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CANADA'S REPRODUCIBLE WEALTH

By Anthony Scott

I. SCOPE OF THE STUDY

1. *Introduction*

The estimates of the reproducible wealth of Canada presented in this paper are the result of an attempt to discover the orders of magnitude involved, and to investigate the available sources of information. It should be emphasized at the outset that the estimates are not official, though they lean heavily for support on data and estimates published by official bodies.

There is at the present time a programme in its early stages at the Dominion Bureau of Statistics which it is intended will produce an exhaustive appraisal of the statistical resources for the production of official estimates. My own estimates have been produced independently of this programme; the Bureau of Statistics, the Economics Branch of the Department of Trade and Commerce, and the Economic Research Department of the Bank of Canada must therefore be absolved of all responsibility for the interpretation and use of their published figures. At the same time, I wish to acknowledge the friendly co-operation and constructive interest in the project shown by members of these three organizations, particularly with respect to the estimates of fixed industrial capital.

Since the purpose of the project is, partly, to investigate the available sources of data, it may be as well to report here on my findings. In general, I believe that the raw materials now exist in sufficient detail to make possible, with some outside augmentation of official sources, a reasonably consistent periodic estimate of Canadian reproducible wealth. Detailed *inventory* estimates are already maintained by DBS for the calculation of the gross national expenditure. It seems to me that it would be valuable to strengthen them by census enumerations of inventories in the less-important industrial groups, such as forestry (operations in the woods), mining, construction, transport, and public utilities. Manufacturing, trade, and agriculture are already well served. *Fixed capital* estimates by industry and in aggregate can now be made fairly directly by the perpetual-inventory method using

official expenditure figures. There are two important deficiencies, however. There are few price indexes of machinery and equipment, and an almost complete lack of knowledge of the service life and of the country of origin of assets used by the various industries. (Country-of-origin data are very helpful in determining which price index is most appropriate.) It should, given time, be possible to ascertain the country of origin of various types of asset by laborious consultation of the trade statistics; but this check cannot be applied to estimates for each industry. In the last analysis it will be necessary to survey the various industries directly to discover the types of assets used, their service life, and their country of origin. Information on *housing* construction is already of a fairly high order and is improving continually. *Consumer durable goods* are surveyed in the decennial census, and automobiles are counted in annual registrations. It would be possible, again given time, to check perpetual-inventory estimates against these physical counts.

In sum, it appears possible to measure the aggregate reproducible wealth using presently available sources. Certain industries, however, are very difficult to handle, and direct surveys will undoubtedly be necessary to reduce the amount of guessing to a minimum. This necessity will be even greater if it is desired to go behind the Canadian aggregate and produce estimates by industry; and materials scarcely exist at all for estimates by region.

2. *Concept and method of presentation*

The totals shown in this paper are estimates of the depreciated (net) stock of assets valued at 1949 prices. This price level is a convenient one for Canada, since most official constant-dollar series are based on the same year – for example, the gross national expenditure. The depreciated or net stock has been chosen to permit comparability with the estimates of other countries. A 1955 estimate is also presented in 1955 prices; but it is rather rough because the main estimates are a by-product of an investment-forecasting exercise for the Royal Commission on Canada's Economic Prospects which was for the most part undertaken in terms of 1949 prices.

I feel strongly that, in addition to its defects of coverage and lack of information, the total suffers by its neglect of natural resources and, to a lesser extent, land. Canada is a country that de-

pends heavily upon the exploitation of depletable minerals and upon the management of replaceable resources, such as farm land, forests, and fisheries. The yearly changes in the known stocks of these resources are, from many points of view, even more important than the changes in man-made wealth. This is particularly so when the objective is to measure the *depreciated* stock. However, the statistical difficulties in the way of attaining wide coverage are presently almost insurmountable. There is some information available, in scattered sources, about the surface uses of land. Farm land is investigated in the decennial censuses and in provincial agricultural reports. The provincial governments have attempted, in varying elaboration, to measure their forest resources. And urban land can be investigated with the help of municipal planning reports, real-estate surveys, municipal assessment rolls and the compilations of provincial municipal affairs and land-taxation departments. To say the least, however, these sources do not present data on uniform bases, and a very large research effort is necessary to make use of them. There is some information on fisheries, but its evaluation has rarely been attempted.

When we come to underground resources, only suggestive global estimates exist. Further, no method has been worked out for adjusting the values annually to take account of new discoveries, and changed costs methods and markets. In nature, however, the problem of resource stock measurement is similar to that of inventory measurement and evaluation.

Because the data are so sketchy and non-homogeneous, and because the conceptual problems require a great deal of discussion and experiment, I have not presented a resource estimate, even of surface land, in the main estimates, but some rough calculations are appended in the notes. Natural resources remain a relatively unexplored area in Canadian statistics, and, I feel, deserve a fairly high priority in future statistical agendas.[1]

In the succeeding pages I will proceed by the following plan. First I present Table I, a summary table. Then, line by line the table is explained as to source and method. Alternative sources

[1] See Joseph Barnea, 'National Income, Capital Formation and Natural Resources', *Kyklos*, 1956, pp. 360–368; and the subsequent discussion in *Kyklos*, 1957, pp. 79–86, where Mr. Barnea attempts a measurement for petroleum and natural gas. See also my 'National Wealth and Natural Wealth', *Canadian Journal of Economics and Political Science*, August 1956, pp. 373–378.

of measurement are also mentioned. In the third part of the paper there are some brief comments on the findings.

TABLE I

Reproducible Wealth of Canada

Millions of dollars; depreciated (net) stock

Type of Asset	1947 (1949 prices)	1955 (1949 prices)	1955 (1955 prices)
Reproducible Assets			
1. Structures	24,010	35,210	47,210
(a) Private	18,450	26,452	35,362
(1) Dwellings	9,340	12,632	16,649
(2) Other ('Industry') [1]	9,106	13,820	18,713
(b) Public	—	8,758	11,849
(1) Dwellings	—	258	340
(2) Other civilian } (3) Military }	5,566	8,500	11,509
2. Equipment	11,481	22,605	26,511
(a) Private	10,671	21,875	25,597
(1) Producers' durables [1]	5,250	10,950	13,907
(2) Consumers' durables	5,421	10,925	11,690
(b) Public			
(1) Civilian . } (2) Military. }	810	730	914
3. Livestock [1]	1,570	1,490	1,311
4. Inventories			
(a) Private [1]	5,350	8,207	8,220
(b) Public			
(1) Civilian . } (2) Military. }	—	—	—
5. Monetary metals	370	1,144	1,112
6. Net foreign assets	−7,300	−9,000	−11,100
7. Total Reproducible Assets	35,482	59,656	73,264
8. Total, Items 1–4	42,411	67,512	83,252
9. Total, Items 1–2	35,491	57,815	73,721
10. Total 'industrial assets' [1]	21,280	34,467	42,151

[1] Includes the reproducible capital of agriculture, fishing, forestry, mining, manufacturing, construction, transport, storage, communication, finance, trade, and private services industries.

Excludes public-services and community-services capital and housing.

II. NOTES, SOURCES, AND METHODS [1]

(Numbers refer to lines of Table I)

Reproducible Assets

1. *Structures*

All structures estimates are taken from Chapter VI of *Output, Labour and Capital in the Canadian Economy*, by William C. Hood and Anthony Scott, a study written for the Royal Commission on Canada's Economic Prospects. This study is also the source of the machinery and equipment estimates of the next section.

The sources and methods used are discussed in full in the study. In brief, they are the perpetual-inventory method applied to investment expenditure data collected since 1926 by the Department of Trade and Commerce and the Dominion Bureau of Statistics and from 1896 to 1926 by Kenneth Buckley in *Capital Formation in Canada, 1896–1930*. A discussion of these sources will be found by O. J. Firestone, 'Investment Forecasting in Canada', in the NBER volume *Short-term Economic Forecasting* and by Kenneth Buckley in the NBER volume *Problems of Capital Formation*, pp. 91–146. The problem of reconciling the earlier and later investment estimates is also discussed in the Hood–Scott study in Appendix C of Chapter VI. Most of the data on expenditure since 1926, and especially since 1945, have been collected by survey, and are published in a fine industrial classification. Therefore it has been possible to undertake the cumulation and depreciation for the assumed average service life of all assets used by each industry (distinguishing only between structures and machinery and equipment). The price indexes used are described in the Hood–Scott study. For structures, they are mainly synthetic series combining indexes of materials costs and wage-rates. In the exceptional case of dwellings, the index was slightly adjusted for changes in the productivity of construction workers; no other structures price index was so adjusted.

[1] Several acknowledgments are owed for assistance in preparation of these estimates. Mr. Wm. C. Hood in particular participated in the planning of the original 'industrial' capital estimates. Mr. D. H. Jones made useful comments on an earlier draft, and Mr. Christopher Saunders spotted a serious error. I have been assisted in locating data and making computations by Messrs Tom Wilson and Bruce Hurt; and assisted financially by the University of British Columbia Research Committee.

No original estimate is available of the same totals, by industry, in current values, nor at original cost, though an *aggregate* cumulation for all industry (that is, not the result of summing estimates for individual industry) was made at *original cost*; it is shown in the Royal Commission study as Table 6 B.7. An excerpt from this table is given below.

TABLE II

Industry; Net Stock Valued at Original Cost

Millions of dollars

	Structures	Machinery and Equipment	Total
1947	5,193	4,021	9,214
1948	5,694	4,849	10,543
1949	6,249	5,696	11,945
1950	6,898	6,516	13,413
1951	7,772	7,642	15,414
1952	8,958	8,814	17,772
1953	10,182	10,033	20,214
1954	11,311	10,900	22,211
1955	12,496	11,690	24,186

The last column of Table I gives some approximations to estimates in 1955 prices; it was obtained by multiplying the 1949-price estimate by the implicit price deflator for the gross national expenditure for 1955. In the case of dwellings the IPD was 131·8, and in the case of private and public structures it was 135·4.

(a) *Private.* Canadian investment expenditure data are not classified *in detail* as to ownership, though aggregative estimates are analysed as to 'public' and 'private' expenditures. Government investment in railways would be, for example, classified with the transport industry. Hence, using the perpetual-inventory method, it has not been possible to distinguish between publicly owned and privately owned capital. Instead, in the Hood–Scott study, a distinction was made between 'industrial' and 'social' capital. 'Industrial' capital includes all assets of the farming, lumbering, mining, trapping, fishing, manufacturing, transport, storage, communications, utilities, trade, finance, and private services industries. It excludes 'social capital', and assets of institutions and governments providing community and public services (i.e. it excludes such assets as churches, schools, hospi-

tals, airports, public works, roads, and defence installations) and dwellings. For the most part, this distinction between industrial and social capital is maintained in the present report.

(1) *Dwellings.* This line in Table I shows all dwellings, public and private, for 1947, because it is difficult to distinguish publicly owned housing from privately owned, in value terms. In terms of 'housing units', Firestone estimates that in 1949 1·3 per cent of the stock was 'public'. That is, it was made up of war workers' and veterans' rental housing, residences and quarters for government employees and defence personnel, and 'emergency shelter units'. (A considerable portion of the remaining 98·7 per cent of the stock was, of course, financed in part with some type of government assistance.) It is impossible to tell what portion of this public stock still existed, in public ownership, by 1955. However, if we add the annual increments to the 1949 public stock, it would increase to almost 1·6 per cent of the total stock of units in 1955.

	Total Housing Stock Units	Public Units	Per cent
1949 . . .	3,125,000	41,000	1·3
1955 . . .	3,724,000	58,000	1·6

Many of these government-owned units are of substantial construction and because of their location, expensive to build. Obvious exceptions are 'emergency housing', and some low-cost construction. Since they are relatively new, the depreciation on them would be less than on that for the stock as a whole. The rate of growth of the public stock has also recently been greater than that of the total dwelling stock, as the above figures show. Therefore, it would appear that more than 1·6 per cent, perhaps as much as 2 per cent, of the total depreciated value of the dwelling stock in 1955 was publicly owned. I have used this estimate in the table, for 1955. (See Firestone, *Residential Real Estate in Canada*, 1951, Table 21; also Central Mortgage and Housing Corporation, *Canadian Housing Statistics*, Table 2.)

(2) *Other structures.* This line shows all structures owned by 'industry', whether privately or publicly owned. An analysis

by industry follows, taken from the Hood–Scott study, Table 6. B3:

TABLE III

	Millions of 1949 dollars	
	1947	1955
Agriculture	510	754
Resource industries	1,564	3,736
Primary manufacturing	796	1,062
Secondary manufacturing	1,688	2,358
Transport, storage, and communication	2,957	3,033
Trade, services, and construction	1,591	2,878
Total Industry	9,106	13,821

In the table, 'Resource Industries' include forestry, fishing, mining, and the central electric-station industry. Items may not add to totals because of rounding.

There are few other sources of information on fixed capital of Canadian industry. A bibliography, along with his own estimates, is given by O. J. Firestone, 'Canada's Economic Development, 1867–1953, with Special Reference to Changes in the Country's National Product and National Wealth', published in *Income and Wealth Series VII*, Bowes & Bowes, London, 1958.[1] Balance-sheet asset totals, for tax-paying corporations, classified by industry, will be found in the Department of National Revenue's *Taxation Statistics*. Until recently, the Bank of Canada also presented condensations of the balance sheets of a large number of corporations in its *Statistical Summary*. For particular industries, estimates of fixed capital have been found, or are to be found, in *The Manufacturing Industries of Canada* (although its survey of capital employed was discontinued in 1943), and DBS publications on power facilities, livestock, grain, fisheries, flour mills, electric and steam railways, motor carriers, highways, etc. Some of these sources do not distinguish structures from fixed assets, such as equipment and land, but in others a distinction and even a classification is given. Estimates made with another object in mind are to be found in DBS *Canada's International Investment Position, 1926–1954*.

(b) *Public*. See the remarks above under 'private' structures.

(1) *Dwellings*. 1947 estimate is grouped with private dwellings above. For a discussion of the 1955 estimate, see (a) (1) above.

[1] See especially Table 74 and the notes on p. 321. Firestone's chief source was the manufacturing survey mentioned below.

(2) and (3). *Other civilian and military.* These lines show the Hood–Scott estimates for structures owned by the Government or by institutions. They are taken from Table 6. B.6, and can be analysed as follows:

TABLE IV

	Millions of 1949 dollars	
	1947	1955
Roads	1340	2197
Buildings	1682	2395
'Other engineering'	1268	1570
Institutions	1276	2340
Total public	5566	8502

'Institutions' includes all schools, churches, hospitals, and universities, whether privately or publicly owned. 'Other Engineering' includes dams, canals, airports, etc.

2. *Equipment*

(a) *Private.* See the notes above on private as against public investment; the estimate given here covers 'industrial' equipment.

(1) *Producers' durables.* See the notes above on industrial structures; the same comments apply to the estimates of the net stock of machinery and equipment. Since the service life of equipment is shorter than that of structures, the sources of the data used for the perpetual-inventory method are more recent, and more reliable. This line shows all equipment owned by 'industry', whether privately or publicly owned. The following analysis of the totals, by industry, summarizes Table 3 of Appendix B of the Hood–Scott study:

TABLE V

	Millions of 1949 dollars	
	1947	1955
Agriculture	944	2,066
Resource industries	600	1,457
Primary manufacturing	614	1,346
Secondary manufacturing	1,418	2,254
Transport, storage, and communication	1,116	2,205
Trade, services, and construction	559	1,618
Total industry	5,251	10,946

Many of the sources given above for other private structures also contain estimates of producers' durables; often, however, they are grouped together as total fixed assets, sometimes with land. The 1955-price estimate was derived by multiplying by the gross national expenditure IPD of 125·2.

(2) *Consumers' durables.* This estimate is the total of three distinct computations: (i) passenger cars; (ii) furniture and other durable consumer goods, including appliances; (iii) clothing. Totals are shown in (iv).

(i) *Passenger cars.* There is a small overlap here with producers' durable goods, since some passenger cars are actually in business use. The extent of this overlap is not known. We have assumed here that 12 per cent of the annual expenditure on passenger cars is for business use. Consequently, taking into account the much shorter life of such business cars, we have reduced the stock by 6 per cent in order to obtain an estimate of the consumer-owned stock.

Since the concept of wealth sought is the stock net of depreciation, the usual figure used, the total of registrations in all Canadian licensing jurisdictions, had to be modified. The procedure used was based on the perpetual-inventory method: it produced some unexpected results. Starting with the total number of cars registered each year, the change in registration was subtracted from the number of new cars sold each year to yield an estimate of the number of cars scrapped each year. Next, investigating the average service life of cars, we counted back from 1947 to find how many years' sales were required to produce the number of cars registered in 1947. This number of years was used as the average service life of the cars which were scrapped in 1947. (It was surprisingly high, eighteen years, reflecting the low production and low scrappage rates from 1940 to 1946.) In years subsequent to 1947 the same procedure was followed: the average service lives were centred on their mid-year, producing a series of service lives which was extrapolated in 1955. The reciprocal of the service life for each year was used as the straight-line depreciation rate for that year; this rate was applied to the gross stock (total registrations) of that year. The cumulated net investment figures (sales of new cars minus depreciation) produced the desired net stock figure. The net stock amounted to only one-sixth of the gross stock in 1947, but rose to one-half of the gross stock by 1955. This net

stock was then multiplied by the average value in 1949, and adjusted for business ownership as discussed in the preceding paragraph.

Data on new sales were obtained from *Automobile Statistics for Canada*, 1931; *New Motor Vehicle Sales in Canada*, 1932–37; *Sales of Motor Vehicles and Motor Vehicle Financing in Canada*, 1935–39; and *New Motor Vehicle Sales and Motor Vehicle Financing*, 1946–55. The average 1949 value was also obtained from the last-named publication. The total registrations data were obtained from *Automobile Statistics for Canada*, 1931–40 and *The Motor Vehicle Industry*, 1943–55. A study of the *Canadian Automotive Industry* for the Royal Commission on Canada's Economic Prospects by the Sun Life Assurance Co. of Canada contains a section on scrappage rates and on business usage of passenger cars. The average-age figure of eighteen years used above is confirmed by this study 'for a recent year'.

(ii) *Other consumers' durables and furniture*. The perpetual-inventory method was used here on an expenditure series which includes: 'Automobiles (new) and net purchases of second-hand automobiles, household appliances and radios (including stoves and ranges, washing machines, vacuum cleaners, etc.), furniture and home furnishings, jewellery, silverware, watches and clocks. This is admittedly an incomplete description of durable consumer goods, since it has not been possible to date to include in the total a number of miscellaneous durable items such as dish-washing machines, bicycles, motor cycles, and durable sports equipment. Research designed to rectify this omission is now in progress' (*National Accounts, Income and Expenditure, 1926–50*). The same note appears in more recent numbers. Examination of the United States' income-tax work on service lives and depreciation rates, *Bulletin F*, Goldsmith's *Study of Saving in the United States, Volume III*, and works on consumer expenditure suggest that at the very least, furniture and automobiles should be dealt with separately from the other goods.

The *National Accounts*' consumer durable series described above is published from 1926 to 1955. The series on furniture (published in the *National Accounts* to 1950, extrapolated to 1955 on the basis of ratios to total expenditure) was subtracted from total durable goods, and the residue converted to 1949

prices using the household operation and furnishings indexes, reduced by the constant-dollar outlays on passenger cars from (i) above, and cumulated with an assumed service life of eleven years. The furniture outlays were deflated by the household operation and furniture indexes, and cumulated using an assumed service life of twenty years. Other information on particular consumers' durables can be obtained from DBS publications on the electrical-goods industries; and the 1951 census contains data on the number of homes with *one or more* appliances of given types. Using these sources, however, would leave unmeasured the stock of miscellaneous durables.

(iii) *Clothing*. This category consists of women's and children's and men's and boys' clothing and footwear, from the *National Accounts* expenditure series (extrapolated to 1955 on the basis of a ratio to total consumer outlays). A service life of two years was assumed; expenditures were deflated using the clothing and personal furnishings price indexes. The results are merely notional, since they are very sensitive to the assumed service life used.

(iv) *Total consumers' durables*. This total is not, of course, exhaustive; it includes only the items mentioned explicitly in the above paragraphs. The following table is stated in millions of 1949 dollars; the estimate in 1955 prices in Table I was obtained by using the GNE price deflator for durable goods for 1955 of 107·1.

TABLE VI (millions of 1949 dollars)

	Furniture	Passenger Cars	Clothing	Other Durables	Total Durables
1947	955	375	1,946	2,145	5,421
1948	1,037	510	1,842	2,381	5,770
1949	1,115	730	1,817	2,634	6,296
1950	1,196	1,160	1,803	2,886	7,046
1951	1,278	1,480	1,806	3,053	7,617
1952	1,365	1,780	1,889	3,312	8,346
1953	1,465	2,160	2,014	3,584	9,223
1954	1,566	2,440	2,138	3,791	9,935
1955	1,670	2,800	2,313	4,142	10,925

(b) *Public*. As above, this classification applies to government and institutions. The following analysis, from Table 6, Appendix B, of the Hood–Scott study of *Output, Labour and Capital in the Canadian Economy* is in millions of 1949 dollars:

TABLE VII

Millions of 1949 dollars

	1947	1955
Government	749	539
Institutions	58	193
Total public	807	732

3. *Livestock*

This line summarizes the following estimates of livestock on farms (in millions of 1949 dollars):

TABLE VIII

1947	1,574
1948	1,483
1949	1,457
1950	1,434
1951	1,288
1952	1,378
1953	1,392
1954	1,437
1955	1,486

The source of data was the *Report on Livestock Surveys* for cattle, sheep, horses, hogs, and poultry for 1950 and 1955, and the *Canada Year Books*, 1948–55. Other animals were omitted. The estimates apply to 1 June each year. The 1949 values by which the physical counts were multiplied were the 1949 average price per head as given in the *Canada Year Book* 1951, p. 395. Further information will be found in *Progress and Prospects of Canadian Agriculture*, by W. M. Drummond and W. Mackenzie, a study for the Royal Commission on Canada's Economic Prospects. The 1955-price estimate was obtained by using the 1955 wholesale price index for livestock.

4. *Inventories*

(a) *Private*. This line summarizes estimates made by combining DBS estimates of *changes* in inventories (as published in the current and constant dollar tables of gross national expenditure in *National Accounts, Income and Expenditure* for various years) with estimates of the book value of inventory for the various industries. These latter estimates vary from published data for the main industries to informed guesses for the industries with small inventories. We consider in turn grain

inventories on farms, grain in commercial channels, and business inventories.

(i) *Grain on farms.* This estimate applies to 1 July each year (millions of 1949 dollars):

TABLE IX

1947	120
1948	135
1949	158
1950	70
1951	118
1952	118
1953	324
1954	667
1955	326

The figures are based on the carry-over of grain on farms in the *Canada Year Book*, except for 1950 and 1955, which were obtained by subtracting from total grain carry-over data on grain in commercial channels as published in *Grain Trade of Canada*, 1949–50 and 1954–55. They were multiplied by the appropriate 1949 price for a representative grade of each grain as shown in the 'Prices' table of the *Grain Trade of Canada*. The price used was an average of the 1948/49 and the 1949/50 crop years. In the special case of wheat, the physical stock for each year was multiplied by a weighted average of 1949 prices, the weights being the quantities of each grade *inspected* during the year to which the stock applied (weights from *Grain Trade of Canada* tables on 'Grain Inspection').

(ii) *Grain in commercial channels.* This estimate is an annual average of last-week-in-month figures given in *Grain Trade of Canada* to 1954–55, and *Grain Statistics* for 1955 (in millions of 1949 dollars):

TABLE X

1947	279
1948	295
1949	352
1950	369
1951	467
1952	568
1953	744
1954	846
1955	839

Valuation procedures were identical to those used above for grain on farms. The 1955-price value was obtained by using a wholesale price index for grains.

(iii) *Business inventories*. This figure includes inventories held by government business enterprises but excludes stocks held by such non-business authorities as exist to maintain commodity prices. No precise estimate of the holdings of such authorities has been made.

Grain has already been dealt with. Butter and cheese stocks are the two chief commodities held by the Government. In 1955 there was a stock of 67·5 million pounds of butter in storage at 1 June; about 15 or 20 million pounds would appear to be the 'normal' amount in storage at this time. Hence we may judge that about 47 million pounds were surplus supplies in storage. By the same line of reasoning we may assume that about 15 million pounds of the stored stock of 31 million pounds of cheese were surplus; perhaps more. The wholesale price of butter and cheese were in the neighbourhood of 30 cents per pound; we may judge that the valuation of such stocks, outside manufacturing or trade ownership, was about 18 million dollars. This estimate, however, is very rough; it has not been used in the estimate of total inventories.

The next step was to obtain estimates of the book-value of inventories held in the various industrial sectors in 1951 (a year for which census estimates apply).

Forestry: *Taxation Statistics* was consulted to obtain the ratio of corporate inventories to profits and to fixed assets. Unfortunately, many logging corporations are also saw-millers, and the data must be adjusted to prevent overlapping the manufacturing estimates. An estimate of net income after wages and salaries was multiplied by the inventory–profit ratio, and the estimates of structures and machinery and equipment multiplied by the fixed-assets ratio. It might be possible, given time, to use unofficial trade association reports of various types of timber stocks.

Fishing: No estimate was made, since most inventories are held at the manufacturing stage.

Mining, quarrying, and oil wells: The published individual and aggregate balance-sheet inventories of gold, non-ferrous, and petroleum corporations were given wider coverage on the basis of their net income, and on the basis of their fixed assets. In this industry, like logging, most firms are in both the mining and the manufacturing industries, and adjustment to prevent double-counting is very hazardous. In recent years the

commodity-statistics reports for various industries (by the DBS Industry and Merchandising Division) have shown stocks for some of the main minerals, but the count is not complete.

Manufacturing: The book-value of total inventory held was given in *The Manufacturing Industries of Canada.*

Transport, storage, and communication: The inventory figures of corporations in this sector were found in *Taxation Statistics* and the *Bank of Canada Statistical Summary.* This was checked against an estimate derived by the same method in the 1920s, and carried to the present on the basis of National Account investment-in-inventory estimates. The two methods did not agree well, and a compromise figure was chosen.

Public utilities: A similar procedure was followed to that used for transport, storage, and communications.

Construction: The statements of individual companies, and of those given in aggregate in the *Bank of Canada Statistical Summary* and *Taxation Statistics* were given wider coverage on the basis of net income.

Trade: The wholesale and retail figures given are those shown in the decennial census of distribution for 1951.

Services, finance, insurance, and real estate: Some corporate balance sheets were used, and the rather scattered findings were given wider coverage on the basis of net income.

These admittedly very rough procedures produced the following distribution of book-values of inventories in 1951:

TABLE XI

	Millions of Current Dollars	Per cent
Forestry, fishing, and mining	247	3·4
Manufacturing	3,708	50·6
Construction	480	6·6
Transport, storage, communication, public utilities	102	1·4
Wholesale trade	1,240	16·9
Retail trade	1,480	20·2
Services, finance, insurance, real estate	64	0·9
Total business inventories	7,321	100·0

This total is, in concept, similar to the book-value of inventories used to measure inventory investment in the gross national expenditure calculations (after deducting grain and farm inven-

tories). The GNE figures were therefore used to carry the above total back to 1949. It was then necessary to convert this 1949 'book-value' estimate to 1949 prices, but information was not available for this step; its absence gives our final figure a lower level than it otherwise would have. The book-value for 1949 was carried back to 1947 and forward to 1955 on the *National Accounts*' constant dollar investment in inventory figures; see also the series given in Table 7:12 of the Hood–Scott study for the Royal Commission on Canada's Economic Prospects.

(iv) *Summary*. The following results were obtained from the three series of computations outlined above:

TABLE XII

	Millions of 1949 dollars	
	1947	1955
Grain on farms	120	326
Grain in commercial channels	279	839
Business inventories	4,951	7,042
Total inventories	5,350	8,207

The unavoidable roughness of the original book-value calculations, the omission of certain types of farm inventory, and the difficulties of re-valuing business inventories in 1949 produce a very wide margin of error in these estimates. They suggest an order of magnitude, close to $9 billion in 1955, which may be compared usefully with other types of wealth; but the distribution of magnitudes within this total requires further research. (This order of magnitude agrees well with a check estimate computed by taking the total book-value of inventories in 1941 as shown in *Public Investment and Capital Formation*, 1945, Table 76, and adding the change in inventory figures from the *National Accounts* to 1951.)

The 1955-price estimate was derived by adding to our estimate of the 1955 book value of business inventories, the re-valuation of grain stocks mentioned in paragraph (ii) above:

Business inventories, 1955 book value	7,875 millions
All grain inventories, 1955 prices	345 ,,
Total industrial inventories, 1955 prices	8,220 millions

(b) *Public*

(1) and (2) *Civilian and military*. Publicly owned industrial firms' inventories, grain held for the Wheat Board, government stocks of uranium, and similar inventories are supposed to be included within the total for industry just above. There are no consistent data on other inventories or supplies held by municipal, provincial, nor indeed national governments. The Department of National Defense nowadays gives no details on the stock of weapons or other materials held for it, although the first annual report of the Department of Defense Production gave the inventories of cloth and wool, strategic materials, and standard machine tools held by it as $48 million in 1951. Levels appear to have gradually fallen since then, and the 1955 book value is given as $36 million. The public accounts do not seem to reveal supplies held by the public works, post office, or northern affairs departments, to mention three of the largest.

5. *Monetary metals*

Gold is held by the Government's exchange fund account and by the Bank of Canada. The current value of these official holdings, in U.S. dollars, is stated for each month in the *Statistical Summary of the Bank of Canada*. The 1949-price estimate was derived as follows: the values for the last month of each year was multiplied by the ratio of the Canadian price of gold in 1949 to the American price ($39.90/35.00). Canadian gold stocks are held largely for international trade purposes; their value in this context, along with official holdings of U.S. dollars, is shown in the first table in the notes immediately below.

6. *Net foreign assets*

Table XIII, in billions of current dollars (except for the last three lines), is taken from *Canada's International Investment Position, 1926–1954*. The estimates for 1955 are preliminary (p).

It is impossible to distinguish private from public assets and indebtedness, since it is not known to what extent Canadian individuals or governments hold foreign government securities as

TABLE XIII

Billions of current dollars

	1947	1955
International liabilities:		
Total non-residents long-term investment in Canada.	−7·2	−13·2 p
Equity of non-residents in Canadian assets abroad .	−0·3	− 0·6 p
Canadian dollar holdings of non-residents . .	−0·3	− 0·4 p
Canadian short-term assets of IMF and IBRD .	−0·3	− 0·2 p
Total gross liabilities	−8·1	−14·5 p
International assets:		
Total Canadian direct and portfolio investments abroad	1·4	2·8 p
Government of Canada loans and advances and subscriptions to IMF and IBRD	2·2	2·0 p
Government of Canada holdings of gold . . .	0·3	1·1
Government of Canada holdings of foreign exchange (U.S. dollars)	0·2	0·8
Other Canadian short-term (non-commercial) assets abroad	—	0·3
Total gross assets	4·1	7·0
Net liabilities:		
Net international indebtedness	4·0	7·5
Less Net Government of Canada assets and gold and foreign exchange	2·3	3·6
Commercialized 'private and public international long-term indebtedness'	−6·3	−11·1
In 1949 Prices:		
GNE implicit price deflator (1949 = 100) . .	(86·0)	(123·3)
Commercialized private and public international long-term indebtedness, at 1949 prices . . .	−7·3	−9·0
Non-commercialized Government of Canada loans and advances and subscriptions to IMF and IBRD	−2·6	−2·3
Official holdings of U.S. dollars	0·4	0·6

assets. On the liability side of the above balance sheet, the following analysis is taken from the same source:

TABLE XIV

	Billions of current dollars	
	1947	1955
Government and municipal bonds held by non-residents.	1·5	1·9
Other non-resident investments	5·7	11·3
Total non-resident long-term investment in Canada.	7·2	13·2

P

7. *Natural Resources*

As explained in the first part of this study, the time is not yet right for an evaluation of Canada's natural resources. In principle, there are three ways the statistician can set about this task: (a) capitalization of the income from natural resources; (b) summation of balance-sheet evaluations; and (c) inventory techniques.

(a) *Capitalization.* Determination of the amount that buyers would pay for the right to exploit all resources requires a capitalization of the future net proceeds. Capitalization of present profits is not satisfactory, because profits are struck *after* royalties, etc., have been paid (and many taxes are actually royalties from this point of view) and *after* a wide variety of practices of accounting for depletion have been followed. What is required is the present value of expected future net proceeds before royalties and depletion allowances.

(b) *Summation of balance-sheet or market evaluations.* This procedure is valid only if either firms whose balance sheets show the assets, or organized markets, revalue them continually on the basis of transfer prices for *full* ownership. Agricultural land and crown-granted mineral rights are good examples; but valuations of the latter are very scarce, while farmers' accounts, where they exist at all, are rather unreliable. Forest, fish, and power resources are not usually the property of the exploiting companies.

(c) *Inventory techniques.* These involve multiplying estimates of the physical volume of each resource by the prices at the site (minus such outlays as are foreseeable excluding depreciation, depletion, and most income-taxes). In the case of mining and forestry, this is still likely to be a very difficult computation; in the case of petroleum and natural gas slightly less so.

Land values may be approached by approach (b) if we assume that taxable assessments have some consistent relationship to balance-sheet values. On the basis of an enumeration by the Canadian Tax Foundation and J. Harvey Perry (*Canadian Fiscal Facts* and *Taxation in Canada*) of the 1951 assessments and the taxing regulations in twelve large Canadian cities, we estimated that assessed land values amounted to about 27 per cent of total assessed real-estate values. We then found that total real-estate property taxes paid in these places amounted to about 16 per cent of our estimate of land value alone. If we assume that land

assessments are equal to 100 per cent of market values, and that experience in other municipalities is the same as in the twelve in the sample, we can estimate the value of land in all municipalities. We may at least find the range within which the value probably lies if we assume that only 40 per cent of the land's market value is covered by assessments; i.e. that annual property taxes amount to about 8 per cent of land value alone. Separate calculations were necessary for rural municipalities (some of which are actually suburban).

	High	Low
	(millions)	
Metropolitan and urban municipalities . .	5,300	2,130
Rural municipalities	1,000	500
Total municipal land values . .	6,300	2,650

The Census of Canada, however, puts the 1951 value of occupied farm land and buildings at about $8 billion, a figure difficult to reconcile with the value for rural municipalities given above. About one-fifth of the $8 billion may be in buildings and improvements, and about one-third may be outside organized rural municipalities. Even then the discrepancy is significant, and a great deal of research will be necessary to remove it.

The value of forest land, according to the reasoning of paragraph (a) above, ought to be determined by the capitalization of future returns. We assume that stumpage value is about 10 per cent of the gross value of production in the woods (as measured by DBS). This figure can be defended on the basis of discussions of forest revenues in the New Brunswick, Newfoundland, and British Columbia inquiries into Forest policy, and in the Canadian Tax Foundation's *Forest Tenures and Taxes in Canada*. The capitalization of this annual stumpage in perpetuity at 5 per cent yields a present value of land of about $2 billion in 1953. Some of this, however, is included in the farmland valuation shown above.

The forest land calculations appear to be reasonably consistent with the following independent calculation of the value of the timber stock. We determined on an average value of 46 cents per cubic foot for cut timber in the woods. The forestry branch of the Department of Northern Affairs estimated that in

1953 there were accessible stands of 312,802 million cubic feet, which suggests that these stands might be worth $144 billion!

If we take a 10 per cent stumpage ratio, we find the upper limit of these stands' values to be about $14 billion. If we attempt to find a *market* value for these stands we must make allowance for the fact that some of them are presently immature, and that these will be exposed to hazards of fire, disease, and waste. We would guess that as much as 50 per cent should be deducted for these reasons, giving perhaps $7 billion as the value of forest stands.

The value of minerals and petroleum resources seems even more difficult to calculate. Rapidly changing rates of discovery and rapidly changing market prices obscure the picture. In addition, since most minerals in Canada are produced from land that has been claimed, then put into some type of tenure that is less complete than fee simple, there is no land-right valuation comparable to stumpage. This means in turn that it is impossible confidently to attribute any particular fraction of the net income from mineral enterprises to land, nor to discover a normal relation between the value of land and other property. In my opinion, this is a computation not worth attempting. However, we would suggest that some rough figure be obtained, then carefully kept up to date with increments and decrements measuring the values of new discoveries, depletion, and changes in market prices, as an adjunct to national-income estimates of net income.

We have, in summary: (billions of 1951 dollars):

Municipal land, average of high and low estimates	4·5
Forest land	2·0
Forests	7·0
Minerals, water power sites, etc. . . .	(?)

III. ANALYSIS OF FINDINGS

To make an economic analysis of these estimates is tempting, because Canada is a fast-growing economy with documented records which can be used to shed light on the process of economic development. But the reader is reminded that the wealth estimates presented here are tentative in the extreme; careful interpretation must wait for more detailed measurement of the stock.

For this reason, I have confined this section of my paper to

comparing the rates of growth of the stock of wealth with the rates of growth of other economic variables: the labour force, the population, the gross national expenditure (GNE), and the gross domestic product (GDP) of industry. All values are measured at 1949 prices; the gross domestic product series is based for the most part on the Dominion Bureau of Statistics' indexes of industrial output for various industries, weighted by the gross domestic product at factor cost of each industry in 1949. The GDP for 'industry' excludes residential rents, military and government activity, and community services; it includes agriculture and business and professional services; its sources and methods of computation are described in Chapter 5 of the Hood–Scott study for the Royal Commission on Canada's Economic Prospects.

The following table summarizes these comparisons by presenting the ratios of various types of wealth to the flow variables, 1947 and 1955.

TABLE XV

Ratios of Wealth to Population, Labour, and Output

1949 dollars

Type of Wealth	Per Person		Per Member of Labour Force		Ratio to G.N.E.		Marginal Ratio to G.N.E. 1947–1955	Ratio to Industrial GDP	
	1947	1955	1947	1955	1947	1955		1947	1955
Total reproducible assets	2,832	3,831	7,180	10,739	2·32	2·76	3·86	2·98	3·63
Total structures, equipment, livestock, and inventories	3,385	4,335	8,582	12,153	2·77	3·13	4·01	3·56	4·11
Total structures	1,917	2,261	4,858	6,338	1·57	1·63	1·79	2·01	2·14
Total equipment	905	1,452	2,294	4,069	0·74	1·05	1·78	0·96	1·38
Total inventories	427	527	1,082	1,477	0·35	0·38	0·46	0·45	0·50
Total 'industrial' structures and equipment	1,146	1,590	2,906	4,459	0·94	1·14	2·11	1·20	1·51
Total 'industrial' structures, equipment, and inventories	1,573	2,118	3,988	5,936	1·29	1·53	1·65	1·65	2·01
Total consumers' durables	432	702	1,097	1,967	0·35	0·51	0·88	0·45	0·66
Total dwellings	745	828	1,890	2,320	0·61	0·60	0·53	0·78	0·78
Total consumers' durables and dwellings	1,177	1,530	2,987	4,287	0·96	1·11	1·40	1·23	1·44

It will be seen that all categories of wealth per person and per member of the labour force increased significantly between 1947 and 1955; but the increase was not so marked in the ratios to output. Indeed, the inventory-to-output ratio is approximately constant, as is that for dwellings-to-output. The industrial structures-to-output ratio (not shown) actually declines; only the rapid increase in government structures keeps the total

structures-to-output ratio from decreasing. The marginal ratios reveal the great demands made by the economy, especially for social capital, in the process of growth. It must be remembered, however, that these are *marginal* ratios of *net* capital to *gross* output. In 1947 existing assets were heavily depreciated. By 1955, because of the enormous growth (some 63 per cent for items 1 to 4 in Table I), the average age of assets had declined rapidly. Hence the *net* stock had grown much more rapidly than the gross stock; that is, than the actual capacity. The large marginal ratios reflect, to a considerable extent, this reduction in average age of the stock.

These findings are therefore consistent with those of the Hood–Scott study for the Royal Commission on Canada's Economic Prospects. There it was argued on *a priori* grounds, and confirmed (with respect to the *gross* stock of fixed capital) on statistical grounds that the ratio of output to capital tends to remain fairly stable over long periods of time. However, since this proposition, analytically, depends upon knowledge of the ratio of saving to output (because it is saving that permits the capital formation), and since Canada has been heavily dependent on the saving of foreigners (see the high ratio of net foreign indebtedness to total assets in Table I), it is quite possible either that the capital–output ratio will change or that some other explanation lies behind the relatively small movements in the observed ratio. Certainly it is true that the importance of machinery and equipment, relative to structures, is increasing; it also seems that every worker is, while being equipped with more and more tools of production, at almost the same rate being equipped with consumer durables – and the dependants to use them.

For an independent estimate of incremental capital–population and capital–worker ratios, see D. C. MacGregor, 'Capital Requirements and Population Growth', a paper given at the 1957 annual meeting of the Canadian Political Science Association. Professor MacGregor's estimates are particularly oriented towards the measurement of social capital needed by provincial and municipal governments. Finally, the reader is referred to Table 29 of Book I of the Rowell–Sirois report, p. 116, where 'total capital investment' in 1920 and 1930 is shown, by industry.