423	3.152	2.851	2.805	
17. Chemicals	5.258	4.909	4.270	4.518	4.247	3.491	2.275	1.413	1.343	1.279	1.722	2.176	2.170	2.139	
18. Miscellaneous manufacturing industri	es 1.967	1.813	1.713	1.750	1.684	1.542	1.103	.780	.627	.624	.722	· 909	.889	.945	
19. Wood products	2.960	2.534	2.209	2.276	2.033	1.618	1.398	1.335	1.411	1.354	1.295	1.134	1.003	.983	
20. Iron and steel products	2.062	1.796	1.452	1.752	1.667	1.124	.786	.607	. 537	.606	.766	.943	.840	.797	
21. Transportation equipment	2.333	2.260	1-871	2.234	2.345	1.461	.847	.604	. 506	.427	.637	1.245	1.060	1.046	
22. Non-ferrous metals and electrical															
apparatus	.808	.711	- 583	e03	. 586	.562	. 595	.691	°775	. 892	1.158	1.318	1.120	1.066	
Total manufacturing	2.217	2.021	1.792	1.990	1.856	1.503	161.1	1.019	.968	.955	1.110	1.245	1.175	1.165	
22-Industry aggregate	3.292	3.023	2.703	2.893	2.710	2.314	1.938	1.748	1.678	1.672	1.781	1.813	1.695	1.689	

Table B-9(b) (cont'd)

1949 1950 1951 1952 1953	.518 .469 .424 .496 .550	.165 .160 .166 .200 .206	oil wells 1.432 1.405 1.355 1.411 1.448	.104 .107 .109 .099 .095	5.803 5.748 5.327 5.164 5.236	4.421 4.491 3.644 2.847 2.924	'ing CBC) 3.118 3.046 2.963 2.978 3.008	and gas 8.964 8.762 8.450 8.589 8.962 8	.791 .782 .811 .792 .783	.968 .969 .973 .941 .930	leather .845 .814 .832 .804 .756	.982 .879 .883 .978 .932	.523 .518 .521 .473 .456	2.125 1.985 1.895 2.022 1.977	g and allied	.702 .715 .708 .705 .666	rod. of pet.	2.691 2.480 2.298 2.279 2.172	2.111 1.998 1.835 1.924 1.805 1	industries .792 .778 .706 .712 .632	.931 .889 .891 .834	ucts .827 .818 .742 .767 .820	pment 1.024 .946 .776 .681 .619	and electrical	1.036 .976 .933 .993 .936	1.164 1.116 1.056 1.059 1.027 1	1.692 1.644 1.595 1.590 1.580 1
1954 1955	.563 .576	.191 .209	.446 1.399	.096 .092	5.625 4.923	2.986 3.205	2.957 2.895	3.838 8.293	.837 .808	.930 .914	.811 .740	068 .879	.483 .464	903 1.828		.646 .639		2.239 2.154	711 1.607	.675 .675	.839 .757	.906 .783	.746 .700		.994 .921	.086 1.019	.655 1.565
1956 16	. 596 .7	.192 .2	1.421 1.5	.083 .0	4.502 4.6	2.805 2.5	2.822 2.8	7.982 8.1	.773 .8	. 896 .	. 696 .7	.848 .6	. 440 .4	1.800 1.5		. 601 .6		2.127 2.3	1.594 1.6	. 636 . 6	.754 .7	.674 .7	.632 .6		.922 1.0	.982 1.0	1.493 1.5
1958	02 .822	192 .192	560 1.748	184 .088	100 5.286	318 2.996	103 2.849	.12 8.141	805 .822	.886	.733	133 .861	122 .385	109 1.945		521 .671		327 2.486	125 1.588	. 567	.97 .735	13 .782	.716		139 1.131	137 1.086	80 1.675
1959	.748	.222	1.688 1	•098	4.920	3.115	2.886	7.741	.801	.878	.681	.737	.330	1.831 1		.654		2.463 2	1.553 1	. 505	.698	.685	.725		1.109 1	1.043]	1.647 1
1960 196	.712 .80	.230 .20	.796 1.84	.108 .10	5.001 4.82	3.350 3.35	2.861 2.89	.358 7.22	.821 .82	.933 .94	.762 .72	.785 .70	.373 .37	.826 1.77		.674 .67		.573 2.53	.506 1.50	.522 .48	.723 .71	n.a. n.ä	.771 .77.		113 1.12	087 1.07	.706 1.71
1 1962	3 .780	2 .179	7 1.858	111. 6	4 4.727	5 3.997	2.841	3 7.107	7 .790	942	,676	.629	± .352	3 1.710		.653		9 2.411	5 1.437	· 447	.651	• n.d.	.648		2 1.043	1.009	1.660
-	6.	.18	1.95	11.	4.52	3-51	2.833	6.843	.766	.950	.646	.573	.272	1.649		.656		2.263	1.340	.445	.606	n.a.	.568		1.030	.954	1.62

(1) In calculating GDP for 1962, 1963, Index for Total Fishing and Trapping was used.

(2) GDP at factor cost data available from 1946 only.

Source: Based on data from Dominion Bureau of Statistics and the Royal Commission on Taxation and estimates by Economic Council of Canada.

Table B-9(c)

Ratios of Gross Capital Stock to Gross Domestic Product for 22 Industries

(Based on 1949 dollar estimates)

Machinery and Equipment

		1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
1. Forestry		.242	.205	.151	.221	.167	.137	.147	.165	171.	a176	.180	.181	.188	.226
2. Fishing ⁽¹⁾		1.949	1.854	1.925	1.888	1.899	1.910	1.692	1.805	1.754	1.750	1.589	1.714	1.983	1.988
3. Mining, quarrying and oil w	wells	.869	.787	.705	.706	.689	.682	.683	.721	.812	.903	.927	.961	.917	808
4. Construction		.807	.683	.546	.530	.428	.296	.201	.204	.245	.336	.364	.327	.324	.336
5. Transportation		4.334	3.788	3.458	3.626	3.448	2.659	2.026	1.682	1.474	1.471	1.518	1.681	1.606	1.677
6. Storage(2)		n.a.	n.å.	n.a.	n.a.	n.a.	.897	.880	a966						
7. Communication (including CB	BC)	5.513	5.184	4.732	4.617	4.554	4.372	4.069	3.901	3.749	3.458	3.202	2.978	2.907	2.938
8. Electric light, power and g	388	6.088	5.736	5.330	5.416	5.123	4.617	4.118	3.800	3.655	3.640	3.751	3.551	3.179	3.163
9. Trade		.264	.238	.219	.229	.225	.211	.196	.195	.190	e119	.174	.161	.165	.189
10. Foods and beverages		1.434	1.275	1.207	1.236	101.1	1.107	395	.956	.935	.867	.877	.855	.922	.997
11. Tobacco, rubber and leath	her	.533	. 538	.511	.575	.520	.501	.424	.408	.396	.385	.352	.382	395	.481
12. Textiles		1.661	1.515	1.412	1.747	1.386	1.051	666°	.934	1.018	1,095	1.120	1.133	1.147	1.219
13. Clothing		.299	.269	.242	-250	.230	.213	.205	.188	.197	.212	.222	.230	.265	•284
14. Paper products		2.865	2.466	2.089	2.548	2.139	1.814	1.665	1.674	1.729	1.639	1.503	1.270	1.181	1.171
15. Printing, publishing and	allied														
industries		1.897	1.812	1.704	1.832	1.809	1.860	1.692	1.653	1.648	1.565	1.408	1.213	1.117	1.040
16. Non-met. min. and prod. o	of pet. and coal	2.364	2.007	1.625	1.671	1.510	1.258	1.044	1.009	.992	.982	1.043	.987	.943	1.020
17. Chemicals		2.498	2.091	1.662	1.598	1.360	1.047	.690	.450	.443	.429	.578	.722	.753	.835
18. Miscellaneous manufacturi.	ing industries	.931	.795	.695	.667	.628	. 590	.456	.343	•284	.289	. 347	.449	.457	• 509
19. Wood products		1.999	1.619	1.313	1.286	1.109	.878	.798	.782	.806	°775	.761	.669	.613	.641
20. Iron and steel products		1.356	1.030	e17.	.759	.675	.486	.418	.408	.424	.528	.705	.866	.762	.734
21. Transportation equipment		2.022	1.951	1.617	1.894	1.959	1.241	.731	. 505	.404	.335	. 495	928	.723	.652
22. Non-ferrous metals and el	lectrical														
apparatus		.875	•748	.648	.719	.730	.651	.683	.771	.835	.972	1.270	1.408	1.133	1,054
Total manufacturing		1.557	1.359	1.162	1.257	1.150	.944	.788	.703	.683	.688	.807	.893	.836	.847
22-Industry aggregate		1.562	1,386	1.217	1.294	1.202	1.025	.868	.796	.777	.786	.843	.854	808	.829

Table B-9(c) (cont'd)

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
1. Forestry	.297	.274	.271	.339	.381	.390	. 397	.411	.467	.513	.461	.440	.462	414	.397
2. Fishing (1)	1.791	1.688	1.748	2.039	2.028	1.900	2.009	1.946	2.128	1.863	2.096	2.220	1.994	1.832	2.064
3. Mining, quarrying and oil wells	.732	.685	.656	.696	.738	.757	.722	.712	.768	.846	•799	.826	.814	.796	.830
4. Construction	.335	.345	.366	.357	.372	.415	.446	.443	.469	. 488	.540	.601	.621	.642	.656
5. Transportation	1.783	1.805	1.723	1.736	1.865	2.142	1.955	1.827	1.938	2.096	1.960	2.008	1.993	1.975	1.887
6. Storage (2)	.871	.897	.756	.618	.646	.649	.673	.587	.628	.650	.691	.756	.736	168.	.793
7. Communication (including CBC)	2.878	2.828	2.764	2.792	2.832	2.793	2.734	2.680	2.745	2.913	3.061	3.071	3.165	3.202	3.295
8. Electric light, power and gas	3.279	3.242	3.174	3.269	3.494	3.536	3.350	3.239	3.299	3.278	3.101	2.914	2.829	2.743	2.587
9. Trade	.205	.222	.257	.276	.296	.342	.352	.353	.384	.409	.418	.438	.466	.472	. 483
10. Foods and beverages	1.054	1.052	1.057	1.034	1.044	1.078	1.087	1.094	1.135	1.139	1.147	1.133	1.168	1.197	1.236
11. Tobacco, rubber and leather	.525	.514	.515	.499	.493	.566	.553	.552	.597	.649	.624	.663	.660	.627	.631
12. Textiles	1.286	1.197	1.246	1.444	1.415	1.633	1.372	1.375	1.405	1.528	1.373	1.376	1.261	1.173	1.108
13. Clothing	.308	.324	.340	.331	.346	.387	.389	. 389	.409	.433	.455	.480	.494	.489	.411
14. Paper products	1.162	1.090	1.091	1.248	1.313	1.364	1.421	1.541	1.814	1.999	1.979	2.050	2.109	2.146	2.214 4
15. Printing, publishing and allied															
industries	1.009	1.030	1.043	1.060	\$66	.958	.957	.915	.948	1.005	.962	.935	.963	.970	1.005
16. Non-met. min. and prod. of pet.															
and coal	1.038	166"	1.041	1.180	1.192	1.215	1.115	1.078	1.179	1.214	1.171	1.189	1.194	1.152	1.118
17. Chemicals	616	.927	.908	1.074	1.182	1.235	1.195	1.255	1.356	1.381	1.409	1.346	1.441	1.460	1.432
18. Misc. manufacturing industries	.444	.439	.402	.414	.374	.409	.424	.431	.455	.456	.442	.420	.401	. 393	.421
19. Wood products	.690	.653	.634	.668	.646	.685	.668	.711	.824	.833	.849	.857	.875	.839	.832
20. Iron and steel products	.775	.765	694	.757	.879	1.048	.971	.911	1.054	1.234	1.149	n.a.	n.d.	n.a.	n.å.
21. Transportation equipment	.625	. 588	. 508	.484	.485	.655	.669	• 658	.736	.879	.918	\$16°	.944	.808	.728
22. Non-ferrous metals and electrical															
apparatus	1.033	.984	.941	*994	.936	1.013	.966	• 986	1.124	1.242	1.224	1.177	1.225	1.160	1.129
Total manufacturing	.872	.849	.825	.869	.886	.981	.956	.962	1.069	1.159	1.143	1.156	1.184	1.146	1.117
22-Industry aggregate	.852	.842	.841	.872	906	.992	.968	.951	1.028	1.100	1.096	1.124	1.149	1.132	1.121

(1) In calculating GDP for 1962, 1963, Index for Total Fishing and Trapping was used.

(2) GDP at factor cost data available from 1946 only.

Source: Based on data from Dominion Bureau of Statistics and the Royal Commission on Taxation and estimates by Economic Council of Canada.

Table B-10

Ratios of Gross Capital Stock to Gross Domestic Product

and Investment in Agriculture

						196	115
	1947	.738				1963	111.9
	1946	. 599	1959	1.789		1962	114.0
	1945	.632	1958	1.763		1961	105.9
	1944	.464	1957	1.837		1960	105.1
Equipment	1943	.605	1956	1.473		1959	107.2
hinery and	1942	.407	1955	1.520	uction ollars)	1958	0*66
tios - Mac	1941	.647	1954	1,851	t - Constr of 1949 d	1957	90.5
-Output Ra	1940	.532	1953	1.260	Investmen (millions	1956	103.7
oss Capital	1939	.524	1952	1.042		1955	98.8
Gro	1938	.588	1951	1.219		1954	106.5
	1937	.732	1950	1.214		1953	116.6
	1936	.738	1949	1.093		1952	101.0
	1935	694	1948	• 859		1951	112.8

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Note: 1963 investment figures based on preliminary <u>PPI</u> data for 1963. 1964 figures based on 1964 <u>PPI</u> forecasts. Sources: Capital-output ratios based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada. Investment figures based on data from <u>Private and Public Investment in Canada</u>, Department of Trade and Commerce and Dominion Bureau of Statistics.

Table B-11(a)

Private Investment in Sectors Not Covered By Capital Stock Estimates, 1946-64

(Millions of 1949 dollars)

Machinery and Equipment

	1946	1947	1948	1949	1950	1951	1952	
Financial and commercial services: total	33.2	46.6	58.5	61.0	<u>75.7</u>	71.1	67.9	
Finance, insurance and real estate	5.3	6.0	7.4	8.0	11.4	14.2	11.6	
Commercial services	27.9	40.6	51.1	53.0	64.3	56.9	56.3	
Private social capital: total	n.a.	R.a.	n.a.	n.a.	n.a.	<u>n.a.</u>	17.3	
Universities	2.1	1.9	1.4	2.1	1.5	2.1	3.1	
Churches	.8	1.3	2.8	3.2	4.3	3.2	1.5	
Water and sanitary services	3.6	3.9	4.8	4.6	5.1	5.7	3.4	
Other*	n,a,	n,ā,	n.a.	n.a.	n.ā.	n.a.	9.3	

Table B-11(a) (cont'd)

1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
94 4	70 2	01 9	100 5	100 4	101 7	110.0	127 8	140.9	141 6	147 7	147 5
01.1	13.2	51.0	100.0	100.4	101.7	110.0	127.0	140.5	141.0	41/8/	14710
12.2	13.6	15.7	18.5	18.4	20.6	28.3	23.8	28.7	31.1	23.7	25.6
72.2	65.6	76.1	82.0	82.0	81.1	89.7	104.0	112.2	110,5	124.0	121.9
20.0	18.0	19.9	20.5	21.7	25.3	25.2	32.3	33.2	35.5	36.9	41.9
2.0	2.7	2.5	3.0	3.2	5.2	5.6	8.3	9.4	11.4	12.8	12.2
2.4	2.6	3.3	2.1	2.6	2.3	2.0	1.9	2.3	2.3	2.1	1.8
3.9	1.9	1.7	3.6	4.9	2.9	3.0	3.9	2.1	1.8	1.7	3.8
11.7	10.8	12.4	11.8	11.0	14.9	14.6	18.2	19.4	20.0	20.3	24.1

* Hospitals, schools, other institutional services.

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Note: 1963 figures based on preliminary <u>PPI</u> data for 1963. 1964 figures based on 1964 <u>PPI</u> forecasts.

Source: Based on data from <u>Private and Public Investment in Canada</u>, Department of Trade and Commerce and Dominion Bureau of Statistics, and estimates by Economic Council of Canada.

Table	B-11	(b)
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Private Investment in Sectors Not Covered by Capital Stock Estimates,

<u>1946-64</u> (Millions of 1949 dollars) <u>Construction</u>

	1946	1947	1948	1949	1950	1951	1952
Financial and commercial services: total	37.9	51.6	66.7	39.0	80.5	77.7	51.3
Finance, insurance and real estate	14.4	18.8	27.1	24.0	46.4	43,9	28.4
Private social capital: total	<u>n.a.</u>	n.a.	<u>n.a.</u>	<u>n.a.</u>	n.a.	<u>n.a.</u>	<u>117.5</u>
Universities	14.1	13.9	11.5	9.8	11.8	9.7	7.4
Churches Water and sanitary services	7.3 7.9	11.5 8.0	21.9 9.9	30.2 13.1	26.5	23.9 23.6	19,9 32,3
Other*	n.a.	n.a.	n.a.	n.ä.	n.a.	n.a.	57.9

Table B-11(b) (cont'd)

1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	
69.9	87.5	85.0	105.2	121.2	134.7	191.8	191.2	205.0	197.1	184.8	201.1	
47.9	68.5	60.6	69.4	74.9	100.5	146.3	154.4	169.6	154.3	131.2	138.2	
22.0	19.0	24.4	35.8	46.3	34.2	45.5	36.8	35.4	42.8	53.6	62.9	
132.9	149.8	159.2	156.3	168.1	209.4	212.8	213.8	231.6	223.5	209.4	257.0	
11.0	12.6	16.2	15.6	25.9	37.3	47.6	47.5	61.5	60.1	67.3	84.8	
18.8	23.3	25.0	30.7	35.9	36.9	35.5	37.7	37.1	32.7	27.1	23.9	
33.9	43.8	35.6	46.4	42.6	51.7	56.8	50.3	45.1	38.0	33.8	54.4	
69.2	70.1	82.4	63.6	63.7	83.5	72.9	78.3	87.9	92.7	81.2	93.9	

* Hospitals, schools, other institutional services.

Note: 1963 figures based on preliminary <u>PPI</u> data for 1963. 1964 figures based on 1964 <u>PPI</u> forecasts.

Source: Based on data from <u>Private and Public Investment in Canada</u>, Department of Trade and Commerce and Dominion Bureau of Statistics, and estimates by Economic Council of Canada.

TECHNICAL STUDIES

The following is a list of technical studies which have been prepared as background papers for the First Annual Review of the Economic Council of Canada. They are being published separately and are available from the Queen's Printer, Ottawa. Although they are being published under the auspices of the Economic Council, the views expressed in them are those of the authors themselves.

Staff Studies

- Population and Labour Force Projections to 1970, by Frank T. Denton, Yoshiko Kasahara and Sylvia Ostry.
- 2. Potential Output, 1946 to 1970, by B. J. Drabble.
- An Analysis of Post-War Unemployment, by Frank T. Denton and Sylvia Ostry.
- 4. Housing Demand to 1970, by Wolfgang M. Illing.
- 5. Business Investment to 1970, by Derek A. White.
- Special Survey of Longer Range Investment Outlook and Planning in Business, by B. A. Keys.
- 7. Canada and World Trade, by M. G. Clark.
- 8. Export Projections to 1970, by J. R. Downs.
- 9. Federal Tax Revenues at Potential Output, 1960 and 1970, by D. J. Daly.
- 10. National Saving at Potential Output to 1970, by Frank Wildgen.
- 11. Changes in Agriculture to 1970, by John Dawson.

Special Studies

- Immigration and Emigration of Professional and Skilled Manpower During the Post-War Period, by Louis Parai.
- A Survey of Labour Market Conditions, Windsor, Ontario, 1964: A Case Study, by G. R. Horne, W. J. Gillen and R. A. Helling.

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