A STUDY OF SOME TECHNIQUES OF COLLECTION, ESTIMATION AND CLASSIFICATION USED IN THE MEASUREMENT OF CAPITAL FORMATION IN CANADA

by

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ABSTRACT

This study is an attempt at assembling, analyzing and appraising the main techniques that have been or are used in Canada to collect, estimate and classify data on capital formation.

Data on capital formation are of importance to both government and business. They assist government in policy formulation directed towards national objectives, and business in planning towards the goals of the enterprise.

In consideration of the usefulness of capital formation data to government and business, the techniques used in their derivation are examined with a view to improving the accuracy and value of the data without too great incurrence of additional costs.

The conclusion of this study is that specific improvements can be incorporated into the current techniques. Among the improvements suggested are the introduction of stratification in sample surveys to increase the accuracy of estimates, of classificatory breakdown according to size of establishments to increase the usefulness of the data, and the reduction of structure details in questionnaire forms used in collecting data to release manpower and time for stratification and more detailed classification work.

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CHAPTER I

INTRODUCTION

STUDIES OF CAPITAL FORMATION IN CANADA

Studies of capital formation in Canada date back as early as 1870[1]. Since that year, studies of capital formation have attained an increasing degree of sophistication. Today, such studies have become a major governmental function, the findings of which have come to play a vital role in the formulation of policy by both government and industry.

The studies of capital formation in Canada can be classified into four time periods. The first period is 1870 - 1895, wherein capital formation estimates have been derived by several independent studies.[2] The prime purposes of these studies are, however, not directed at capital formation estimates, per se. Rather, capital formation estimates have been included in the studies as components of a much broader study of gross national expenditure and economic development.

The second period is 1896 - 1925, wherein capital formation as a special focus of study comes into being. Capital formation estimates for this period is essentially the work of Kenneth Buckley.[3] These estimates are derived by indirect techniques of collection and estimation. The

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[1]O. J. Firestone in his comment on Kenneth Buckley, "Capital Formation in Canada", Problems of Capital Formation, Studies in Income and Wealth, Vol. 19, 1957, National Bureau of Economic Research, p. 143

[2]For instance, Michael G. Mulhall, Industries and the Wealth of Nations, London, 1896. For a synthesis of the studies for this early period, see O. J. Firestone, Canada's Economic Development, 1867 - 1953, with Special References to Changes in the Country's National Product and National Wealth Income and Wealth series VII, 1958, Bowes and Bowes, London p. 97 - 118

[3]Kenneth Buckley, Capital Formation in Canada, 1896 - 1930, Canadian Studies in Economics, No. 2. University of Toronto Press, 1955.

approach adopted is one of production or supply.[4] The break-down of estimates is restricted by a lack of appropriate information to one of a commodity-flow classification.[5]

The third period is 1926 - 1945, wherein capital formation estimates have been derived by a governmental body. The first official estimate was in 1945.[6] The approach adopted is essentially one of production or supply. The techniques of collection and estimation are indirect and the classification technique is commodity-flow. Repair and maintenance estimates are also included in the study, such estimates being derived on the basis of a constant ratio relationship between new investment and repair and maintenance. The first series was revised in 1951 with two basic changes.[7] The first and most fundamental change that heralded the beginning of a new classification technique is the substitution of the end-user[8] for the commodity-flow technique. The second change is in the abandonment of the constant ratio and the adoption of a variable ratio method of deriving estimates of repair and maintenance.

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[4]The production or supply approach ascertains the value of capital goods actually invested during a particular period of time. For a discussion of this approach, see page 11.

[5]The commodity-flow classification presents data according to the components of capital formation, e.g. construction, and machinery and equipment. For a discussion, see "The Commodity-Flow Technique", page 78.

[6]Dominion-Provincial Conference on Reconstruction, Public Investment and Capital Formation, A Study of Public and Private Investment Outlay, Canada, 1926 - 1941, Ottawa, King's Printer, 1945

[7]Department of Trade and Commerce, Private and Public Investment In Canada, 1926 - 1951, 1951.

[8]The end-user classification presents data according to the final user e.g. the various industries. For a discussion see "The End-User Technique", page 65.

The fourth period, 1946 and onwards, marks a milestone in the measurement of capital formation in Canada. Radical steps were taken to orientate capital formation measurement from one previously based on a production or supply approach to one based on a "money" or expenditure approach.[9] A separate Department of Reconstruction and Supply was established in 1944 to undertake, in conjunction with the Dominion Bureau of Statistics, capital expenditure surveys to determine business investment intentions. Here a new time concept in the measurement of capital formation is introduced. The measurement of capital formation is possible for the future (the next year) and, as previously, for the past (the last year) when preliminary and actual estimates of capital formation can be derived from the surveys. Since 1946, estimates of future capital formation have been published annually; since 1949, estimates of past capital formation have been published annually. In these studies a more direct technique of estimation - the "blow-up" technique[10] - is used, and the end-user technique of classification is retained.

PURPOSES OF STUDY

A basic objective in outlining the preceding section is to indicate the various techniques of collection, estimation and classification that have been used at one time or another in the measurement of capital formation in Canada. The gamut ranges from the crude and now discarded techniques used in earlier years for estimating historical series to the sophisticated and refined

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[9]The "money" or expenditure approach ascertains the money outlay for the production or acquisition of capital goods. For a discussion of this approach, see page 11.

[10]The "blow-up" technique refers to the inflation of non-census survey data to reflect the univers. For a discussion of the "blow-up" technique, see page 45.

techniques in current use for measuring current capital formation.

The purposes of the study are:

1. to assemble the main techniques that have been or are currently used in Canada to collect, estimate and classify data for the measurement of capital formation. As aforementioned, there have been many techniques used, but, apparently, these have not been grouped or classified into a meaningful whole.
2. to delineate the problems involved in the application of such techniques and, in general, the measurement of capital formation.
3. to analyse and appraise such techniques with respect to limitations, quality, accuracy and practical applicability.
4. to suggest possible improvements in such techniques as are considered plausible in terms of additional effort and time, and desirable in terms of additional accuracy and precision.

SCOPE OF STUDY

The scope of the study will, in general, take into consideration the techniques that have been or are still used in collecting, estimating and classifying data on past, current and anticipated capital formation. The measurement of capital formation in Canada as a special study was virtually absent prior to 1945. It was with the Dominion-Provincial Conference on Reconstruction in 1945 that attention was directed to measuring capital formation. Since then several studies have been undertaken, each using common or different techniques in the derivation of final estimates.

While the study will attempt to cover and categorize the main techniques used since 1945, specific attention will be devoted to the techniques that are in current use. These are the techniques as are used by the Dominion Bureau of Statistics in the measurement of actual and anticipated capital formation.

Chapter II forms the foundation stone in the study. In this chapter, the basic premises are laid as the concept of capital formation is discussed and defined, and the various possible approaches to the measurement of capital formation are categorically listed.

Chapter III answers, in part, purpose number 2. It seeks to identify some of the more pertinent problems that confront the economist in the measurement of capital formation. These problems are by no means exhaustive, but they serve well to illustrate that the measurement of capital formation requires special skills. The accuracy of the final estimates will depend, in part, on the skills in solving these problems.

The focus of the study is in the subsequent three chapters which attempt to answer the four purposes as outlined. The measurement of capital formation is envisaged as consisting of three distinct phases. Chapter IV is devoted to a study of the techniques used in the first phase - the collection of data. Chapter V is devoted to a study of the techniques used in the second phase - the estimation of capital formation from the collected data. Chapter VI is devoted to a study of the techniques used in the final phase - the classification of the estimates of capital formation.

The final chapter draws the conclusions from the preceding three chapters. An attempt is made to consolidate these conclusions and to

trace their systematic and logical development through the three stages in the measurement of capital formation.

METHODOLOGY OF STUDY

The methodology of the study is twofold. First, the study is based primarily on a close examination of the various publications on capital formation in Canada with a view to ascertaining the techniques used in the compilation of capital formation estimates. This procedure cannot but rely heavily on library material. In addition to library material, the writer was fortunate to have access to unpublished documents by officials of the Dominion Bureau of Statistics.

Second, in supplementation to an examination of published and unpublished documents, direct interviews and correspondence were undertaken with officials of the Business Finance, and the National Accounts and Balance of Payments Divisions of the Dominion Bureau of Statistics, Ottawa. The interviews and correspondence were of considerable help in supplying information as to the techniques used, as such information is very often not included in studies of capital formation. They also served to clarify the techniques that are currently used by the Dominion Bureau of Statistics. That the emphasis of the study is on current techniques is an indication of the contribution of these interviews and correspondence.

CHAPTER II

CONCEPT, DEFINITIONS AND MEASUREMENT OF CAPITAL FORMATION

CONCEPT OF CAPITAL FORMATION

An economic process involves the interplay of two, three or a combination of the factors of production - land, labour, capital and enterprise. An economic process that directs these factors of production for future productivity rather than current consumption would, in its broadest sense, constitute capital formation. The concept of capital formation is, therefore, very wide and embraces both tangible and intangible capital assets.[1]

Capital is the stock of productive assets in existence at any point of time; capital formation is the flow which either augments or diminishes this stock over different points of time.

Part of this flow of capital assets can be subject to quantitative measurement and part of it cannot be reduced to numerical terms. Due to difficulties in quantitative measurement, intangible items are usually excluded from the measurement of capital formation.[2] Statistics on capital formation, therefore, usually cover the following components:

1. fixed durable capital assets. These refer to construction and machinery and equipment, which are used in substantially the same form for an extended time period. They do not

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[1] See Appendix I for diagrammatic coverage of capital formation.

[2] Future productive capacity is facilitated not only by net additions to a country's stock of capital goods, but also by increases in intangible assets, e.g. research and technical training. However, valuational difficulties do not allow easy inclusion in the measurement of capital formation.

undergo physical transformation in the period in which they are being used and do not become a physical part of final commodity production. They involve a major expenditure at the time of acquisition, but further capital outlays are small until replacement is necessary. Their services are usually spread over a time period until they wear out or become obsolete. Therefore, only part of their value is recovered by selling a unit of product on which they are used.

2. current circulatory capital assets These refer to inventories at all stages of production. They give up their economic services at once. Their value is fully recovered by selling the single unit of product on which they are used.

Any additions to, replacement of, or improvement in these two capital items constitutes capital formation. While repair and maintenance expenditures are not capital formation but current expenses, these are included in studies on capital formation in Canada.[3] However, their inclusion is clearly separated from estimates of capital formation.

DEFINITIONS OF CAPITAL FORMATION[4]

1. Capital formation refers to that part of a country's national

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[3]The basis for the inclusion of repair and maintenance expenditures is that these have similar characteristics to additions, replacements and improvements, in that they are to some extent postponable and draw on the same pool of material and labour as do expenditure on new investments.

[4]To avoid confusions in terminology, "savings" and "investments" have been deliberately omitted in the definitions. "Capital formation" is a much wider term and embraces both "savings" and "investment", as well as the money outlay for the acquisition of capital goods. However, "investment", as used in any part of this thesis, is treated as co-equal to "capital formation".

output which is set aside as additions to, replacement of, or improvement in its stock of capital goods.

2. Gross capital formation refers to all the output of capital goods in a given time period, without an adjustment being made for depreciation, amortization, obsolescence and other allowances for capital used up in the productive process.
3. Net capital formation refers to all the output of capital goods in a given time period, after an adjustment is made for depreciation, amortization, obsolescence and other allowances for capital used up in the productive process.
4. Gross fixed capital formation refers to the output of fixed capital goods in a given time period, excluding inventories, without an adjustment being made for depreciation, amortization, obsolescence and other allowances for capital used up in the productive process.
5. Net fixed capital formation refers to the output of fixed capital goods in a given time period, excluding inventories, after an adjustment is made for depreciation, amortization, obsolescence and other allowances for capital used up in the productive process.

MEASUREMENT OF CAPITAL FORMATION

Capital formation is a three-staged process, beginning with the act of saving, through the investment of such saving, and ending with the production of capital goods from such investment.[5] The measurement of capital formation can be attempted at any of these three stages with

[5]See Appendix II for a diagrammatic representation of the process of capital formation.

varying degrees of accuracy.

The measurement of savings would be an extremely poor indicator of capital formation, due to offsets to the investment stage by capital losses, hoarding, capital export, lending for consumption and public loans for purposes other than investment, as well as counterbalancing forces of capital gains, dishoarding, capital imports, repayment of debts for consumption and provision for maintenance and replacement.[6]

The measurement of the funds available for investment, while itself a mere approximation, is a more accurate indicator of capital formation. Information of such funds seeking investment through the capital market can be derived from statistics of new issues of securities, of mortgage loans and bank advances and other financial statistics.[7] Since such a measurement takes account of only the flow of funds through the capital market, the omission of the flow of funds not passing through the capital market, such as the investments in sole proprietorships, poses a major defect in measuring capital formation at this intermediate stage.

The measurement of the value of newly created capital goods is the

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[6]There are two basic approaches to the measurement of savings:
(i) at its source, e.g. of business establishments from profit and loss statements or taxation statistics

(ii) at some intermediate stage between their original creation and their ultimate use.

[7]A particular difficulty in the measurement of funds available for investment is that statistics as are available measure the flow of funds at various intermediary stages between the original source and their ultimate destination. In such a measurement, overlapping and duplication cannot always be avoided.

most accurate indicator of capital formation. There are two broad approaches to such a measurement:

1. the "money" or expenditure approach
2. the "physical" or production approach

The "money" or expenditure approach ascertains the money outlay for the production or acquisition of capital goods. Data on such money outlay can be collected directly by capital expenditure surveys, or less directly from secondary sources, e.g. reports.

The "physical" or production approach ascertains the value of capital goods actually invested during a particular time period. Data on such value can be collected from statistics of production of construction, machinery and equipment and inventories. There are basically two techniques in the measurement of capital formation under the "physical" approach.

The first is the commodity-flow or supply technique, wherein the flow of capital goods is measured either at the point of production, at the point of distribution, or at the point of consumption. The measurement of capital formation at any of these points should yield similar results after adjustments for distribution costs, installation costs, markups and taxes. This is the usual and most practical technique under the "physical" approach for the measurement of the fixed capital component of capital formation, i.e., construction, and machinery and equipment.

The second is the change-in-stock technique, wherein the quantitative difference in the stocks between the beginning and the end of

the period is measured, with appropriate adjustments for valuational differences. This is the usual and most practical technique under the "physical" approach for the measurement of the circulatory capital component of capital formation, i.e., inventories.

CHAPTER III

PROBLEMS OF MEASURING CAPITAL FORMATION

The measurement of capital formation is not without problems. The problems that arise at the three stages of measurement - collection, estimation and classification - can be categorized as conceptual, valuational and statistical.

CONCEPTUAL PROBLEMS

Conceptually, capital formation refers to the production and acquisition of capital goods. More specifically, it refers to the production and acquisition of the three components of capital formation - construction, machinery and equipment, and inventories. However, these components are not subject to clear and precise definition.

The principal conceptual problems that arise from the lack of definitional precision are:

1. the treatment of producer vis-a-vis consumer goods
2. the distinction between capital and current expenditure
3. the treatment of used assets, "external" capital goods, gold and military expenditure.

Producer vis-a-vis consumer goods

The three components of capital formation can be either producer or consumer capital goods. Conceptually, the measurement of capital formation includes producer capital goods and excludes consumer capital goods. However, the distinction between the two categories of capital goods cannot be maintained in the "physical" approach to capital formation measurement.

The "include producer and exclude consumer capital goods" distinction is itself not a hard and fast rule. Residential housing which is essentially a consumer capital goods item is generally included in the construction component of capital formation. The basis for its inclusion is its long-term durability.

A further complication is the problem of inter-group transfers. A transfer from the consumer to the producer group can be resolved by regarding the transfer as positive capital formation, while at the same time as a negative consumption expenditure if the fundamental identity of net national production and net national expenditure in the national accounts is to be preserved. A transfer from the producer to the consumer group can be resolved by regarding the transfer as negative capital formation, while at the same time as a positive consumption expenditure of the particular consumer sector of the national accounts.

Capital vis-a-vis current expenditures

Capital expenditure refers to the gross outlays on durable physical assets used in the operation of an establishment, while current expenditure refers to the working expense which does not increase the productive efficiency of the asset or lengthen its life span.

Capital formation is conceptually defined to include capital expenditure and exclude current expenditure. The problem arises when the economic distinction between capital and current expenditure is different from the accounting distinction. The measurement of capital formation by data collection through direct field surveys is subject

to business interpretation of what constitutes capital expenditure. Accounting definition of capital expenditure as used in business establishments is based on accounting conventions and conveniences. Generally, it is an outlay that is charged to fixed assets accounts and on which an annual depreciation is charged against the asset.[1]

A generally accepted standard of judgment in the distinction between capital and current expenditure is the durability criterion. Expenditures for the acquisition of new capital assets with more than one year's life expectancy or for the betterment of existing capital assets with more than one year's life expectancy are deemed capital expenditures. Thus, all new acquisitions of durable assets are capital expenditures, while repairs and maintenances are current expenditures.[2]

Accounting definition of capital expenditure, however, may not strictly adhere to the durability criterion. It is often convenient for an establishment to charge expenditures on certain durable producer's goods with a life expectancy exceeding one year to current expenditure account rather than capitalize them. It is precisely because of this difference in the distinction between capital and current expenditure that a supplementary item entitled "Capital Items Charged to Operating Expenses" has to be added to current estimates

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[1]W. E. Karrenbrock and H. Simons, Intermediate Accounting. Third Edition, W. J. Gage Limited, Toronto, p. 403.

[2]Ibid, p. 416-417

of capital formation in Canada.[3]

A problem which arises from the acceptance of the durability criterion is the treatment of complicated capital assets with some parts satisfying the durability criterion, while other parts do not. It is neither practical nor customary to attempt any division into their capital and current expenditure components.

A related problem is in the treatment of repair costs which do not extend the normal life of the capital asset, but which, however, involve the replacement of parts which satisfy the durability criterion. A recommended solution is to treat such expenditures which do not materially lengthen the economic life of the asset or raise its productivity as current expenditures.

Used assets, "external" capital goods, gold and military expenditures

These items are problematic as they do not fit neatly into the conceptual definition of capital formation.

The transfer of a used asset between two establishments would represent a positive capital formation to the transferee and a negative capital formation to the transferor. If such an approach is adopted,

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[3]In the Dept. of Trade and Commerce publication "Private and Public Investment in Canada, Outlook", there has been since 1947 an item called "Capital Items Charged to Operating Expenses" (CICOE) under the Manufacturing, Utilities and Trade sectors. The CICOE is conceived as the difference between estimates of capital formation derived from the capital expenditures survey and the supposedly higher estimates that can be derived from a commodity-flow method. This difference was for 1947, made up of 10% of new machinery and equipment plus repairs to machinery, in the Manufacturing sector, 1.3% in the Utilities and 8% in Trade. These percentages have been applied every year since then.

domestic capital formation as a whole would not be affected by the transfer. Transfers of used capital assets are recorded at their selling price which will generally differ from the book value of the asset. As such, transfers may include capital gains or capital losses. If the selling price is used as the yardstick of measurement, however much capital gains or losses may affect individual establishments, the domestic supply of capital for the economy as a whole is not affected - a positive capital formation is counterbalanced by an exact amount of negative capital formation.[4]

Capital formation transcends national boundaries. Imports of "external capital goods" are additions to a country's real capital stock; exports of "internal" capital goods are subtractions from a country's real capital stock. As such, imports of "external" capital goods are treated as positive capital formation; exports of "internal" capital goods are treated as negative capital formation.

A particularly difficult problem is the treatment of gold which can be considered either as a source of foreign exchange or a commodity. As a source of foreign exchange, it should be considered as a component in the foreign capital account; as a commodity, it should be considered as a component in the domestic capital account. Either treatment should yield the same total capital formation. However, for analytical and classificational purposes, it is deemed necessary to handle gold in the appropriate account.

Basically, there are four approaches to the treatment of gold. First the traditional approach considers gold as a balancing item in

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[4]Since such a balance is always maintained so long as transfers of used assets are within national boundaries, all used assets are excluded from capital formation estimates, unless imported.

international trade, and, as such, is included in the foreign capital account. Second, the League of Nations approach considers gold as a commodity, and, as such, is included in the domestic capital account.[5] Third, the current approach is that propounded by the International Monetary Fund which attempts to distinguish between gold reserves and gold production.[6] Gold reserves are treated as a component in the foreign capital account; gold production is treated as a component in the domestic capital account. Fourth, the final approach is that of the United Nations which attempts to distinguish between different holders of gold.[7] All changes in the stocks of gold held by monetary authorities and in private hoards should be treated as changes in net foreign investment; all changes in the stocks of gold held by industry and gold mines should be treated as changes in domestic capital formation.

The treatment of military expenditure which includes capital expenditure on construction, equipment and machinery and inventory, gives rise to complicated conceptual problems. The decision to include or exclude military expenditure as part of capital formation can have a tremendous effect on the final estimate of capital formation.

There are two basic approaches to the treatment of military expenditure. The firstis a wartime concept of national production approach, wherein all military expenditures are treated as capital

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[5]League of Nations, Studies and Reports on Statistical Method No.7. Measurement of National Income and the Construction of Social Accounts, Geneva, 1947, p. 67

[6]For a discussion of the I.M.F. approach see United Nations, Technical Appendix : Definitions and Measurement of Capital Formation, E/CN3/129.

[7]United Nations, Problems in Measuring Capital Formation. Statistical Paper Series F/3

formation.[8] The basis for such a treatment lies in the belief that military expenditure shares a similar characteristic with productive capital expenditure in that it serves either to maintain or augment the flow of consumer goods in the future. The second is a peacetime concept of national income approach, wherein only expenditures in capital assets which are useful also for peacetime purposes are treated as capital formation, while all other expenditures are treated as current expenses.[9]

VALUATIONAL PROBLEMS

The accuracy of the valuation of net capital formation depends on the accuracy of

1. the valuation of gross capital formation
2. the valuation of capital consumption

Valuation of gross capital formation

The general principle in the valuation of gross capital formation is to value capital production or acquisition at its full cost in terms of current prices. Full cost refers to all the costs incurred by the final user in connection with the production, acquisition and installation of the capital item.

The valuation of capital assets in terms of current prices is problematic. The problem is especially vexing with respect to the

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[8]Simon Kuznets, National Production in Wartime, National Bureau of Economic Research, 1945, p. 7

[9]For a discussion of the peacetime concept of national income approach see United Nations, Technical Appendix : Definitions and Measurement of Capital Formation, E/CN 3/129

valuation of the inventory component of capital formation. Under the change-in-stock method of measuring capital formation, inventory data are book-valued, and different valuations for the same amount of inventory can be derived, depending on the accounting method of inventory valuation adopted. To arrive at a valuation of physical changes in terms of current prices requires a good deal of valuational adjustment.[10]

Valuation of capital consumption

Perhaps, the most difficult part of the measurement of capital formation is the determination of an appropriate value for capital consumption to arrive at the final value for net capital formation. Capital consumption is difficult to define accurately and still more difficult to estimate. It refers to the negation of capital formation by physical depreciation or economic obsolescence or both.

There are two basic approaches to the valuation of capital consumption. The more widely accepted is the accounting approach which values capital consumption according to accounting practices. The accounting approach is generally defined in terms of the actual accounting provisions charged aginst income for the depreciation and obsolescence of capital assets. Amortization and depletion are not generally included in the valuation of capital consumption as the former refers to intangibles and the latter to the exhaustion of natural resources, both of which are conceptually excluded from the measurement of capital

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[10]See "The Valuational Adjustment Technique" page 52.

formation in its narrowly defined sense.

Depreciation, in the accounting sense, refers to the periodic allocation to operating expenses of the cost of the capital asset over its economic life.[11] The problem involved is the determination of the basic depreciation rates used in various industries for various types of capital assets. This determination is complicated by the fact that while a simple linear rate is applicable for some capital assets, a curvilinear rate would be more applicable for some other capital assets.[12]

The second amd more theoretical approach to the valuation of capital consumption is the economic approach. This approach measures capital consumption in terms of current prices rather than original costs. The problem arises with the necessity of determining appropriate price indices to convert depreciation allowances at original cost to a replacement or current cost basis.[13] The valuation of capital consumption at original cost is biased upwards in periods of rising prices. While the purpose of the economic approach is to maintain physical rather than money capital intact, it is difficult, in practice, to translate it into a readily measurable definition.

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[11] W. E. Karrenbrock and H. Simons, op.cit., p.431

[12] R. W. Goldsmith, A Perpetual Inventory of National Wealth, National Bureau of Economic Research, 1950, p. 17.

[13] For an excellent discussion of the methods for adjusting depreciation for price changes see E. C. Brown, Effects of Taxation : Depreciation Adjustments for Price Changes, Harvard University Graduate School of Business Administration, 1952.

STATISTICAL PROBLEMS

The accuracy of capital formation estimates depends on the accuracy of collection, estimation and classification. Part of the accuracy of collection, estimation and classification depends on the solutions to the statistical problems that confont any of these three stages in the measurement of capital formation.

Statistical problems can arise because of

1. inadequate information
2. inappropriate information.

Inadequate information

Information inadequacy is not a major problem in current methods of measuring capital formation. However, the same cannot be said of the measurement of historical capital formation where there is an obvious lack of information pertaining to capital formation. The further back in time, the scarcer the information.

The dearth of available information is in some way overcome by the use of less direct statistical techniques to derive estimate which, while leaving much to be desired, are, nevertheless, close approximates.

This partial solution is especially utilized in the commodity-flow approach to capital formation measurement, wherein estimates are prepared on the basis of production and imports less exports. Where information is only available for certain years, estimates for other years will have to be derived from the available information by such indirect techniques

as bench-mark, interpolation and extrapolation.[14] Where information is only available for part capital formation, total estimates will have to be derived by the "blow-up" technique.

Inappropriate information

Inappropriate information, as used in this context, refers to available information which requires a considerable degree of processing and adjustment before estimates could be arrived at that are consistent with the concept of capital formation. The problem of inappropriate information is manifest in, inter alia, conceptual differences, time differences, and data inconsistency. Conceptual differences have been touched on earlier. However, their importance is significant enough to warrant re-iteration. These are differences in the treatment of producers vis-a-vis consumer goods, used assets, "external" capital goods, gold and military expenditure, and the distinction between capital and current expenditure. Different treatments and different practices contribute to the problem of inappropriate information.

Time differences refer to the differences in the accounting period adopted by the establishment and the period adopted for the measurement of capital formation. The latter is essentially based on the calendar year; the former is based on either the calendar year or the fiscal year. Data collected through secondary sources, e.g. reports that are based on the fiscal year, need necessarily to be adjusted to the calendar year.

Data inconsistency is represented by either inconsistency through

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[14]See "Historical Techniques" (of estimation), p.57.

time or inconsistency through source. The former refers to the inconsistency of data as collected in different periods; the latter refers to the inconsistency of data as collected from different sources. In the case of the former, the data collected must be adjusted to some common base to achieve comparability in estimates through time. In the case of the latter, the problem is presented in the form of a choice among different possible alternative sources of information. The choice of any one source depends on the quality and accuracy of the source material.

CHAPTER IV

TECHNIQUES OF COLLECTION

The collection of data on capital formation in Canada has relied on a variety of techniques. There are two broad categories of techniques that are or have been used. The first or current technique is primary data collection based on field surveys. The second or "historical" technique is secondary data collection based on documented records, reports, the Census and related studies.

THE CURRENT TECHNIQUE

The current technique of field surveys is carried out by the Business Finance Division of the Dominion Bureau of Statistics (D.B.S) in conjunction with the Department of Trade and Commerce. Its origin can be traced to 1944 with the establishment of the Department of Reconstruction and Supply (now the Department of Trade and Commerce) which was created, among other reasons, to undertake surveys of capital investments. From its modest beginnings and limited coverage, the techniques became more sophisticated, more complex and more extensive in coverage. Today, the following enterprises with a gross value of production (G.V.P.) of $200,000 and over are included in the survey: forestry, mining, manufacturing, public utilities, construction, trade, financial institutions, commercial services, and education, health, welfare and religious institutions.

There are three surveys of investment intentions. A year-end survey is based on an almost complete coverage of establishments with a gross value of production of over $200,000. A mid-year survey is

based on a sample of the larger establishments. Its purpose is to indicate the changes in investment plans occurring in the previous six months and to provide a basis for revising the forecasts for the current year. A preliminary survey is carried out in September based also on a sample. The findings of this survey, however, are not published and are strictly for governmental use.

There are two surveys of actual investments based on a fairly complete coverage. The first is undertaken concurrent with the year-end investments intentions survey. It provides preliminary estimates of actual investments for the current year. The second survey follows early in the next year and yields final totals for the year just passed.

The findings of the investment intentions and actual investment surveys are published in three annual white papers. The most important publication is the "Outlook" which provides the following information by industry:

(i) the original forecasts for the coming year

(ii) the preliminary actual estimates for the current year

(iii) the final actual estimates for the preceeding year

The second publication is the "Regional Supplement" which provides the same information but cross-classifies industries by provinces and metropolitan areas. The third publication is the "Mid-Year Review" which provides information on the revised forecasts for the current year on an industry basis but without regional breakdowns.

The present state of the capital investment surveys in Canada is advanced in comparison to the investment surveys of other countries. These surveys are establishment and buyer-orientated rather than company and seller-orientated. The establishment-orientation is to facilitate regional breakdowns. The buyer-orientation is, in part, to overcome a definitional problem : what is a capital good to one could possibly be a consumption good to another.

In the United States, similar surveys are undertaken by the Department of Commerce-Securities Exchange Commission (S.E.C.) and McGraw-Hill. The Commerce - S.E.C. quarterly and annual surveys are based on smaller samples and cover less enterprises (e.g. residential, institutional and governmental sectors are not included). The surveys are buyer-orientated like the Canadian surveys, but are company-orientated unlike the Canadian surveys, thereby, making it impossible for regional breakdowns. In Sweden, only annual surveys of investment intentions are taken, covering some 4,000 industrial enterprises (in Canada, it is around 18,500). In Australia, semi-annual surveys are taken of some 30% of business enterprises (in Canada, it is around 80%).

The Canadian surveys of capital expenditures are based primarily on mailed questionnaires. The questionnaire forms as used in 1950 and 1963 are shown in Appendix III. They serve to indicate the extra-ordinary increase in structural details that has taken place through time. The classification similarity of the findings of the surveys through the period suggests that the reason for the increase in

structure details is to aid the respondent (e.g. the corporate accountant) in the filling in of the questionnaire forms.

However, the increase in structure details also provides additional clerical work to both the D.B.S. and the establishment.[1] The justification for the increase in structure details must, therefore, necessarily depend on the increase in the accuracy of investment estimates of both intentions and preliminary surveys vis-a-vis actual.

It would be very difficult to analyze the multitudinous determinants of intentions and preliminary estimate accuracy. It would also be difficult to isolate one determinant from all others in analyzing its effect on the accuracy of the estimates. A basic assumption in analyzing structure details as a determinant in the accuracy of estimates is to hold other determinants constant, e.g. that estimating techniques are the same throughout the period.

The charts attached show the percentage deviations of intentions and preliminary estimates from actual for the period 1951 - 1961 for selected enterprises. Charts I (a) and I (b) show deviations of construction and machinery and equipment estimates for business enterprises; Charts II (a) and II (b) show deviations of construction and machinery and equipment estimates for manufacturing as a major

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[1]The increase in structure details has not led to further classificatory breakdowns. If, therefore, the purpose of the increase is not for classificatory purposes, but rather to facilitate the ease in completing questionnaire forms, this very purpose could be defeated if accounting information of the establishment is in aggregate figures. For instance, a blanket allowance for anticipated investment is not usually broken down into allowances for particular types of construction or particular types of machinery and equipment.

component of business enterprises; Charts III (a) and III (b) show deviations of construction and machinery and equipment estimates for the paper industry as a major component of manufacturing.

The charts serve to indicate that no discernable improvement in accuracy was achieved with an increase in structure details, except possibly in the estimates of machinery and equipment for the paper industry, ceteris paribus. In fact, Chart I (a) shows a greater degree of inaccuracy through time.

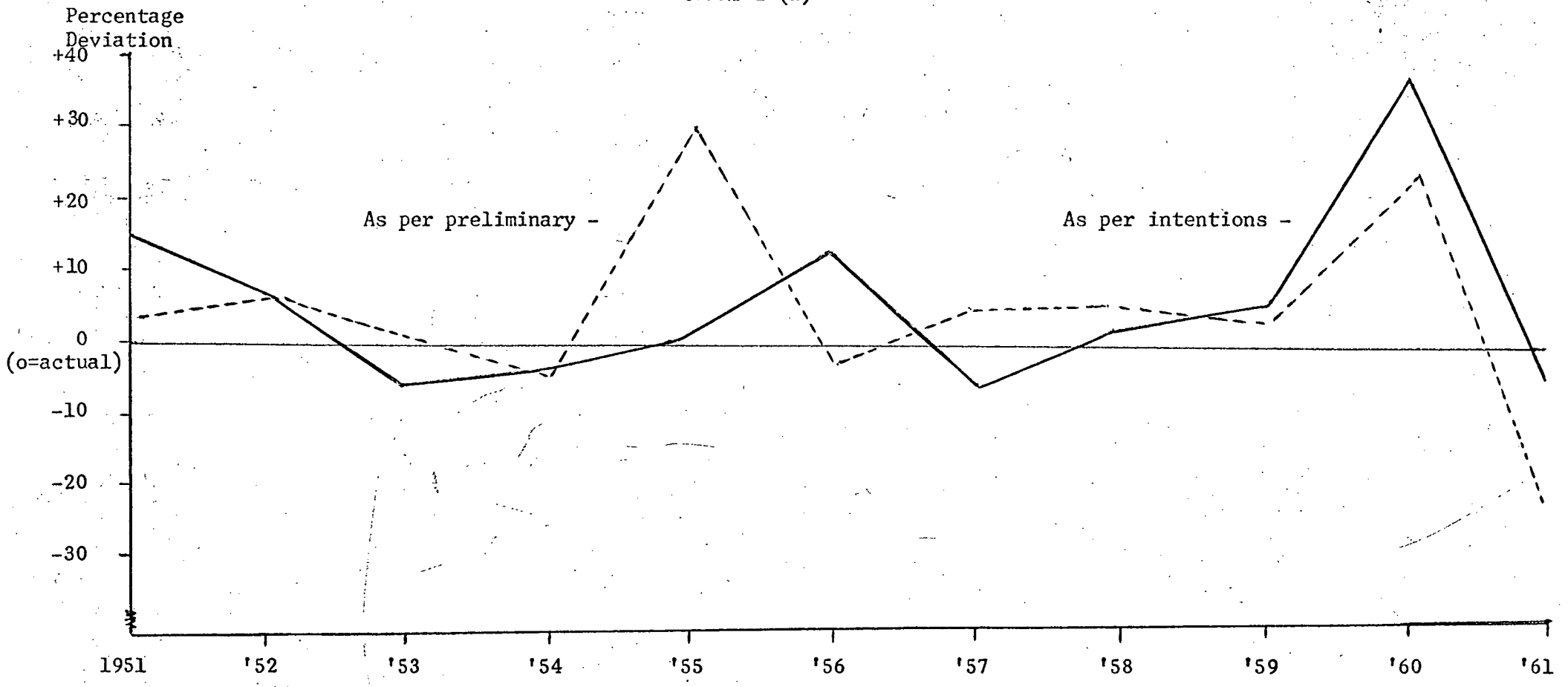
While the limitations of such a one-angled analysis are recognized, it, nevertheless, suggests that since no significant improvement in accuracy is associated with increased structure details, the intentions and preliminary questionnaire forms could be simplified without sacrificing too much accuracy. The actual estimates questionnaire form could be retained as it stands.

A second area for simplification is the elimination of the repair estimates from the intentions and preliminary questionnaire forms, and the adoption of estimates based on historical data instead.

The validity of using historical data depends on the degree of relationship between capital expenditures and repair expenditures. If the relationship is close, a ratio factor can be developed in the determination of repair estimates that could probably be just as accurate as the survey results.

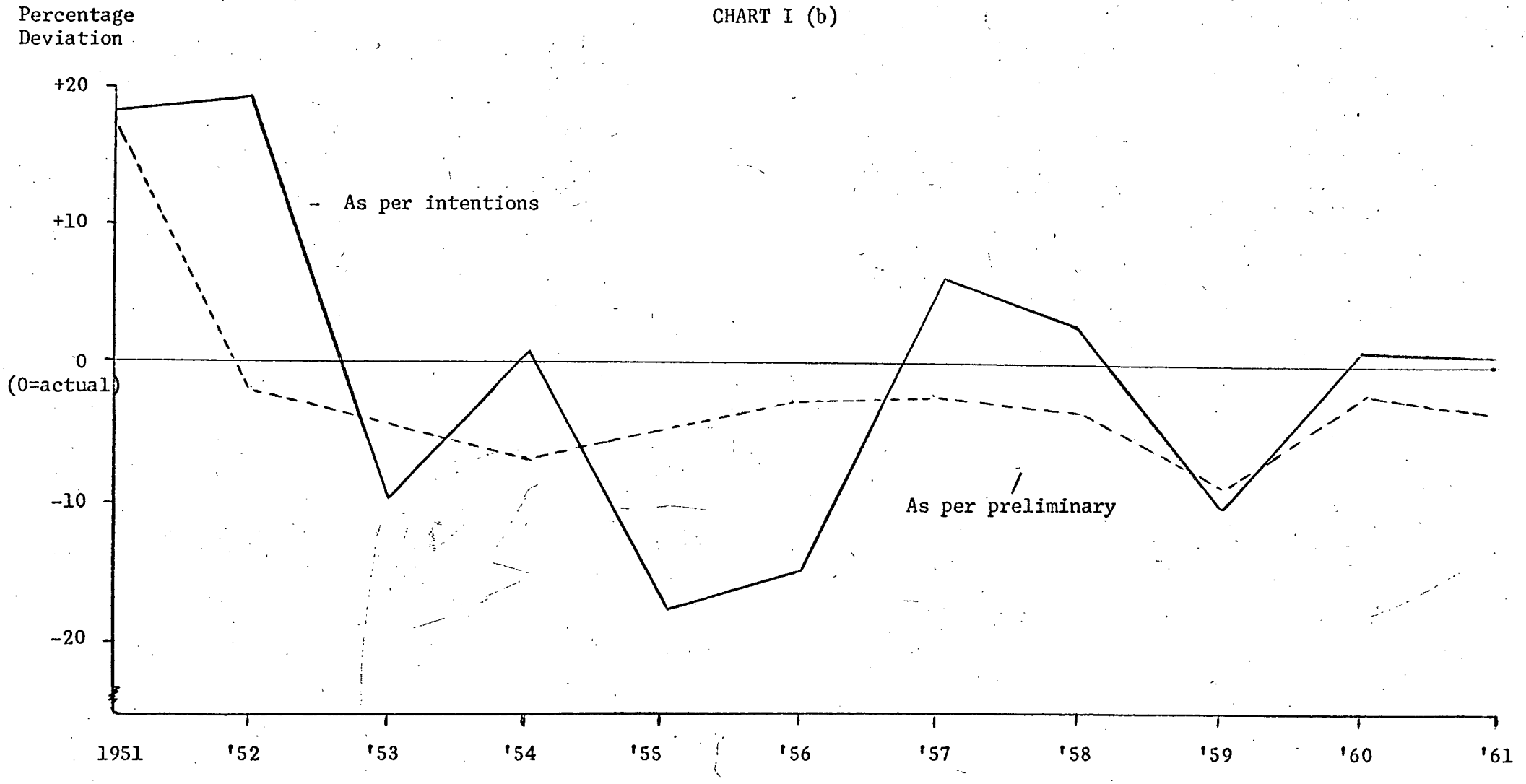
Appendix IV provides the computations in the determination of the co-efficients of correlation between capital and repair expenditures of construction and of machinery and equipment for business

CHART I (a)



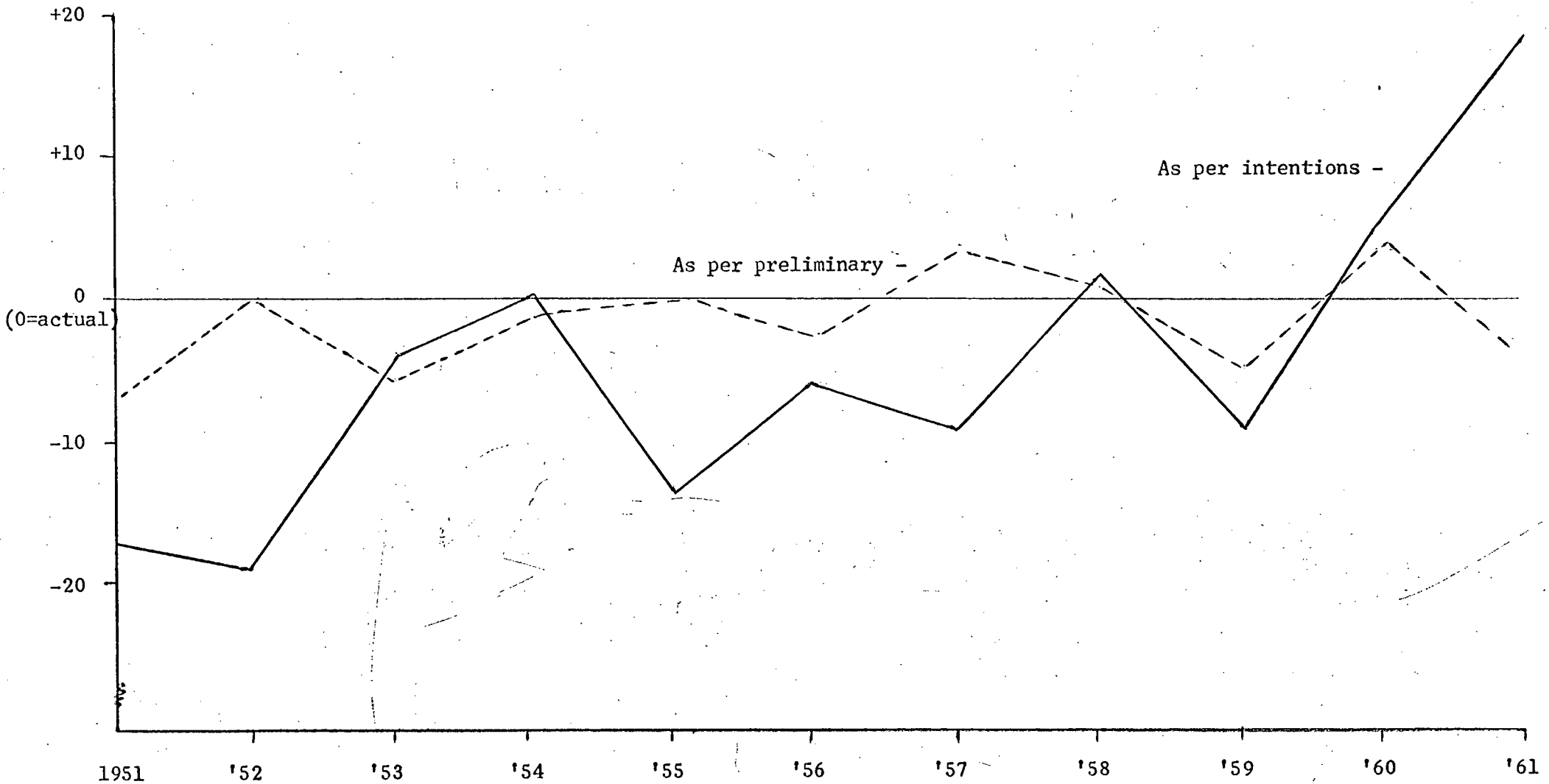
Business Enterprise: Percentage Deviations of Intentions and Preliminary Construction Estimates from Actual.

CHART I (b)



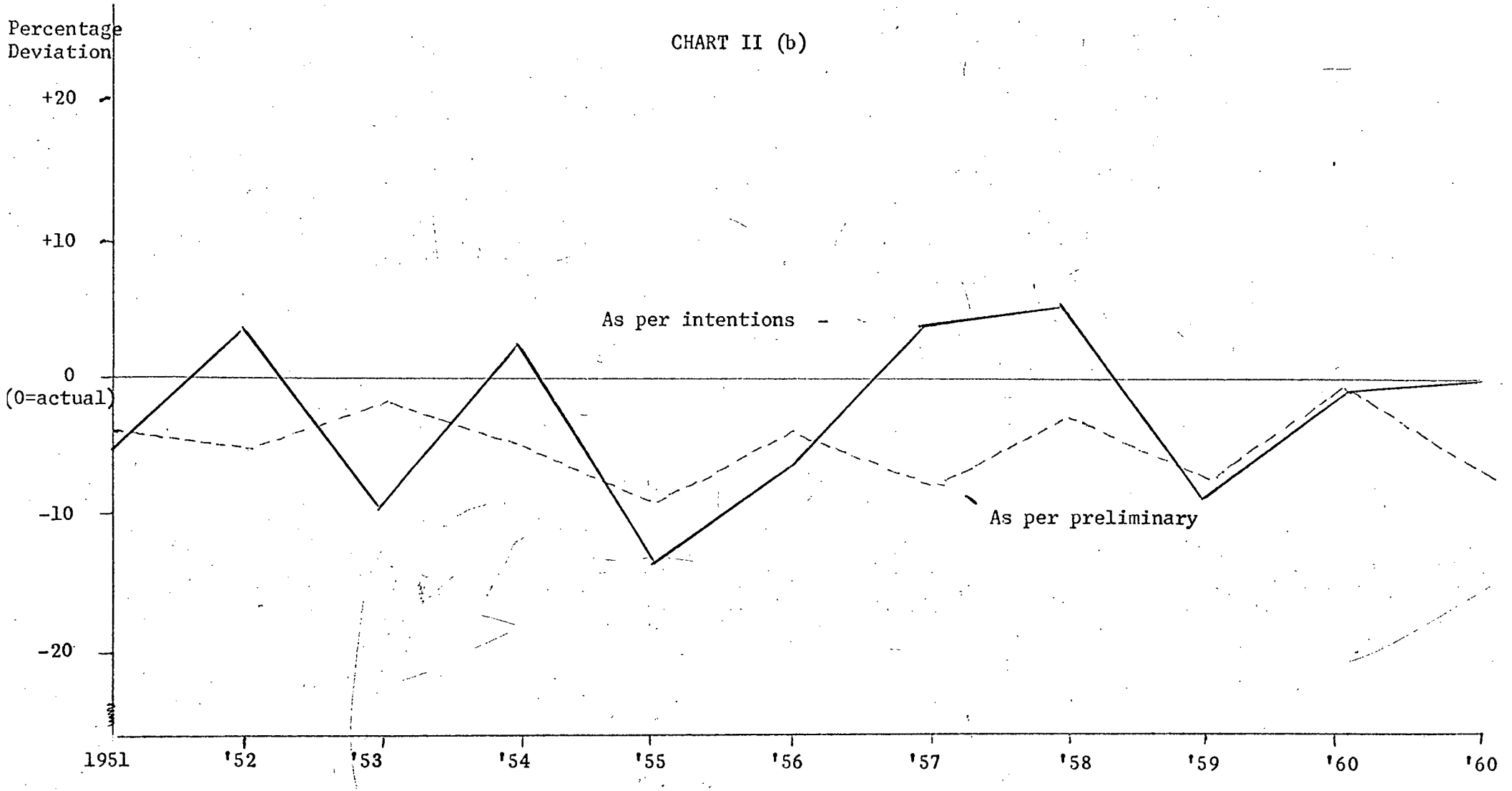
Business Enterprise: Percentage Deviations of Intentions and Preliminary Machinery and Equipment Estimates from Actual.

CHART II (a)



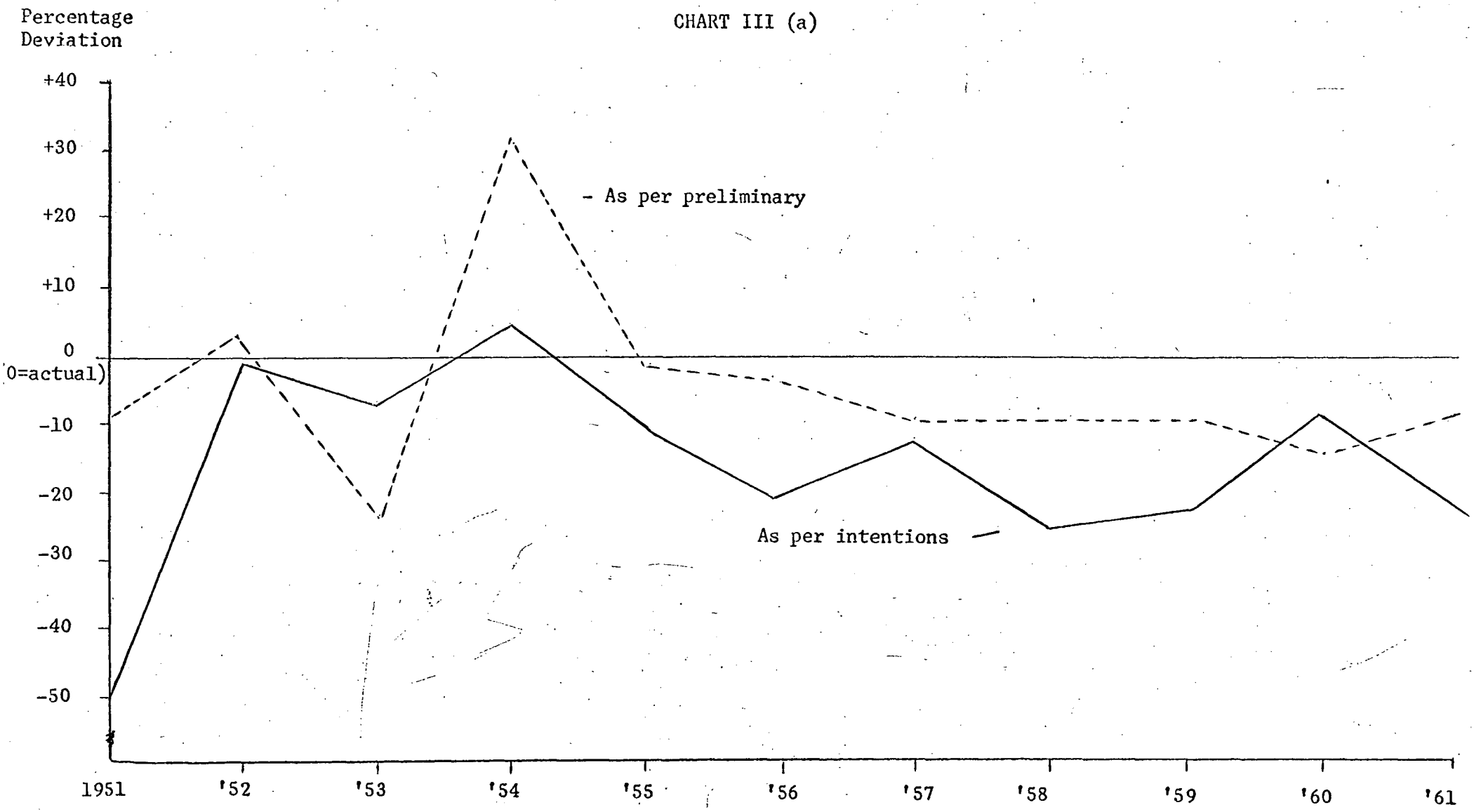
Manufacturing: Percentage Deviations of Intentions and Preliminary Construction Estimates from Actual

CHART II (b)



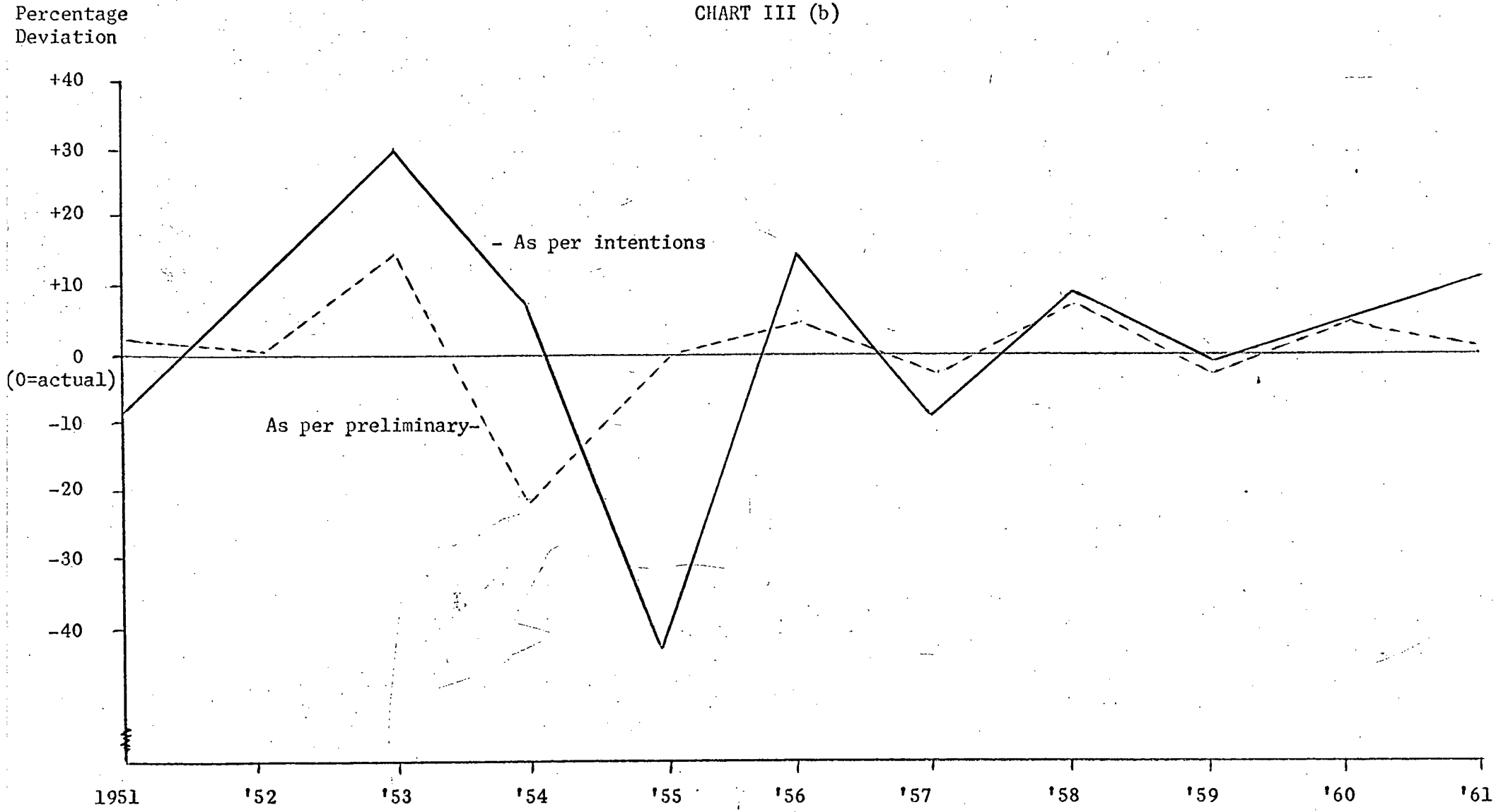
Manufacturing: Percentage Deviations of Intentions and Preliminary Machinery and Equipment Estimates from Actual

CHART III (a)



The Paper Industry : Percentage Deviations of Intentions and Preliminary Construction Estimates from Actual.

CHART III (b)



The Paper Industry : Percentage Deviations of Intentions and Preliminary Machinery and Equipment Estimates from Actual.

enterprises, manufacturing and the paper industry. The co-efficients of correlation as computed are:

(a) business enterprises

(i) construction 90%

(ii) machinery and equipment 99.5%

(b) manufacturing

(i) construction 94%

(ii) machinery and equipment 95%

(c) paper industry

(i) construction 54%

(ii) machinery and equipment 86%

There is an extremely high degree of correlation between capital expenditure and repair expenditure in five instances. This very close relationship provides justifiable grounds for substituting a ratio factor for the survey of repair estimates in the intentions and preliminary questionnaire forms. The repair series could be retained in the actual estimates survey.

The simplification of the intention and preliminary questionnaire forms by the reduction of structure details and the elimination of repair estimates would enable a release of resources and time for both the establishment and the D.B.S. For the establishment, the burden of completing the intentions-preliminary questionnaire would be substantially simplified so that the surveys could well be replaced by quarterly requests and more qualitative information that could prove more useful in current analysis. For the D.B.S., the burden of checking returns would be simplified, and the elimination of the repairs series

could release the necessary manpower resources and time for improved estimating procedures and survey stratification as are dealt with in the next chapter.

"HISTORICAL" TECHNIQUES

The current technique of field surveys is adequately suited for the correction of future, current, and, at most, very immediate historical investment data. The field surveys can be moulded to the specific requirements of the investigation.

For the collection of historical investment data, however, the survey method is a poor technique. Establishments do not always retain historical records which are beyond a certain age and which are of no further use. Even if such records are available, there is the difficult problem of re-interpretation of the records to suit the requirements of the questionnaire. Therefore, a primary reliance must be placed on less direct techniques of collection. In Canada, this reliance is placed on records, reports, the census and related studies.

Records

Records refer to the unpublished documents that are filed by institutions. The technique involves the analysis and extraction of relevant investment data from such documents. This can be a very painstaking and time-consuming procedure, and as such, is in some sense a technique of last resort.

The use of records is especially resorted to in the collection of investment data for the period before and around the turn of the century.

A case can be cited. In the collection of data on the building and real estate activity in Greater Toronto for the period 1886 - 1948, Buckley makes extensive use of records of registration, transfer and mortgages from the Toronto and York Registry Offices, and permit issues from Toronto city.[2]

In the absence of other sources, records provide the only solution to data collection.

Reports

Reports refer to the published documents that are filed by institutions. They are more widely used as they are more amenable to the collection procedure and do not require the painstaking efforts of record analysis. Reports could be public or private.

Reports are especially adaptable to the supply or commodity-flow approach where there is no industrial, regional or sector breakdown. Under such an approach, investment data of the various components of capital formation can be collected by an analysis of the relevant reports. For construction, there is the D.B.S. "Report on the Construction Industry in Canada"; for producers' durable goods, there is the D.B.S. "The Manufacturing Industries of Canada, Total Report"; for non-farm inventory, there are numerous sector and industrial reports.

While reports are useful sources of investment data, there is, however, one significant disadvantage in their use. This refers to presentation of the reports. Obviously, the reports are orientated

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[2]Kenneth Buckley, Capital Formation in Canada, 1896-1930, University of Toronto Press : 1955 p. 122.

to their particular set of objectives and presentation might not necessarily tally with the requirements of capital formation. Therefore, the utilization of such reports might require some initial re-classification. This need is particularly strong with public reports or public accounts.

The Public Accounts are compiled and classified according to a public finance approach which distinguishes between current and capital accounts. But such a classification is not co-equal with the classification manifested in the national income approach which also distinguishes between current and capital account. While the latter approach agrees with the required definition of capital formation, that of the former can and does deviate from the concept of public capital formation as investment in durable physical assets in the public sector. In other words, the problem arises in that there is no clear-cut estimate of public capital formation in the Public Accounts.

The concept of capital accounts under the public finance approach is not so rigidly defined as under the national income approach. The result is differing definitions among different governmental bodies and in different years. On the one hand, there are instances where items that are not included under the definition of public capital formation are included in the capital accounts, e.g. capital direct relief expenditure; on the other hand, many truly investment items are charged to current accounts. The latter practice is particularly true for the year in which governments are in favourable fiscal positions. Further, capital outlays as reported in the public accounts

do not distinguish between income-generating expenditures and transfer payments.

The public finance approach as adopted in the Public Accounts, therefore, does not provide a reliable criterion for determining the items to be included in public capital formation. To arrive at a satisfactory estimate of public capital formation would require a re-classification of data. Re-classification, while laborious, is, nevertheless, possible as the Public Accounts are sufficiently detailed. It would involve a re-examination of each item of expenditure, and the selection of expenditures for purposes of expanding, improving or maintaining physical assets as items of capital formation.

The Censuses

The Censuses are complete enumeration of the universe in relation to a particular activity or a set of particular activities. They can be one of population, manufacturing, labour or any similar or dissimilar activity.

The Censuses are expensive and time consuming means of data collection. As such they are limited to infrequent intervals. In Canada, the censuses of population, housing, labour, agriculture, merchandizing and fisheries are taken every ten years, with supplementary censuses of population and agriculture every five years. The last decennial censuses were in 1961; the last quinquennial censuses were in 1956.

The decennial censuses are important sources of information in the collection of historical estimates of capital formation, especially

when records and reports are lacking. An application can be seen in the derivation of construction estimates in Firestone's study of the residential real estate in Canada.[3] The census data provide appropriate benchmarks for the study of the full period. Thus, Firestone draws information on the number and value of dwellings for the period 1921 - 1944 on the Decennial Census of Canada, 1921, 1931 and 1941.

There are, however, two drawbacks in the use of census data. These are:

1. The Census data are only valid for the census year. In Firestone's study, original computations were available for the census years 1921, 1931 and 1941 only. Estimates for the intervening periods had to be derived indirectly from interpolation, which can at best prove to be only an approximation, depending on the index chosen for interpolation.
2. As in reports, the presentation and classification of the census data do not always conform to the requirements of the conceptual meaning of capital formation. In the study cited, adjustments were made with respect to classification and with respect to different enumerational techniques employed in the three censuses. For instance, the 1921 census did not make a clear distinction between buildings (i.e. separate structures) and dwellings (i.e. self-contained units used for residential purposes). The

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[3] O.J. Firestone, Residential Real Estate in Canada, Toronto, 1931.

distinction is important because several dwellings can be contained in one building.

Related Studies

Related studies refer to the published or unpublished studies that have part or full relation to the study of capital formation, and part or full coverage of the study of capital formation.

There are several studies of capital formation in Canada. Some are independent studies; others are dependent studies. Independent studies rely for data collection on primary sources of information. Dependent studies rely for data collection on primary as well as secondary (including related studies) sources of information.

There are two broad ways in which data on capital formation can be collected from related studies. These are:

1. directly This involves the incorporation of estimates of capital formation, as are available in related studies, into a dependent study. A good example is the 1951 Department of Trade and Commerce Study entitled "Private and Public Investment in Canada, 1926 - 1951", which draws its data, aside from other sources, from two basic studies. The direct estimate of investment in machinery and equipment from 1926 - 1941 were drawn from an earlier study prepared for the Dominion-Provincial Conference on Reconstruction in 1945.[4] The estimate of housing was drawn from Firestone's study of the residential real

[4]Dept. of Supply and Reconstruction, Public Investment and Capital Formation, A Study of Public and Private Investment Outlay, Canada, 1926 1941, Ottawa, King's Printer, 1945.

estate in Canada.[5] Data from these related studies were used almost unchanged or with minor revisions.

2. indirectly This involves the incorporation of estimates of capital formation, as are available in related studies, into a dependent study, but only after extensive adjustment. A good example is Buckley's estimate of the flow of construction commodities from 1926 - 1930[6], derived from "Public Investment and Capital Formation" (or P.I.C.F.).[7] The P.I.C.F. estimates were adjusted by a modification in the commodity classification adopted by P.I.C.F. For instance, the P.I.C.F. 1926 estimate for construction of $371.8 million was adjusted to $339.9 million in Buckley's study.[8] The adjustments carried out are as follows:

		Value in 1926 ($000)
Estimate as per P.I.C.F.		371.800
Items excluded in Buckley's Study:		
Bolts, nuts and rivets	4,596	
Installations by contractors	19,055	
Force-account materials	11,753	

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[5]O. J. Firestone, op.cit.

[6]Kenneth Buckley, op.cit.

[7]Dept. of Supply and Reconstruction, op.cit

[8]Kenneth Buckley, op.cit, p.87

		Value in 1926 ($000)
Estimate as per P.I.C.F.		371.800
Tanks, storage	2,851	
Glass fixtures	403	
Piling wood	17	
	38,675	
Items added in Buckley's study:		
Unmanufactured products	6,792	
Total adjustment		- 31,883
Estimate as per Buckley's study		339.917

CHAPTER V

TECHNIQUES OF ESTIMATION

The estimation of capital formation in Canada has relied on many techniques that range from arbitrary but ingenious methods to the highly systematized approach currently in use by the D.B.S. In general, these techniques can be categorized into two broad groups. The first or current technique relies on direct estimation from available base data. The second or "historical" technique relies on indirect estimation through the use of relevant statistical tools, in the absence of available base data.

CURRENT TECHNIQUES

There are two basic current techniques used in the estimation of capital formation in Canada. The first, used by the Business Finance Division of the D.B.S., is the "blow-up" or inflation technique applied to the estimation of the construction and machinery and equipment components of capital formation. The second, used by the National Accounts and Balance of Payments Division of the D.B.S., is the valuational adjustment technique applied to the estimation of the inventory component of capital formation.

The "Blow-Up" Technique

The "blow-up" technique refers to the inflation of non-census survey data to reflect the universe. The D.B.S. capital expenditure surveys are limited to establishments with a G.V.P. of $200,000 and above; an estimate of the capital expenditure of establishments

with a G.V.P of less than $200,000 is needed to provide the capital formation data for the universe. This estimate can be derived from the reported survey data based on certain accepted relationships.

The current "blow-up" is sales-ratio technique, based on the relationship of investment to sales of both reporting and non-reporting establishments. It assumes that the ratio of investment to sales in a given year is the same for reporting as for non-reporting establishments. In equation form,

$$\frac{\text{Reported investment}}{\text{Reported Gross Value of Sales (G.V.S.)}} = \frac{\text{Non-reported investment}}{\text{Non-reported G.V.S.}}$$

Therefore,

$$\frac{\text{Total G.V.S.}}{\text{Reported G.V.S.}} = \text{"Blow-up" factor}$$

The application of the "blow-up" factor to the reported investment yields the estimate for the universe.

Thus, if

$$\frac{\text{Total G.V.S.}}{\text{Reported G.V.S.}} = \frac{100}{80}$$

"Blow-up" factor = 1.25

Reported investment = $60

Total investment = 60 x 1.25

= $75

Appendix V illustrates an actual intentions estimate of capital and repair expenditures for the paper industry in British Columbia for 1963.

The sales-ratio method of "blow-up" is simple and plausible as it stands. However, its accuracy, in practice, is open to doubt.

This arises from the nature of the D.B.S. capital expenditure surveys taken at different points of time. The "blow-up" of the preliminary survey figures is done by using the G.V.S. of year n; the "blow-up" of the actual survey figures is done by using the G.V.S. of year n+1. In other words, sales information for two different years are used to prepare the two estimates, preliminary and final, for the same year. The assumption that sales in two different periods are comparable undermines the validity of testing the accuracy of the preliminary estimates.

It is recognized that practicability demands that sales figures of the previous year be used in the "blow-up" of the preliminary estimates, as current sales figures are not as yet available. However, it must be also recognized that such an approach suffers from several weaknesses. The first and most obvious, is sales volume is subject to fluctuations in different years. The Keynesian trade cycle stresses a sudden and sharp downturn that could result from a decline in the psychological marginal efficiency of capital.[1] The "blow-up" of a preliminary survey based on the sales figures of a business boom and the "blow-up" of a final survey based on the sales figures of a sudden downturn are liable to yield non-comparable estimates.

A closely related weakness lies in the relationship of sales to investment. The preliminary survey of investment of year n is

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[1]J. M. Keynes, The General Theory of Employment, Interest and Money, New York: Harcourt, Brace & Co., 1936

assumed to be related to the sales of year n - 1; the final survey of investment of year n is assumed to be related to the sales of year n. That either relationship exists is doubtful. On a priori grounds, investment should be the cause and sales the effect. If such a cause and effect relationship is accepted, then the assumed relationship in the preliminary survey should be reversed, and the relationship in the final survey should take cognizance of a time lag between investment and sales.

The third weakness is the problem of new establishments. In the preliminary survey, data for new establishments are not included in the "blow-up", but are added onto the derived estimates as a separate item; in the final survey, these are included in the "blow-up" (the greater the capital outlay of the new establishment, the greater will be the amplification of the derived estimates). The net result would be a higher estimate for the final than for the preliminary.

The current sales-ratio technique leaves much to be desired. A constructive step would be to abandon sales-ratio and to introduce a matching "blow-up" technique to provide linkage between different periods. Matching can be obtained in either an investment-ratio technique or an investment-difference "blow-up" technique.

The investment-ratio technique involves the use of three variables - the total investment for the base year, the investment of reporting establishments for the base year, and the investment of reporting establishments for the current year. The "blow-up" factor can be derived in two ways:

1. as the percentage increase or decrease in the investment of reporting establishments in the two years, i.e.,

$$\text{"Blow-up" factor} = \frac{\text{Reported investment in current year}}{\text{Reported investment in base year}}$$

2. as the percentage of total investment to the investment of reporting establishments in the base year, i.e.,

$$\text{"Blow-up" factor} = \frac{\text{Total investment in base year}}{\text{Reported investment in base year}}$$

To arrive at an estimate of the universe for the current year, the "blow-up" factor is applied to the total investment for the base year in the first approach, and to the reported investment for the current year in the second approach. Thus, if

Total investment for the base year = \$1,500

Reported investment for the base year = \$1,000

Reported investment for the current year = \$1,200

Then, under the first approach

$$\frac{\text{Reported investment in current year}}{\text{Reported investment in base year}} = \frac{1200}{1000}$$

"Blow-up" factor = 1.2

Total investment for the current year = 1500 x 1.2

= \$18,000

Under the second approach

$$\frac{\text{Total investment in base year}}{\text{Reported investment in base year}} = \frac{1500}{1000}$$

"Blow-up" factor = 1.5

Total investment for the current year = 1200 x 1.5

= \$18,000

The accuracy of the two approaches rests on the validity of an underlying assumption: the ratio of investment in a given year to the preceding year is the same for non-reporting as for reporting establishments. This assumption is workable so long as the survey sample is the same for both years and adjustments are made with regard to new establishments and establishments which have gone out of existence.

The investment-difference "blow-up" technique also involves the use of three variables - the percentage share of sales of reporting establishments, the investment of reporting establishments for the base year, and the investment of reporting establishments for the current year. The investment-difference "blow-up" is derived from the division of the percentage share of sales into the absolute change in the investment of reporting establishments. The derived figure is added to or subtracted from the reported investment for the current year, depending on whether the change is positive or negative, to yield the total investment for the current year. Thus, if

Share of the sales of reporting establishments = 80%

Reported investment for the base year = $1,000

Reported investment for the current year = $1,200

Then,

$$\frac{\text{Absolute change in the investment of reporting establishments}}{\text{Percentage share of the sales of reporting establishments}} = \frac{200}{.80}$$

Investment-difference "blow-up" = $250

Total investment for the current year = $1200 + $250

= $1450

As in the investment-ratio technique, the accuracy of the investment-difference "blow-up" technique is based on the validity of its underlying assumption: in this case, the direction of the absolute change in the investment of non-reporting establishments is the same as the direction of change reported, and that the amount of the change in the investment of the non-reporting groups varies directly with their proportion of total sales.

The accuracy of the matching "blow-up" techniques can be strengthened, and hence the estimates improved, if the sample is stratified. The current practice of surveying a biased sample of establishments with a G.V.P. of $200,000 and above and omitting those with lesser G.V.P. has been examined by Holmes and proven less accurate than a stratified sample.[2]

In a sample study of the effect of stratification, Holmes arrives at some worthwhile conclusions:[3]

1. "Blow-ups" without stratification may either overestimate or underestimate the investment of the smallest class.
2. Stratification results in considerably different estimates for classes other than the smallest.

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[2]Richard A. Holmes: The Canadian Survey of Manufacturers' Investment, A Statistical Study. Doctoral Dissertation, Indiana University, August, 1960.

[3]Ibid, P. 27-40.

3. Stratification increases the precision of the investment-ratio and the sales-ratio estimates in the majority of cases.

Holmes, however, does not go beyond proving the desirability of stratification. The essence of stratification is greater accuracy with minimum additional expenses. A stratified sample must consider some establishments with a G.V.P. less than $200,000, but not necessarily all establishments with a G.V.P. more than $200,000. A suggested stratified sample could be as follows:

(a) establishments with a G.V.P. less than $200,000 — 20%

(b) establishments with a G.V.P. between $200,000 and $1,000,000 — 50%

(c) establishments with a G.V.P. more than $1,000,000 — 100%

The suggested figures are arbitrary and could be revised through time with accumulated experience. The increased expenses necessary for a 20% sample of establishments with a G.V.P. less than $200,000 is in some measure offset by reduced expenses on a 50% (currently 100%) sample of establishments with a G.V.P. between $200,000 and $1,000,000. The reduction of structure details and the elimination of the repair estimates from the intentions and the preliminary survey questionnaire forms, as suggested in the preceding chapter, should release manpower, resources and time for any additional work required for stratification.

The Valuational Adjustment Technique

The measurement of the inventory component of capital formation relies on a different technique of estimation. Inventory data

obtained from various reports through the supply or survey methods[4] do not conform to the conceptual meaning of capital formation as the increases in the flow of physical assets valued at current prices. Inventory data as obtained are book-valued and reflect price changes.[5] The technique that is currently used to effect such an adjustment is the valuational adjustment technique.

Accounting methods of inventory valuation differ for different establishments. The first-in-first-out (FIFO) method could result in a change in valuation with no change in the number of physical units. The last-in-first-out (LIFO) method is consistent with the conceptual meaning of capital formation so long as stocks are increasing. However, this method is unacceptable for taxation

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[4]For the period 1944-48, data were derived from the investment survey capital schedules. For the earlier years, the Census provided the necessary data. For later and current years, the various divisional sections of the D.B.S. are responsible for the collection of inventory data.

[5]The difference between the inventory data as per reports and the inventory data as per National Accounts is essentially due to the fact that in the former, inventory withdrawals are at original cost, while in the latter, they are at current prices. In a period of a rise (fall) in price, book values as per reports would be higher (lower) than the inventory valuer as per National Accounts, even if there is no physical change. Thus, if we assume that original cost is $2.00 and current price is $3.00, the following computation illustrates the "fictitious" increase in inventory value:

	No.of Units	As per reports	As per National Accounts
1. Beginning inventory	10	$ 20	$ 20
2. Add: Purchases	+10	+30	+30
3. Deduct: Withdrawals	-10	-20	-30
4. Ending inventory	10	30	20
5. Change in inventory	0	10	0

purposes in Canada.[6] The average cost method strikes as a medium between the FIFO and LIFO methods and, as such, adjustment in valuation is necessary. The lower of cost or market method is conservative and need not reflect the physical change in inventory valued at current prices.

The valuational adjustment technique involves six distinct steps. These are:

1. Book-value information as per reported inventory data.
2. Determination of a deflator price index.
3. Computation of a constant dollar book value.
4. Computation of the year to year change in constant dollar book value.
5. Determination of a revaluer price index.
6. Computation of the value of physical change in current dollars.

The two crucial steps in the technique are the determination of a deflator and a revaluer price index. The purpose of the deflator is to convert the current dollar book value of inventories to a constant dollar book value. The purposes of the revaluer is to revalue the physical change in inventory in current dollars.

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[6]The objection in disallowing LIFO is that in rising prices there will be a deferment of the incidences of taxes until some future years and that there may even be an over-all saving in taxes if the income tax rates themselves are expected to go down in periods of price declines. The decision of the Canadian Income Tax Department to disallow LIFO stems from the judgment of the Privy Council against Anaconda American Brass Limited, which held that LIFO was not appropriate in arriving at taxable income under the former tax legislation, the Income War Tax Act.

The deflator involves the selection of appropriate price indices in accordance with the commodity content of the inventory. For instance, for manufacturing and wholesale inventory, component parts of the wholesale price index compiled by the Labour and Price division of the D.B.S. are widely used. The selected price indices are considered in the light of the age of stocks, the turnover period and the accounting methods adopted by the establishment.

In general, the deflator price index is an average of prices over several months, depending in part on the turnover period[7] and in part on the accounting methods used. For inventories valued on a FIFO basis, the turnover period is directly appropriate as the relative period for deflation. For inventories valued on a non-FIFO basis, some lengthening of the period over which prices are to be averaged is appropriate as prices in prior periods will continue to have an effect on the book value of the current period.

The deflator prices index divided into the current dollar book value of inventories will provide the constant dollar book value of inventories. The change in the constant dollar book value is, in effect a measure of the physical change of inventories for the

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[7]The turnover period, generally is calculated by dividing the year-end book value of inventories by the cost of goods purchased for raw material inventories, and by sales of the period for finished goods and trade inventories, and multiplying this rate by 12 to express it in months. The relevant data for these calculations for the most part, are available in census of industry reports or from estimates prepared from sample surveys. There are certain shortcomings in this procedure which result principally from statistical inadequacies, but experimentation indicates that in most circumstances, fairly large modification in the period would not greatly affect the results.

period. To value this physical change in current dollars requires the use of the revaluer price index.

The revaluer is based on the average prices for the current period. It adopts the same price index used for the deflator, but on a current annual or current quarterly average basis, rather than a monthly or a turnover period basis.

The inventory valuational technique can be illustrated in the following computation (figures quoted are hypothetical).

	Constant dollar book value as per year n-1	$150
1.	Book value of inventory as per reported data	200
2.	Deflator price index 1.2	
3.	Constant dollar book value as per year n (200 ÷ 1.2)	167
4.	Year to year change in constant dollar book value	17
5.	Revaluer price index 1.15	
6.	Value of physical change in current dollars (17 x 1.15)	19.55

The six-steps procedure in arriving at a capital formation valuation of inventory is based on generalizations as to the turnover period, the accounting methods of valuation used and the price indices deemed appropriate. While it is recognized that this procedure is workable, it is not exactly accurate. Assuming the validity of the generalizations, there is still one glaring defect in the procedure. Inventory data are collected, analyzed and classified on an <u>industry basis</u>, while the price indices adopted for the deflator and the revaluer are on a <u>commodity basis</u>. For instance, inventory estimates of the chemical industry are prepared by the Inventories Section of the Industry and Merchandizing Division of the D.B.S., while the

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deflator and the revaluer are based on the commodity wholesale price indices compiled by the Labour and Prices Division of the D.B.S.

The inconsistency of the approach and the incompatibility of the industry estimates and the commodity price indices could have contributed to the wider margin of errors in the estimates of the inventory component of capital formation.[8] In view of this, an improvement in the valuational technique would be the adoption of a common basis for both the book value estimates of inventory and the price indices applied in deflation and revaluation. A common commodity basis would entail tremendous clerical work and revisions of existing procedures of collection and classification. A common industry basis is less revolutionary, less laborious and permits the continuance of an already established industrial classification.[9] If the common industry basis is accepted, the commodity price indices have to be rejected and industry price indices substituted instead.

"HISTORICAL" TECHNIQUES

The techniques of "blow-up" and valuational adjustment are appropriate in the estimation of current capital formation, insofar

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[8] "The estimates of the value of physical change in inventories are subject to a relatively wider margin of error than most of the other National Accounts aggregates" - National Accounts, Income and Expenditure, 1926-1956, D.B.S., p.169.

[9] The Standard Industrial Classification Manual, D.B.S., 1960, classifies establishments to industry classes on the basis of their principal activities. The classification scheme consists of 12 divisions which include all branches of economic activity.

as base data are available. These techniques are, however, inappropriate in the estimation of historical capital formation, without adequate base data. Reliance must be placed extensively on indirect techniques of estimation. These can be identified as the bench-mark technique, and the techniques of interpolation and extrapolation.

The Bench-Mark Technique

The bench-mark is used when there is an availability of adequate base data for a particular time period, but when there is a non-availability of adequate base data for other time periods. This bench-mark period is used as a reference point from which estimates of capital formation could be derived for the other time periods.

An excellent example of the application of the technique is Buckley's estimation of the construction component of capital formation for the period 1896 - 1930.[10] The bench-mark was 1921 wherein adequate base data were available from the Decennial Census and the Construction Census. Several steps were involved in the estimation. Given information as to the value of construction for 1921 and a breakdown of such information into value elements (materials, labour, overhead and profits), the estimation of the value of construction for the rest of the period was determined as follows:

1. The estimation of the annual value of construction material for the period under study.
2. The estimation of the annual total value of construction for the period.

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[10] Kenneth Buckley, op. cit., p. 73-77.

The estimation of the annual value of construction material was derived in two stages:

1. The computation of an index of the annual flow of construction material from absolute data collected by the supply method.
2. The application of the computed index to the value of material used in the bench-mark year to provide estimates of the value of construction material for each year.

The estimation of the annual total value of construction was also derived in two stages:

1. The determination of the relationships between the material, labour, overhead and profit elements of the total value of construction, and the computation of ratios of these relationships.

2. The application of the computed ratios to the value of construction material used each year to arrive at the estimate of the total value of construction for each year.

A very simple computation based on hypothetical figures should serve to illustrate the steps in the procedure as outlined.[11]

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[11] This illustration is extremely simple and does not take into consideration the refinements as used by Buckley, e.g., the differences in the price movements of material costs and labour costs.

Value of total construction as per bench-mark year		$100
Flow of construction materials at producers' prices:		
as per bench-mark year		30
as per "unknown" year		35
Index of flow of construction material	(35 ÷ 30)	1.16
Value of construction material as used in construction:		
as per bench-mark year		40
as per "unknown" year	(40 x 1.16)	46.4
Material component of total construction		
as per bench-mark year	(100 x 0.40)	40%
Value of total construction		
as per "unknown" year	(46.4 ÷ 0.40)	116

The accuracy of the outlined application of the bench-mark technique rests strongly on the accuracy of the bench-mark estimate and the interrelationships of the elements that go to make up the estimate. The derived estimates under such a technique can, at best, be only an approximation, for even if the bench-mark estimate is accurate, the interrelationships of the elements are liable to vary through time.

Interpolation

Interpolation refers to the determination of a series of intermediate terms, given known terms for different time periods. It differs from the bench-mark technique, insofar as two points of reference are available, one at the beginning of the period, the

other at the end of the period. Interpolation is a simple statistical technique which provides only a rough and ready measure of capital formation.

While interpolation has been frequently used in Canada, it is not merely a technique of simple proration between the two points of reference. The technique is best illustrated in Buckley's estimation of the machinery and equipment component of capital formation for the period 1902 - 1910.[12] In this instance, three reference points were available, 1900, 1905 and 1910, the estimates being derived from the quinquennial Census of manufacturing. Interpolation was used to determine the intermediate terms (1901-1909) between reference points 1905 and 1910.

The basis for interpolation was the annual estimates derived from the annual Ontario Census of production. The variations in these estimates were assumed to be representative of the variations in the national estimates. Thus, in the estimation of agricultural implements, chain indices of the Ontario estimates were spliced to the national three-points indices to provide the indices used for interpolation. The computations were as follows:

YEAR	CHAIN INDICES FOR ONTARIO	INDICES OF NATIONAL PRODUCTION	INDICES USED
1900	100.0	100.0	100.0
1901	121.7	-	116.6
1902	144.8	-	134.6
1903	158.0	-	142.7
1904	161.0	-	140.6
1905	156.0	130.5	130.5

[12] Ibid, p.97-98

YEAR	CHAIN INDICES FOR ONTARIO	INDICES OF NATIONAL PRODUCTION	INDICES USED
1905	100.0	100.0	100.0
1906	108.4	-	108.4
1907	111.4	-	111.4
1908	113.7	-	113.7
1909	156.9	-	156.9
1910	165.7	165.8	165.8

The figures indicate a bias in the Ontario indices for 1900-1905, and an exceptionally close agreement between the Ontario indices and the national indices for 1905-1910. For the first period, the bias was prorated evenly and eliminated for each year in the period. For the second period, there was no necessity to eliminate any bias, and the Ontario indices were accepted as representative variations in the national estimates, without necessary adjustments.

Given a set of indices as the basis for interpolation, the derivation of the estimates was a case of simple multiplication. The computations were as follows:

YEAR	NATIONAL PRODUCTION PER CENSUS ($,000,000)	INDICES	DERIVED ESTIMATE ($,000,000)
1900	10	-	-
1901	-	116.6	12
1902	-	134.6	14
1903	-	142.7	14
1904	-	140.6	14
1905	13	-	-
1906	-	108.4	14
1907	-	111.4	15
1908	-	113.7	15
1909	-	156.9	20
1910	21	-	-

The accuracy of estimates derived from interpolation depends essentially on the accuracy of the correlated estimates, used as

the basis for interpolation, to reflect the trend and movement for the universe. In the example cited, the correlated estimates of the Ontario Census would prove to be more accurate for the second period (1905 - 1910) than for the first period (1900 - 1905), as indicators of the trend and movement for the universe.

Extrapolation

Extrapolation refers to the determination from a series of known terms, a series of unknown terms which lie outside the range of the known terms. It differs from the bench-mark technique, insofar as it involves a series of reference points; it differs from interpolation, insofar as the reference points all lie on one end of the period under study.

Extrapolation is a simple statistical technique of predominant use in forecasting. While simple projection is often used for extrapolating into the future, historical "unknowns" are derived by less crude means. An example to cite is the determination of the level of municipal investment for the period 1926 - 1932, in P.I.C.F.[13] Estimates for subsequent years were available.

As with interpolation, the basis for extrapolation was the application of a known correlated series to reflect the trend and movement of capital formation. In this case, municipal bond issue

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[13]Dominion-Provincial Conference on Reconstruction, op. cit., p.117.

was used as the basis for extrapolation.[14] First, the trend of municipal bond issues was determined. Second, the relationship between municipal bond issues and municipal investment was determined for the "known" years. Third, the determined relationship was aligned with the trend of municipal bond issues to provide extrapolated estimates of municipal investment for the preceding "unknown" years (1926 - 1932)

Extrapolation is only a rough and ready technique in estimating capital formation, the accuracy of which depends essentially on the accuracy of the correlated estimate to reflect the trend and movement of capital formation. In the example cited, the accuracy of municipal bond issues to reflect municipal investment is, however, questionable as

1. municipal investments could be financed from sources of funds other than bond issues, with varying proportions.
2. bonds could be issued for purposes of re-funding. In 1932, substantial accounts of bonds were issued for such purposes.
3. bonds could be issued before, after or simultaneously with investment. While it is expected, on a priori grounds, for investment to proceed after the receipt

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[14]Municipal bond issues of 27 major cities (cities with population of 30,000 and over) were obtained from "The Financial Post, Record of Prospectuses", published by the MacLean Publishing Co., Toronto.

of funds from a prior issue of bonds, it is also possible for investment to precede bond issues. A case of the latter is in the municipal investment of 1924 which was partly covered by bonds issued in 1929.

CHAPTER VI

TECHNIQUES OF CLASSIFICATION

The final stage in the measurement of capital formation is the classification of the estimates. The techniques of classification in Canada range from the simple consolidated estimates as presented in the National Accounts to the elaborate disaggregated sector by sector, industry by industry breakdowns as presented in "Private and Public Investment in Canada" (P.P.I.). As in the study of the techniques of collection and estimation, the two broad categories - current and historical techniques - shall be adopted for this study.

CURRENT TECHNIQUES

There are two current techniques of classification used in Canada. The first technique is that adopted by "Private and Public Investment in Canada". This is the end-user technique which attempts to classify capital formation estimates at the user or demand level. The second technique is that adopted by "National Accounts, Income and Expenditure". This is the National Accounts technique which attempts to classify capital formation estimates as a component of a bigger study of national income and expenditure.

The End-User Technique

The end-user is a classification technique which presents capital formation estimates according to the sector, industry or institution in which capital formation took place. It is essentially an industrial

classification technique as it is based on "The Standard Industrial Classification".[1]

The end-user technique has been in vogue since the advent of the capital expenditure surveys which makes possible these industrial breakdowns. These surveys are industry orientated in that the unit adopted is the establishment which is statistically defined as "the smallest unit which is a separate operating entity capable of reporting all elements of basic industrial statistics."[2] An industry is conceived as composing of all the establishments engaged in the same or similar kind of economic activity.[3]

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[1] The Standard Industrial Classificational Manual, D.B.S. 1960, is essentially composed of 12 divisions which are broken down into industrial groupings, e.g. manufacturing (Division 5) is broken down into 20 industrial groupings. These industrial groupings are broken down into industrial classes, e.g. the paper industry (Group 10 in manufacturing) has 4 industrial classes. The final breakdown is into industrial products, e.g. paper box and bag manufacture (Class 3 in the paper industry) is broken down into 3 product groups.

The P.P.I. adopts the basic structure as outlined in the manual. The 12 divisions and the industrial groupings as per manufacture (Division 5) are used. There are no further breakdowns of these industrial groupings. There is some modification in the breakdowns of the other divisions.

[2] D.B.S., The Standard Industrial Classificational Manual, 1960, page 8.

[3] This poses no problem if establishments are engaged in only one kind of economic activity. However, in practice, some establishments engage in more than one economic activity. In such cases, the principal activity is deemed the activity it engages in. The criterion in judging the principal activity rests in the greater of the net values added by the different industrial activities. The weakness in this approach is that it is inconsistent with the "gross revenue obtained" basis applied to the case of establishments having activities confined to one particular division of the classification.

The end-user technique as currently used distinguishes between twelve divisions which are themselves subject to subdivisions. Manufacturing is the most significant division wherein nineteen industrial groupings are recognized. Schedule I illustrates the extent and degree of the industrial breakdown.

SCHEDULE I

END-USER CLASSIFICATION AS USED IN "PRIVATE AND PUBLIC INVESTMENT"

1. Agriculture and Fishing
2. Forestry
3. Mining, Quarrying and Oil Wells
4. Manufacturing
    - Food and Beverages
    - Tobacco Products
    - Rubber
    - Leather
    - Textile
    - Clothing and Knitting Mills
    - Wood
    - Furniture and Fixtures
    - Paper and Allied Industries
    - Printing, Publishing and Allied Industries
    - Primary Metal

- Metal Fabricating
- Machinery
- Transportation Equipment
- Electrical Products
- Non-metallic Mineral Products
- Petroleum and Coal Products
- Chemical and Chemical Products
- Miscellaneous

5. Utilities
   - Electrical Power
   - Gas Distribution
   - Railway Transportation
   - Urban Transit Systems
   - Water Transport and Services
   - Motor Transport
   - Grain Elevators
   - Telephone
   - Broadcasting
   - Water Systems
   - Other Utilities
6. Construction Industry
7. Housing
8. Trade
   - Wholesale
   - Chain Stores

Independent Stores

Department Stores

Automotive Trade

9. Finance

Banks

Insurance, Trust and Loan Companies

Other Financial Companies

10. Commercial Services

Laundries and Dry Cleaning

Theatres

Hotels

Other Commercial Services

11. Institutional Services

Churches

Universities

Schools

Hospitals

Other Institutional Services

12. Government Departments

13. Total

The measurement of capital formation provides government and business an indication of the size, variability and direction of the demand for capital goods. Governmental interest in capital formation estimates arises primarily because the government faces a number of specific problems which require the formulation of positive and related policies. Business interest in capital formation estimates arises primarily because business is making its own commodity-market analyses and general economic appraisals, and capital formation estimates provide some of the information required for intelligent planning of business operations.

However, the degree of the usefulness of capital formation estimates to either the government or business depends, in part, on how these estimates are presented. Obviously, a lump sum estimate would be of less significance to government or business than a deconsolidated presentation. The end-user technique of classification presents deconsolidated capital formation estimates according to the source of demand. This is specific significance to both the government and business. The government is able to direct its policies at particular sectors or industries to effect a desired national objective. Business is able to plan its operation more objectively. Greater objectivity is rendered possible as the sector and industrial breakdowns provide a ready-made market appraisal of the dimensions and composition of demand for capital goods, an indication of the rate of capital expansion that has taken place or is taking place for the country, sector or industry, and an aid in appraising the general economic position as well as the specific industry.

The usefulness of this end-user technique of classification as currently used is undeniably immense. The sector, industrial and institutional breakdowns provide an indication of the source of demand for capital assets. But within each sector, industry or institution is a whole gamut of establishments which only common denominator is the economic activity pursued. One obvious source of differentiation is the size of the establishments. Size plays a distinct role in the magnitude of capital investment, but what is more significant is that it does affect the accuracy with which investment is anticipated.

The current estimates of investment intentions do not provide for a breakdown according to size of establishment. The estimate as presented is a lump sum figure for the particular industry and, as such, conceals the varying degrees of accuracy that could be expected from establishments of different sizes. In two studies of the deviations of actual from anticipated expenditures for capital assets, the following conclusions have been drawn[4]:

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[4] Irwin Friend and Jean Bronfenbrenner, "Plant and Equipment Programs and Their Realization: Short-Term Economic Forecasting, Studies in Income and Wealth, Volume 17, National Bureau of Economic Research, Princeton University Press, 1955, pp. 53 - 111.

O. J. Firestone, "Investment Forecasting in Canada", Ibid., pp. 113 - 259.

1. Larger-sized establishments are considerably more accurate in their anticipations than smaller-sized establishments.[5]
2. The extent to which anticipating data represent an improvement over projection based on past outlays is more significant for larger-sized establishments than smaller-sized establishments.

Estimates of investment intentions have displayed varying deviations from actual for different industries. But in one of the studies it was found that there was no evidence that industry characteristics (within the manufacturing sector) were associated with differences in the accuracy with which expenditures were anticipated.[6] The varying deviations in different industries were attributed to the differences in the sizes of establishments of different industries.

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[5] Among the reasons for the greater accuracy of larger-sized establishments given by Irwin Friend, Jean Bronfenbrenner and O. J. Firestone are:

1. Expenditure plans of larger-sized establishments usually involve a number of separate projects. The extent that these discrepancies between expenditures and anticipations for these individual projects are random in nature, there will already be cancellation of positive against negative discrepancies within the establishment.
2. Larger-sized firms make blanket allowances in their reports for contingency expenditures; smaller-sized establishments usually do not attempt to make such allowances.
3. The decision-making process in larger-sized establishments is more formalized, and plans are more rigidly adhered to than in smaller-sized establishments.

[6] Irwin Friend and Jean Bronfenbrenner, op. cit., p. 74.

Considering the significance of size on the accuracy of estimates, the industrial classification structure as per P.P.I. is somewhat inadequate in the omission of size characteristics. If, therefore, size could be introduced into the classification, the value of the estimates as so classified would be greatly enhanced. The increased benefits could be derived in two ways.

First, the additional classificatory subdivision would provide government and business an insight into the capital formation of different sized establishments. Government policy formulation can be directed at specific sized establishments if and when the need arises. Business policy can be formed on a more comparable and useful basis. For instance, business can use the rate of capital expansion of a particular sized industrial group as the standard, which is more meaningful, rather than the overall industrial standard.

Second, the breakdown according to size of establishments would provide the reviewer an indication of the reliability of the investment forecasts of particular sized groups. Such an indication can be included in P.P.I. by notation or by a separate table.[7]

While the increased value of an end-user classification that includes a breakdown according to the size of establishments is recognized, the difficulty posed is the time and effort required in

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[7] The P.P.I. publications do provide a separate table for comparing anticipation with actual on an industry basis. The figures for comparison are in absolute terms. What is suggested here is a revision of the table to permit comparison of anticipation with actual on an establishment size basis. The average of past deviation of anticipation from actual for different size groups expressed in percentage terms can also be included.

the preparation of such a classificatory breakdown. Following from the earlier chapters, a plan was envisaged for the simplification of questionnaire forms which would release the necessary manpower for stratification of the sample survey. The stratification was conceived in terms of the size of establishments according to G.V.P. If, therefore, the stratified-sized groups are carried forward into the classificatory-sized groups, the additional work required would be considerably reduced. For a start, the classificatory breakdown according to size can be introduced into certain more important industries. With accumulated experience, such a classificatory breakdown can be eventually introduced into all the activities covered by the survey.

A suggested classificatory breakdown according to size can be illustrated.

4. Manufacturing

Paper and Allied Products

Large establishments[1]

Medium establishments[2]

Small establishments[3]

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1. G.V.P. more than $1,000,000
2. G.V.P. between $200,000 and $1,000,000
3. G.V.P. less than $200,000

The National Accounts Technique

The National Accounts technique presents capital formation data in a very much consolidated form, such data being only a component of

a bigger study of national income and expenditure.

The National Accounts in Canada consist of six published accounts. These are:

1. the personal income and expenditure account which shows the distribution of earnings, transfer payments and expenditures for the personal sector.
2. the government revenue and expenditure account which shows the distribution of revenue, transfer payments and expenditures for the government sector.
3. the non-resident revenue and expenditure account which shows the distribution of receipts and payments for the non-resident sector as a result of exports and imports.
4. the business operating account which is a product account which summarizes the transactions of the business sector. While all transactions in intermediate goods and services are omitted, all returns to factors of production are explicitly shown.
5. the investment income appropriation account which shows the sources and dispositions of investment income for the whole economy.
6. the consolidated national savings account which shows the sources and disposition of savings for all sectors of the economy. This account measures gross fixed capital formation for the private sectors as well as changes in inventory.

The capital formation component of the National Accounts is represented in the consolidated national savings account. The net balance of savings as derived from the various income and expenditure accounts is carried forward as a source of the savings of the consolidated national savings account. The disposition of the savings are channelled into capital formation with respect to gross fixed capital formation and inventories.

SCHEDULE II

CLASSIFICATION AS USED IN THE

NATIONAL SAVINGS ACCOUNT (DISPOSITION)

Business gross fixed capital formation

(a) New residential construction

(b) New non-residential construction

(c) New machinery and equipment

Value of physical change in inventories

Surplus (+) or deficit (-) on current account with non-residents

Residual error of estimate.

Schedule II shows the classification as used in the consolidated national savings account (disposition). It indicates that only estimates of private gross fixed capital formation and inventory are presented; estimates of public gross fixed capital formation are omitted.[8] In the Canadian

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[8]The omission of public gross capital formation inevitably results in differences between the National Accounts and P.P.I. in the total estimate of gross fixed capital formation. A reconciliation statement is included in both publications to account for the difference. The reconciliation shown in the National Accounts is as follows:

1. Total private and public investment in Canada as per P.P.I.
2. Deduct: New residential construction by governments
3. New non-residential construction by governments
4. New machinery and equipment outlays by governments
5. Business gross fixed capital formation as per National Accounts.

National Accounts, public gross capital fixed formation is included in the government revenue and expenditure account. This is tantamount to treating government capital formation as current expenditure where, in fact, the proper and consistent treatment would be for its inclusion in the consolidated national savings account.

An improvement in the classification of capital formation data would be the separation of governmental expenditure into governmental current expenditure and government gross fixed capital formation. Only the former would be included in the government revenue and expenditure account; the latter would then be included in the consolidated national savings account. Such a breakdown is desirable for analytical purposes. To effect such a breakdown requires adjustments in the presentation of some of the accounts. The required adjustments are:

1. the government revenue and expenditure account would have to cater for only governmental expenditure on current goods and services. A savings offset by governmental gross fixed capital formation would have to be included as a result of the exclusion of governmental gross fixed capital formation expenditure.
2. the consolidated national savings account would include governmental gross fixed capital formation as an item in its disposition and the savings offset by governmental gross fixed capital formation as an item in its source.
3. the business operating account would have to break down its sales to government item into

   a. sales to government of current goods and services
   b. governmental gross fixed capital formation .

"HISTORICAL" TECHNIQUES

"Historical" techniques as used in this context refer to those techniques that were previously used to classify capital formation data, but which are no longer in current use. Two basic "historical" techniques can be discussed. These are:

1. the commodity-flow technique, which attempts to classify capital formation data at the supply level.
2. the National Transactions Accounts technique, which attempts to classify capital formation data in terms of sector aggregates.

The Commodity-Flow Technique

The commodity-flow technique refers to the classification of data according to the commodity component of capital formation. This technique is most amenable to the production or supply approach which collects capital formation data according to their commodity component.

The commodity-flow technique has been discontinued in Canada since the utilization of capital expenditure surveys to collect capital formation data and its replacement by the end-user technique.

The historical use of the commodity-flow technique and the refinements incorporated within it can best be illustrated by quoting actual classification structures as were used. Refinements in the technique are possible, insofar as details of the commodity components are available. Thus, Buckley's study of an earlier period shows evidence of less refinement, while P.I.C.F. shows evidence of greater refinement.

The commodity-flow technique and refinement therein can be illustrated in the following classification structures adopted by Buckley and P.I.C.F.

1. Illustration of technique with absence of classificatory breakdowns of commodity components.

CLASSIFICATION OF ANNUAL ESTIMATES OF TOTAL NEW AND REPAIR CONSTRUCTION 1896-1930

YEAR	TOTAL CONSTRUCTION ($m.)
1896	78
1897	67
----	--
1929	1046
1930	928

Source:

Buckley, op. cit., p. 128

2. Illustration of technique with classificatory breakdowns according to the types of commodity component.

CLASSIFICATION OF MACHINERY AND EQUIPMENT

Farm machinery and equipment

Mining and oil well machinery and equipment

Electrical machinery and equipment

Industrial machinery and equipment

Locomotives and railway cars

Vehicles and aircraft

Ships and boats

Office and store machinery and equipment

Professional and scientific equipment

Carpenters' and mechanics' tools

Durable containers

Miscellaneous durable equipment

Sources:

Buckley, op. cit., p. 90.
P.I.C.F., p. 40-43.

3. Illustration of technique with classificatory breakdowns according to no distinct criterion.

CLASSIFICATION OF INVENTORIES

a. Farm inventories
   (1) Livestock on farms
   (2) Grain on farms
b. Grain in commercial channels
c. Business inventories
   (1) Manufacturing
   (2) Wholesaling
   (3) Retailing
   (4) Miscellaneous

Sources:

Buckley, op. cit., p. 103
P.I.C.F., p. 44-45

While the commodity-flow technique is simple, its application suffers from two drawbacks. These are:

1. the inability to obtain industrial breakdowns. Capital formation data as presented by the technique cannot trace the industries in which capital formation takes place.
2. the greater degree of inaccuracy in the final estimates vis-a-vis those of the end-user technique.

The first drawback is essentially one arising from the different approaches used in collecting capital formation data. While the capital expenditure survey approach makes possible an industrial classification, the production or supply approach cannot provide such a classification as data are primarily obtained through national statistics.

The second drawback arises because of

1. the lack of adequate data to allow for annual inventory change in commodity-flow. This results in an upward bias in periods of rising economic activity as a build-up of inventory becomes necessary to cater to expanding business, and a downward bias in periods of declining economic activity as output declines so as to reduce inventory holdings.
2. the inability to determine with assurance the end-use of many of the commodity-flows. A commodity item can be used for the production of consumer goods rather than producer goods.[9]

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[9] For instance, electrical motors form an important part of many household appliances, e.g. refrigerator and air conditioner.

3. the inadequacy of the commodity data to allow a satisfactory distinction between new investment and repair and maintenance expenditures.[10]

The National Transactions Accounts Technique

The National Transactions Accounts is a recent development in Canada in response to the money flow type of accounts as developed by Copeland and the Federal Reserve Board for the United States.[11] However, while the National Transactions Accounts is a response to the money flow accounts, they differ from them and have more in common with the already established National Accounts. Their purpose is to complement rather than compete with the National Accounts. The

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[10] The breakdown of new investment and repair and maintenance expenditures is carried out in P.I.C.F. by the assumption of a constant ratio between the two items. For instance, the ratio is 70.4% for new construction and 29.6% for repair and maintenance of existing construction.

[11] M.A. Copeland. A Study of Moneyflows in the United States. National Bureau of Economic Research, 1952.

M.A. Copeland, "The Feasibility of a Standard Comprehensive System of Social Accounts", National Bureau of Economic Research, Problems in the International Comparison of Economic Accounts. Conference on Research in Income and Wealth, October 1954 (Studies in Income and Wealth, Vol. 20), 1957.

M.A. Copeland. Flow of Funds in the United States 1939-1953, Board of Governors of the Federal Reserve System, December 1955.

For a discussion of the National Transaction Accounts, see L.M. Read, "Development of National Transactions Accounts - Canadian Journal of Economics and Political Science, February 1957.

S.J. Handfield-Jones, "The National Transactions Accounts", Proceedings of the Business and Economic Statistics Section, Papers presented at the 115th (New York, 1955) and 116th (Detroit, 1956) annual meetings, American Statistics Association, Part 1, 1956.

L.M. Read, S.J. Handfield-Jones and F.W. Emerson, "The National Transactions Accounts for Canada, 1946-1954", in William C. Hood, Financing of Economic Activity in Canada, Royal Commission on Canada's Economic Prospects, July 1958, p. 461 ff.

National Transactions Accounts was only a short-lived experiment and its application was only to the period 1946-1954.[12]

The National Transactions Accounts distinguish between eleven sectors of economic activity and four categories of economic transactions. The eleven sectors are consumers, unincorporated business, non-financial corporations, government enterprises, banking, life insurance, other finance, federal government, provincial governments, municipal governments, and rest of the world. The four categories are the Current Transactions Account, the Investment Transactions Account, the Financial Transactions Account, and other transactions and errors.

The National Transactions Accounts make use of a double-entry system. In the Current and Investment Transactions Accounts, purchases or values taken are recorded as debits for the sectors making the purchases, and sales on value given are recorded as credits for the sectors making the sales. In the Financial Transactions Accounts, an increase in financial assets is recorded as a positive debit for the sector having the increase, and a decrease in financial assets is recorded as a negative debit for the sector having the decrease.

The double-entry system of accounts permits a balance in the category and sector accounts. In the Current Transactions Account, the excess of credits over debits is gross savings which represents the amount of current savings available for investment. The gross savings are recorded as a balancing debit entry in the Current Transactions Account and an offsetting credit entry in the Investment

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[12] L.M. Read, et. al., "The National Transactions Accounts for Canada, 1946-1954" ibid.

Transactions Account. In the Investment Transactions Account, the excess of sector credits over sector debits is sector financial savings. The sector financial savings are recorded as a balancing positive or negative debit entry in the Investment Transactions Account and an offsetting credit entry in the Financial Transactions Account. The financial savings of a sector represent the net amount borrowed from or loaned out to other sectors. A positive entry represents the net amount which the sector has available out of its current savings for lending to other sectors; a negative entry represents the net amount of investment funds which the sector has had to obtain or withdraw from other sectors.

The capital formation component of the National Transactions Accounts is the Investment Transactions Account which is the equivalent of the Consolidated National Savings Account of the National Accounts. In both accounts, data on gross fixed capital formation and inventory are presented.

The classification as used in the National Transactions Accounts is an improvement over that of the National Accounts and promises great potential. The Investment Transactions satisfies the limitation of the Consolidated National Savings Account with respect to its inclusion of governmental gross fixed capital formation. The sectoral pattern of the National Transactions Accounts not only provides data on governmental gross fixed capital formation, but also provides a breakdown of such data into federal government capital formation, provincial government capital formation and municipal government

capital formation. Data on private gross fixed capital formation and inventories are also broken down into the various sectors of the National Transactions Accounts.

The novelty of the National Transactions Accounts lies not so much in the ability to classify capital formation data according to its various sectors, but in the ability to trace the flow of funds through the various financial intermediaries to finance capital formation. The flow of funds is traced in the Financial Transactions Account. A sector either invests its own savings in capital formation, borrows the savings of other sectors for capital formation, or lends its own savings for the capital formation of the borrowing sectors. The Financial Transactions Account, therefore, presents the net savings, borrowings and loans for each sector.

CHAPTER VII

CONCLUSION

This study has attempted to assemble, analyze and appraise the main techniques that have been used in Canada to collect, estimate and classify data on capital formation. It has also attempted to delineate the problems involved in the measurement of capital formation, and to offer suggestions for improvements in current techniques with respect to increased accuracy and value without too great incurrence of additional costs.

The measurement of capital formation can be conceived as a three-staged process, beginning with the collection of data, then the estimation of capital formation from the collected data, and finally the classification of the estimates of capital formation. The measurement of capital formation at any of these stages requires an artist's touch to a statistician's skill. The problems that confront the statistician are numerous and judgment plays an important role in the measurement. Solutions must be decided upon with respect to conceptual, valuational and statistical problems.

Capital formation is the increase in the flow of a nation's capital goods. This increase can be measured at the supply level, the demand level, or any intermediate level in the flow of capital goods. To avoid problems of duplication, the most appropriate measurement is at either the point of origin or the point of use.

The approach of this study has been a consideration of, first, current techniques and, second, "historical" techniques. The

current techniques (except for estimating inventory) are based on measurement at the point of use. The "historical" techniques are based mainly on measurement at the point of origin. Attention has been focussed primarily on the current techniques, while only a cursory examination of the "historical" techniques has been attempted.

CURRENT TECHNIQUES

The current techniques are those used by the Business Finance Division of the D.B.S. in measuring the construction, and machinery and equipment components of capital formation, and by the National Accounts and Balance of Payments Division of the D.B.S. in measuring the inventory component of capital formation. The former data are published in "Private and Public Investment", the latter data in "National Accounts, Income and Expenditure". The measurement of construction and machinery and equipment in the former is for actual as well as anticipated. The measurement of inventory in the latter is limited to actual.

As used in "Private and Public Investment" (P.P.I.)

The importance of capital formation data as per P.P.I. cannot be overemphasized. Series on actual and anticipated capital expenditures have been widely used in the analysis of economic trends and have become one of the best-known business barometers. Especially important are data on anticipated capital expenditures for they provide the basis on which government and business can arrive at intelligent economic decisions affecting the nation or the business

enterprise. Government can formulate policies towards desired national objectives; business can plan towards the goals of the enterprise.

Advance knowledge of the course and distribution of investment plans will be helpful if a choice has to be made between alternative policies. Such policies may be called for because a rise or a decline or a change in the composition of the investment plans which is not in consonance with national objectives appears in sight. For instance, a tight money policy was formulated in 1948 on the basis of data on anticipated capital expenditure. In the Bank of Canada Annual Report it was mentioned that

> "Early in 1948 it became apparent that business intended to make even larger capital expenditures. Accordingly, the bank in February 1948 suggested to the chartered banks that conditions prevailing at that time made it undesirable for capital expenditures to be financed through expansion of bank credit."[1]

Anticipated capital expenditure data can assist the businessman in planning the future course of business activity. There is every realization by businessmen of the close relationship between the success of the individual business enterprise and the general prosperity of the industry and country. Among other uses, anticipated capital expenditure data provide a market appraisal as to the dimensions and composition of demand for capital goods, help the businessman in planning his own investment programmes on the basis of industry

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[1]Annual Report of the Bank of Canada to the Minister of Finance for the year 1948 (February 11, 1949), p.7.

standards, and guide him in his appraisal of the general economic outlook as well as the specific commodity market in which he is interested.

In consideration of the importance of capital formation data to government and business, it is desirable that such data be accurate. The degree of accuracy that could be expected depends, in large measure, on the techniques used in their derivation. The techniques as used in P.P.I. have been analyzed in the preceding chapters.

The sample survey technique of data collection is suitable, but this technique makes it necessary for the application of an estimating technique to arrive at a figure for the universe. This is achieved by the use of the "blow-up" or inflation technique.

There are several methods of "blow-up". The current method is the sales ratio (total sales/reported sales) applied to reported investment, based on the assumption that the ratio to sales in a given year is the same for reporting as for non-reporting establishments. The defect in the application of this method as per P.P.I. is that sales of two different years are used to prepare preliminary and final actual estimates for one year. It is, therefore, suggested that the D.B.S. substitute a matching ratio for the present sales ratio so as to provide linkage between different periods. Two matching ratios have been suggested. The investment ratio is based on the assumption that the ratio of investment in a given year to

the preceding year is the same for non-reporting as for reporting establishments. Its computation is as follows:

either (i) $\frac{\text{Reported investment in current year}}{\text{Reported investment in base year}}$

applied to the total investment for the base year

or (ii) $\frac{\text{Total investment in base year}}{\text{Reported investment in base year}}$

applied to the reported investment for the current period.

The investment-difference "blow-up" is based on the assumption that the direction of the absolute changes in the investment of non-reporting establishments is the same as the direction of change reported, and that the amount of change in the investment of non-reporting groups varies directly with their proportion of total sales. Its computation is as follows:

$\frac{\text{Absolute change in the investment of reporting establishments}}{\text{Percentage share of the sales of reporting establishment}}$

added to or subtracted from the reported investment for the current year.

The next suggestion is that the D.B.S. substitute a stratified sample for the present biased sample so as to increase the accuracy of the estimates. The present sampling procedure is to solicit data from all establishments with a gross value of production (G.V.P.) over $200,000, to the exclusion of establishments with a lower G.V.P. The proposed stratification is as follows:

1.	establishments with a G.V.P. less than $200,000	20%
2.	establishments with a G.V.P. between $200,000 and $1,000,000	50%
3.	establishments with a G.V.P. greater than $1,000,000	100%

The proposed stratification takes into consideration establishments of different sizes. It is recognized that stratification would entail additional costs. In the light of this, the proposed stratification is so designed that only 50%, instead of the present 100% coverage of establishments with a G.V.P. between $200,000 and $1,000,000 is considered. The additional costs arising from the 20% coverage of establishments with a G.V.P. less than $200,000 is, thereby, offset in some measure by the reduction in costs resulting from the smaller coverage of establishments with a G.V.P. between $200,000 and $1,000,000.

In consideration of the likely overall increase in costs with stratification, it is suggested that two adjustments be made in the intentions and preliminary questionnaire forms which would allow a possible release of manpower and time for stratification work. These adjustments are, first, a simplification of the questionnaire forms, and second, the elimination of repair estimates from the questionnaire forms. It has been found that the tremendous increase in structure details through time as per questionnaire forms have not contributed to any significant improvement in the accuracy of

estimates. It has also been found that there is an extremely high degree of correlation between capital expenditures and repair expenditures, which provides justifiable grounds for the elimination of repair estimates from the questionnaire forms. Repair expenditures can be estimated indirectly by the application of a ratio factor.

In consideration of the importance of capital formation data to government and business, it is also desirable that such data be sufficiently detailed to permit economic analysis, discriminatory governmental policies and effective business planning. The present end-user technique of classification distinguishes capital formation as between different sectors, industries and institutions. This classification provides government a basis for the formulation of policies directed at the economy, sector, industry or a particular type of institution. It also provides business a basis for planning after a consideration of the investment p icture of the economy and the industry.

The present classification, however, does not distinguish capital formation as between different sizes of establishments. In Chapter VI it has been noted that the size factor is the critical factor affecting the accuracy of investment anticipations. In view of this and of the desirability for more detailed information, it is suggested that a classification according to size of establishment be incorporated into the present classification. Additional costs

can be kept at a minimum if the size subdivisions as per the proposed sample stratification is carried into the classification stage. In this more detailed classification, governmental policies can be more discriminating, and business planning can be more effective with a knowledge of the investment plans of specific markets and similar-sized competitors.

As used in "National Accounts, Income and Expenditure"

Capital formation data as presented in the National Accounts are actual estimates for the preceding year. The value of such data is essentially in their relationship to the overall pattern of national economic activity. Besides purposes of economic analysis, the data as presented are of very much less significance to government and business than those presented in P.P.I.

The data on gross fixed capital formation as presented in the National Accounts are obtained directly from P.P.I. Data on inventory are collected from the various divisions of the D.B.S., but these are processed before presentation in the National Accounts.

The current technique that is used in processing collected data on inventory is the valuational adjustment technique, which is an attempt at eliminating inventory increases or decreases arising from price changes, rather than from physical changes. This elimination is done by the use of first, a deflator price index to deflate current dollar book values as per reported data into constant dollar book values, and second, a revaluer price index to

revalue the change in constant dollar book values into current dollars.

The valuational adjustment technique is plausible, but its present application suffers from one defect. Inventory data are collected on an industry basis, but the price indices used in deflation and revaluation are on a commodity basis. It is suggested that the use of a common basis be substituted for the present use of the two incomparable bases. Due to the greater number of items to be considered with a commodity basis, it is suggested that industry prices be used as the common basis for inventory data as well as for deflation and revaluation,

Both the data on gross fixed capital formation as obtained from P.P.I. and the data on inventory as processed by the inventory valuational adjustment technique are presented in the Consolidated National Savings Account of the National Accounts. But the National Accounts classification includes gross fixed capital formation data of only the private sector. Data on gross fixed capital formation of the public sector are omitted from the Consolidated National Savings Account. For analytical purposes, it may be desirable for the inclusion of data on governmental gross fixed capital formation in the Consolidated National Savings Account. It is, therefore, suggested that such an inclusion be undertaken. The inclusion can be undertaken by a series of adjustments in the various accounts. Essentially, it involves first, a distinction of governmental expenditures into capital and current, and second, the relegation of capital expenditures to the Consolidated National

Savings Account and the retention of only current expenditures in the government revenue and expenditure account.

"HISTORICAL" TECHNIQUES

"Historical" techniques have received considerably less attention in this study. The underlying reason for such a bias is that their value is essentially in the measurement of past capital formation. Historical data, while useful for economic analysis, is of little use to government and business in decision making.

The techniques of collection - records, reports, the censuses and related studies - are of value insofar as they are useful as sources of capital formation data when such information cannot be obtained from surveys.

The techniques of estimation - the bench-mark, interpolation and extrapolation - are also of value insofar as they are useful devices for estimating capital formation when such information cannot be obtained from more direct means. The problem in their application is that they require a considerable degree of skill and judgment so much so that the accuracy expected from the resulting estimates cannot be more than a mere approximation.

The techniques of classification - the commodity-flow and the National Transactions Accounts - are no longer used for presenting data on capital formation. The capital expenditure survey approach of measuring capital formation at the user level has rendered the commodity-flow technique obsolete. However, the National Transactions

Accounts technique promises great potential. Its advantages over the present National Accounts technique are that capital formation data as presented are less consolidated than those in the National Accounts and that it traces the movement of funds from lenders to borrowers, through financial intermediaries between the various sectors of the economy.

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APPENDIX

APPENDIX I

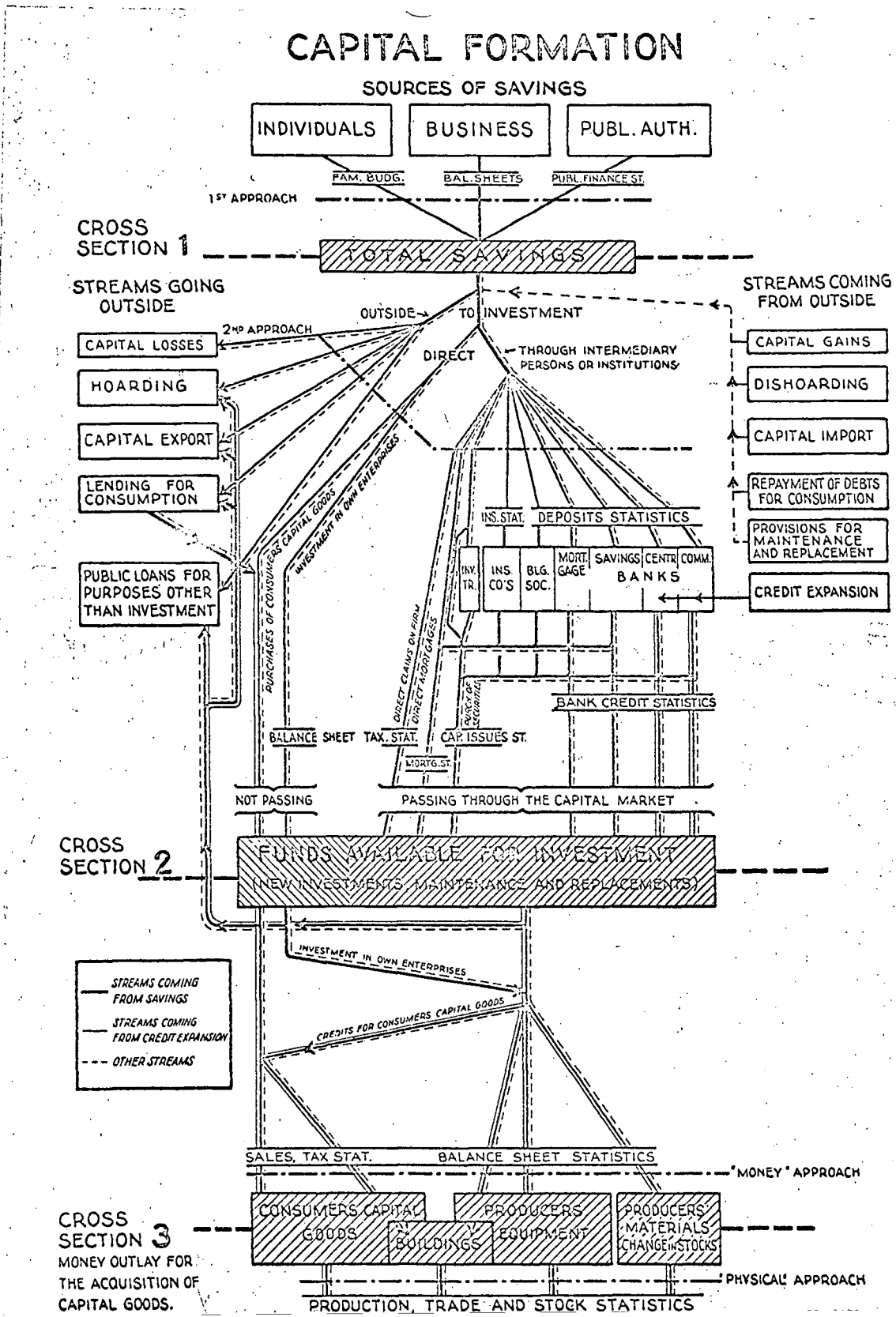
COVERAGE OF CAPITAL FORMATION

Gross Additions to Plant and Equipment	Net Changes in Stocks	Net Changes in International Claims	Investment in Intangible Capacities
1. All fixed durable property whether in the hands of individuals or governments: a. All property used for business purposes. b. All residential property.	1. Fuel, raw materials of all kinds in the hands of producers.	1. Claims in the form of cash or non-equity securities.	1. Education, skills and health.
2. Machinery and equipment in the hands of producers, including governments.	2. Work in progress in the hands of producers.	2. Ownership of foreign property held abroad.	2. Accumulation of knowledge through research, exploration and experience.
3. Durable movable goods in the hands of consumers.	3. Finished goods for distribution in the hands of producers, and supplies.	3. Ownership of gold domestically held.	3. Establishment of productive capacity by creating consumer wants and goodwill.
	4. Finished goods in the hands of consumers.		

Source: Dominion-Provincial Conference on Reconstruction: Public Investment and Capital Formation, A Study of Public and Private Investment Outlay, Canada, 1926-1941, Ottawa, 1945, p. 10.

APPENDIX II

DIAGRAMMATIC REPRESENTATION OF THE PROCESS OF CAPITAL FORMATION



APPENDIX II -- Continued

Source: League of Nations, Statistics Relating to Capital Formation: A Note on Methods, 1938, p. 9.

APPENDIX III(a)

QUESTIONNAIRE FORMS USED IN CAPITAL AND REPAIR EXPENDITURES SURVEY, 1950

Repair and Capital Expenditures, Preliminary Estimate for 1950 and Forecast for 1951, Canadian Industry

(Dominion Bureau of Statistics)

Taken in conformity with the requirements of the Statistics Act, Chap. 43, Statutes of Canada, 1948.

INSTRUCTIONS:—Please prepare in duplicate. Keep one copy for your files and return one copy immediately in the enclosed envelope to the Dominion Bureau of Statistics, Ottawa. If no such expenditures have been made in 1950, and if none are planned for 1951, submit a "nil" report to enable us to close your file for this survey. Individual reports will be treated as confidential and used only for the purpose of arriving at group totals.

If you operate more than one establishment, a separate report is to be made for each establishment. This statement should include your expenditures made not only on the main operations of the establishment, but also on townsites, warehouses, employees' facilities, such as housing, canteens, company stores, schools and all other facilities forming a part of the establishment.

If you operate or plan to operate a plant for the production or distribution of electric power for your own use, the expenditures on it should be included here. If, however, you sell or plan to sell power, a separate report should be made for the power plant.

Principal trade or business.....

Part of business covered by this report.....

Name under which business is carried on (please print).....

Head office address.....
(Give street and number in cities and large towns)

Location of works for which this report is made. .....
(Street and number)
.....
(City, Town or Post Office) (County) (Province)

Address to which we should mail these forms.....

	Department use	Preliminary estimate of expenditures made in 1950 (whole year)	Forecast of expenditures likely to be made in 1951
1. Estimated Repair Expenditures— Report gross repair expenditures, including all material and labour costs. Include the value of work done by your own employees, as well as payments to persons outside your business. Do not include under Section (1) replacements of capital assets; these should be shown in Section (2).			
(*a*) Repair expenditures on buildings and other structures		$	$
(*b*) Repair expenditures on machinery and equipment		$	$
2. Estimated Capital Expenditures— Report gross expenditures on new physical assets or facilities of a capital nature used in the operation of your business, including additions, replacements, major alterations and all items of this nature, with the exception of previously existing buildings and other structures, and used machinery and equipment. Include capital expenditures met out of receipts from insurance claims for fire and other damage. Take into account the value of work done by your own employees and also the cost of installation. Do not deduct any allowance for scrap or trade-in value of your old assets. Mining companies should include preliminary development and exploration costs here. *Report construction in the year in which carried out and equipment in the year in which acquired, irrespective of the time payment is made.* Do not include the value of your own re-used material. Under Part (*a*) show expenditures on all new construction, including buildings of all types, mine shafts, tracks, roads, transmission lines, blast furnaces, docks, aerial towers, etc. Exclude the value of land purchased but include the cost of land improvements. Exclude expenditures for the purchase of previously existing buildings and other structures. Under Part (*b*) show the installed cost of all new machinery and the delivered cost of movable equipment such as new motor cars, trucks, railway rolling stock, office furniture and appliances, etc., whether for your own use or for rent to others. Exclude expenditures on used machinery and equipment.			
(*a*) Capital expenditures on new buildings and other structures		$	$
(*b*) Capital expenditures on new machinery and equipment		$	$
Total 1(*a*), 1(*b*), 2(*a*) and 2(*b*)		$	$

REMARKS.....

.....

Name and address of person making this report .....
(Name) (Official position)
.....
(Business address)

Date of this report.....19.....

Department use
Edited.....
Checked.....
Entered on card.....
Card checked.....

APPENDIX III(a) -- Continued

MIDYEAR SURVEY FORM

FOR IMMEDIATE ATTENTION

Confidential Keep One Copy

Dominion Bureau of Statistics
Ottawa - Canada

REVISED FORECAST OF REPAIR AND CAPITAL EXPENDITURES, 1951

(Second Estimate - as of May, 1951)

Some months ago you kindly supplied us with a forecast of anticipated repair and capital expenditures in connection with the above-named establishment for the year 1951. Since then your plans may have changed, and in order to maintain an up-to-date record of the investment plans of business, we are now asking for a second estimate of these expenditures. Exact data are not required. A review of the figures which you gave us earlier and a re-statement in the light of present conditions which would either confirm or revise your first estimates, is all that is necessary. If there has been any major revision in your plans for investment in NEW CAPITAL ASSETS, you are asked to outline the reasons for such changes.

This questionnaire is being sent to only a sample group of business establishments. The individual reports will be kept confidential and used only for the purpose of arriving at group totals.

Please prepare in duplicate, keep one copy for your files and return one copy immediately to the Dominion Bureau of Statistics, Ottawa, using the enclosed envelope, which is postage free.

The definitions of the expenditures listed below are the same as those given on the green "Forecast 1951" Schedule, a copy of which we assume you have on file.

	(Omit Cents)	For Departmental Use
1. REVISED ESTIMATE OF REPAIR EXPENDITURES, 1951 (whole year)		
(a) Repair expenditures on buildings and other structures	$	.....
(b) Repair expenditures on machinery and equipment	$	.....
2. REVISED ESTIMATE OF CAPITAL EXPENDITURES, 1951 (whole year)*		
(a) Capital expenditures on new buildings and other structures	$	.....
(b) Capital expenditures on new machinery and equipment	$	.....
TOTAL of 1(a), 1(b), 2(a) and 2(b)	$	

* NOTE: If there is any major change from your previous estimate with respect to either of the CAPITAL EXPENDITURES items, 2(a) and 2(b) above, please indicate in the "Remarks" section below, the principal reasons for such changes.

Remarks on changes in anticipated CAPITAL EXPENDITURES on

2(a) New buildings and other structures

.....

.....

2(b) New machinery and equipment

.....

.....

Name, official position and business address of person making this report .....

Date of this report .....

APPENDIX III(a) -- Continued

Source: O. J. Firestone, "Investment Forecasting in Canada", National Bureau of Economic Research, Short-Term Economic Forecasting, Studies in Income and Wealth, Vol.,17, Princeton University Press, 1955, p. 248-249.

APPENDIX III(b)

QUESTIONNAIRE FORMS USED IN CAPITAL AND REPAIR EXPENDITURES SURVEY, 1963

Preliminary Estimate for 1962 and Forecast for 1963 .....p. 110 - 115

Revised Forecast for 1963 (Mid-Year Survey) .....p. 116

Actual Estimate for 1962 .....p. 117 - 120

FORM F6 – FORECAST – 1963

INSTRUCTIONS

Complete in duplicate. Keep copy marked "File Copy" and return original in the enclosed envelope to the Dominion Bureau of Statistics, Ottawa. If no such expenditures were made in 1962, or are expected to be made in 1963, please submit a "Nil" report to enable us to close your file for this survey. Individual reports will be treated as CONFIDENTIAL and used only for the purpose of arriving at group totals.

CONFIDENTIAL KEEP FILE COPY

DOMINION BUREAU OF STATISTICS, OTTAWA

BUSINESS FINANCE DIVISION

CAPITAL AND REPAIR EXPENDITURES

Preliminary Estimate for 1962
and
Forecast for 1963

Taken in conformity with the requirements of the Statistics Act, Chap. 257 of the Revised Statutes of Canada, 1952

Principal operations or type of institution .....

Part of operations covered by this report .....

Location or area of operations or institution for which this report is made .....

Name under which operation is carried on (Please PRINT) .....

Correct mailing address .....

Head office address .....

Check type of organization: ☐ Individual ☐ Partnership ☐ Incorporated Company ☐ Incorporated Co-operative ☐ Unincorporated Co-operative

If this is a government-owned organization, state whether it is owned by Federal, Provincial or Municipal Government .....

Period covered by this report (1962) – ..... (1963) – .....
(Calendar year figures are preferable)

CAPITAL AND REPAIR EXPENDITURES (See Reverse Side for Definitions)	Department use only	Preliminary estimate of expenditures (Omit cents) 1962	Forecast of expenditures expected (Omit cents) 1963	Department use only
1. Estimated capital expenditures on new building, marine and engineering construction ..... Including replacements, additions and major alterations		$	$	
2. Estimated capital expenditures on new machinery and equipment ... Including automobiles, trucks and office equipment		$	$	
3. Estimated repair expenditures on all building, marine and engineering structures		$	$	
4. Estimated repair expenditures on machinery and equipment		$	$	
TOTAL 1, 2, 3 and 4		$	$	
5. Expenditures for the acquisition of land, existing buildings and used equipment ..... Report expenditures for the acquisition of land and previously existing buildings, used machinery and equipment, unless imported. Include here, also, the estimated value of your own reused material. These expenditures are not to be included in Items 1 to 4 above.		$	$	
Value of construction, as shown in Item 1, done or to be done by contract		$	$	
Value of construction, as shown in Item 3, done or to be done by contract		$	$	

Name and address of person making this report ..... (Name) (Official Position)

..... (Business address)

Date of this report .....

Department Use

Edited .....

Checked .....

Entered .....

L10

CAPITAL AND REPAIR EXPENDITURES

The purpose of the survey of Capital and Repair Expenditures is to determine the expenditures made on durable physical assets for the economy as a whole. To make these statistics as comprehensive as possible, each firm should report all of their Capital and Repair Expenditures. The information collected in this survey is divided according to industry and province, it is therefore necessary that we receive the data in this detail.

DEFINITIONS

CAPITAL EXPENDITURES: Report gross expenditures on new physical assets or facilities used in the operation of your business, including additions, replacements and major alterations. Include all costs charged to capital account, such as architectural, legal and engineering fees as well as work done by your own labour force; do not deduct receipts from insurance claims or allowances for scrap or trade-in. Include also, expenditures of a capital nature which have been charged to operating account.

CONSTRUCTION: Report total cost of construction carried out during the year, irrespective of the time final payment is made. Include also the cost of elevators, heating systems, etc., which may be considered an integral part of the building or structure. Exclude expenditures for the acquisition of previously existing buildings and other structures as well as the value of land purchased. However, include the cost of site preparation and land improvements.

MACHINERY and EQUIPMENT: Report total installed cost of all new machinery, motors, generators, transformers, etc., and the delivered cost of movable equipment, automobiles, trucks, office furniture and appliances, etc., whether for your own use or rent to others. Include progress payments paid out prior to delivery, and any balance owing or hold-backs in the year of acquisition. Exclude expenditures on used machinery and equipment unless imported.

REPAIR EXPENDITURES: Report gross repair expenditures, including all material and labour costs. Include the value of work done by your own employees, as well as payments to persons outside your employ. Do not include here replacements of capital assets; these should be shown as capital expenditures in Item 1 or 2 of the report. Do not include routine maintenance costs, such as char service, oiling or cleaning machinery, sanding and snow removal.

FORM F 1G – FORECAST – 1963

INSTRUCTIONS
Complete in duplicate. Keep form marked "File Copy" and return original in the enclosed envelope to the Dominion Bureau of Statistics, Ottawa. If no such expenditures were made in 1962, and none are planned for 1963, please submit a "Nil" report to enable us to close your file for this survey. Individual reports will be treated as CONFIDENTIAL and used only for the purpose of arriving at group totals.

CONFIDENTIAL KEEP FILE COPY

DOMINION BUREAU OF STATISTICS, OTTAWA

BUSINESS FINANCE DIVISION

CAPITAL AND REPAIR EXPENDITURES

Preliminary Estimate for 1962
and
Forecast for 1963

Taken in conformity with the requirements of the Statistics Act, Chap. 257 of the Revised Statutes of Canada, 1952

REPORTS REQUIRED:

Separate reports are required for each type of operation in which your organization is engaged. Type of operations are, e.g. manufacturing, wholesaling, motor transportation, warehousing, electric utility, waterworks, mining.

(a) A consolidated report for each province in which activities are conducted should be submitted for firms engaged in all industries except manufacturing.

(b) A separate report for each establishment, or area of operation, should be submitted by all manufacturing firms.

NOTE: 1. To make these statistics as comprehensive as possible each firm should report ALL of their Capital and Repair Expenditures. If sufficient forms have not been provided, please advise.

2. Include only expenditures made on establishments and properties located in Canada. In addition to expenditures made on the main operations, include also those made on Townsite and employee facilities, such as canteens, stores, schools, streets, etc., which form a part of the entire establishment, WITH THE EXCEPTION OF PERMANENT RESIDENTIAL HOUSING.

3. In leasing arrangements, e.g. lease-back and net-lease, for the construction of "revenue" or "leasehold" buildings, the firm paying for the work should report the total expenditure made.

1. Principal operation or type of institution .....
2. Part of operations covered by this report .....
3. Location of operations, or institution, for which this report is made .....
4. Name under which operation is carried on .....
5. Correct mailing address .....
6. Head office address .....

Check type of Organization: ☐ Individual ☐ Partnership ☐ Incorporated Company ☐ Incorporated Co-operative ☐ Unincorporated Co-operative

If government-owned, state whether Federal, Provincial or Municipal .....

In cases where this form is being completed on behalf of an institution, please state the body to whose budget or account, capital and repair expenditures are charged, e.g. name of religious body, etc. .....

PLEASE READ CAREFULLY

CAPITAL EXPENDITURES: Report gross expenditures on new physical assets or facilities used in the operation of your organization including additions, replacements, and major alterations. Include all costs charged to capital account, such as architectural, legal and engineering fees as well as work done by your own labour force; do not deduct receipts from insurance claims or allowances for scrap or trade-in. Include also, expenditures of a capital nature which have been charged to operating account.

REPAIR EXPENDITURES: Report gross repair expenditures, including all material and labour costs. Include the value of work done by your own employees, as well as payments to persons outside your employ. Do not include here replacement of capital assets; these should be shown as capital expenditures in Item 1 or 2 of Section A. Do not include routine maintenance costs, such as char service, oiling or cleaning of machinery, sand or snow removal.

SECTION A.	Department use only	Preliminary estimate of expenditures (Omit cents) 1962	Forecast of expenditures expected (Omit cents) 1963	Department use only
1. Estimated capital expenditures on new building, marine and engineering construction ..... Report construction carried out during the year, irrespective of the time final payment is made. For types of structures see Section B of this form, pages 2 and 3. Include the cost of elevators, heating systems, (air and water lines) etc., which may be considered an integral part of the structure. Exclude expenditures for acquisition of existing assets and the value of land purchased. However, include cost of site preparation and land improvements.		$	$	
2. Estimated capital expenditures on new machinery and equipment ..... Report total delivered and installed cost of all new machinery and equipment, such as motors, generators, transformers, technical apparatus, cars, trucks, office furniture, etc., whether for your own use or rent to others. Include progress payments in the year payment is made. Include any balance owing, or hold-backs, in the year of acquisition. Exclude expenditures on used machinery and equipment unless imported.		$	$	
3. Estimated repair expenditures on all building, marine and engineering structures		$	$	
4. Estimated repair expenditures on machinery and equipment		$	$	
TOTAL: 1, 2, 3 and 4		$	$	
5. Estimated expenditures for the purchase of land, used building and equipment ..... Include estimated expenditures for the purchase of land and previously existing buildings and for used machinery and equipment, unless imported. Include here, also, the estimated value of your own re-used material. These expenditures not to be included in items 1 to 4 above.		$	$	
MINING COMPANIES ONLY				
6. Estimated expenditures on exploration ..... In general, activities generated by exploration expenditures should result only in information regarding the possible presence of minerals, in commercial quantities. Any capital outlays on construction or machinery and equipment incurred in connection with exploration activity should be included in capital expenditures in Item 1 or 2 above.		$	$	

CONSTRUCTION EXPENDITURES ONLY BY TYPE OF STRUCTURE

"GRAND TOTALS" OF SECTION B, PAGE 3, SHOULD EQUAL AMOUNTS SHOWN IN SECTION A, ITEM 1 AND 3.

NOTE: – In this section, please show expenditures on new and repair construction as reported in Section A, Items 1 and 3 respectively, by type of structure. Do not report a single value for a combination of structures, such as those comprising "CENTRAL ELECTRIC STATIONS" or a "TOWNSITE" when it is possible to provide a breakdown by the types of structure listed. If none of the specified types of structure are appropriate please enter the correct description and data in the space provided.

EXPENDITURES ON BUILDING CONSTRUCTION (Exclude Permanent Dwellings, Machinery and Equipment)		CONSTRUCTION EXPENDITURES			
		PRELIMINARY 1962		FORECAST 1963	
		CAPITAL	REPAIR	CAPITAL	REPAIR
Factories, plants, workshops, food canneries and smelters	1		1		
Mine and mine mill buildings	2		2		
Railway stations, offices, roadway buildings	3		3		
Railway shops, engine houses, water and fuel stations	4		4		
Warehouses, storehouses refrigerated storage, etc.	5		5		
Grain elevators	6		6		
Hotels, clubs, restaurants, cafeterias, tourist cabins	7		7		
Office buildings	8		8		
Stores, retail and wholesale	9		9		
Garages and service stations	10		10		
Theatres, arenas, amusement and recreational buildings	11		11		
Laundries and dry cleaning establishments	12		12		
Schools and other educational buildings	13		13		
Churches and other religious buildings	14		14		
Hospitals, sanatoria, clinics, first-aid stations, etc.	15		15		
Other institutional buildings	16		16		
Farm buildings (excluding dwellings)	17		17		
Broadcasting, radio, and television relay and booster stations, telephone exchanges	18		18		
Aeroplane hangars	19		19		
Passenger terminals, bus, boat or air	20		20		
Armouries, barracks, drill halls, etc.	21		21		
Bunkhouses, dormitories, camp cookeries, bush depots and camps	22		22		
Other building construction, please specify	30		30		
I SUB-TOTAL – Value of All building Construction		$	$	$	$
EXPENDITURES ON MARINE CONSTRUCTION (Exclude Ships and Machinery)					
Docks, wharves, piers, breakwaters	31		31		
Retaining walls, embankments, riprapping	32		32		
Canals and waterways	33		33		
Dredging and pile driving	34		34		
Dyke construction	35		35		
Logging booms	36		36		
Other marine construction, please specify	40		40		
II SUB-TOTAL – Value of All Marine Construction		$	$	$	$

SECTION B – (continued)

CONSTRUCTION EXPENDITURES					EXPENDITURES ON ENGINEERING CONSTRUCTION (Exclude Machinery or Repairs to Machinery)
PRELIMINARY 1962		FORECAST 1963			
CAPITAL	REPAIR	CAPITAL	REPAIR		
				41	Hard surfaced or paved streets, highways, parking lots, etc.
				42	Gravel or stone streets, highways, roads, parking lots, etc.
				43	Dirt, clay or other streets, roads, parking lots, etc. (logging roads if applicable)
				44	Grading, scraping, oiling, filling
				45	Sidewalks, paths
				46	Aerodromes, landing fields, runways, tarmac
				47	Tile drains, drainage ditches, storm sewers
				48	Water mains, hydrants and services
				49	Sewage systems, connections and disposal plants
				50	Water pumping stations, and filtration plants
				51	Water storage tanks
				52	Dams and reservoirs
				53	Irrigation and land reclamation projects
				54	Electric power generating plants, including water conveying and controlling structures
				55	Electric transformer stations
				56	Power transmission and distribution lines, trolley wires
				57	Street lighting (standards, brackets and luminaires)
				58	Railway track and roadbed
				59	Signals and interlockers
				60	Telegraph and telephone lines, underground and marine cables
				61	Gas mains and services
				62	Pumping stations, oil
				63	Pumping stations, gas
				64	Oil storage tanks
				65	Gas storage tanks
				66	Oil pipe lines
				67	Gas pipe lines
				68	Oil wells
				69	Gas wells
				70	Oil refinery – (processing units)
				71	Natural gas cleaning plants
				72	Bridges, trestles, culverts, overpasses, viaducts
				73	Tunnels and subways
				74	Incinerators
				75	Park systems, landscaping, sodding, etc.
				76	Swimming pools, tennis courts, outdoor recreation facilities
				77	Mine shafts and other below surface workings
				78	Fences, snowsheds, signs, guard rails
				90	Other engineering construction, please specify (Not to include machinery or repairs to machinery)
$	$	$	$		III SUB-TOTAL – Value of All Engineering Construction
$	$	$	$		GRAND TOTAL – sum of sub-totals, I, II and III

IS ANY CONSTRUCTION WORK REPORTED ABOVE DONE, OR TO BE DONE BY CONTRACT? ☐ No ☐ Yes

$	$	$	$	IF "YES", PLEASE SHOW AMOUNTS

6602-6-1: 4-9-62

RESPONDENTS EXPLANATORY NOTES

(Please mention here any tentative plans being considered which are not covered in the data reported. Also give any further clarification of the reported data which would be of value in interpreting the schedule):

Period Covered By This Report —(1962)— (1963)—

(Calendar year figures are preferable)

If you are leasing a building completed during 1962 please give the name and address of lessor:

NAME: .....
(Please Print)

ADDRESS: .....

If you expect to lease a building that will be completed during 1963, please give the name and address of the lessor.

NAME: .....

ADDRESS: .....

Name and address of person making this report

..... (Name) (Official position)

..... (Business address)

Date of this report ..... 19 .....

Department Use

Edited .....

Checked .....

Entered .....

FOR IMMEDIATE ATTENTION

Confidential **Keep One Copy**

DOMINION BUREAU OF STATISTICS

Business Finance Division

Ottawa – Canada

SAMPLE SURVEY

REVISED FORECAST OF CAPITAL EXPENDITURES, 1963

(Second Estimate – as of June 1963)

Some months ago you supplied us with a forecast of anticipated Capital Expenditures in connection with this establishment for the year 1963. Since then your plans for the year may have changed. In order that we may have up-to-date information on intentions of investment we are now asking you to give us a second estimate of what these expenditures will be for the same establishment during 1963.

Exact information is not required. A review of the figures which you gave us earlier (on the green Forecast 1963 questionnaire) and a restatement of intentions, in the light of present conditions, which would either confirm or revise your earlier estimate, is all that is necessary. If no change has occurred in your plans, it is still important that you return this form confirming that fact. If there has been any major revision in your plans for investment in NEW CAPITAL ASSETS you are asked to outline the reason for such changes.

Inasmuch as this is a sample survey of establishments selected at random from our mailing list, it is only necessary to provide estimates covering those establishments for which you have received questionnaires. However, in view of the nature of this survey, it is important that all questionnaires received be completed and returned as soon as possible, but not later than June 20, 1963.

All reports are confidential and are used only for the purpose of arriving at group totals. Please prepare in duplicate, keep one copy for your files and return the other to the Dominion Bureau of Statistics, Ottawa, in the enclosed envelope.

SECTION A – REVISED ESTIMATE OF CAPITAL EXPENDITURES 1963 (whole year)
(Definitions are the same as on the green "Forecast 1963" questionnaire)

	Omit cents	For department use
1. Capital expenditures on new building, marine and engineering construction		
2. Capital expenditures on new machinery and equipment		
TOTAL		

SECTION B – REASONS FOR CHANGES IN CAPITAL EXPENDITURES PLANS FOR 1963 SINCE REPORTED ON THE GREEN FORECAST "1963" QUESTIONNAIRE.

1. Please indicate in which of the following categories there have been changes from earlier expectations which have resulted in a larger or smaller program.

(a) Cost and availability of outside financing ..... ☐ 1

(b) Earnings position ..... ☐ 2

(c) Working capital requirement ..... ☐ 3

(d) Short run sales outlook ..... ☐ 4

(e) Longer run sales outlook ..... ☐ 5

(f) Competitive conditions ..... ☐ 6

(g) Prices of construction and equipment ..... ☐ 7

(h) Other economic reasons (please specify) 8

.....

(i) Other explanatory reasons (such as equipment breakdowns, management change, merger, accounting adjustment and errors, routine over-or-under-estimates, incomplete anticipation, etc.)
Please specify 9

.....

2. Has the reason for change given in question 1 resulted in your program being

(a) expanded ..... ☐ 10

(b) accelerated ..... ☐ 11

(c) stretched-out ..... ☐ 12

(d) postponed ..... ☐ 13

(e) reduced ..... ☐ 14

3. Are construction and machinery prices

(a) as anticipated ..... ☐ 15

(b) higher ..... ☐ 16

(c) lower ..... ☐ 17

SECTION C – PROGRESS OF PROGRAM

(a) Is your 1963 capital expenditure program as far advanced at this time as you originally anticipated? Yes ☐ 18 No ☐ 19

(b) If you have had difficulties in implementing your program, please state principal areas of difficulties (e.g. financing arrangements, supply conditions, strikes, weather conditions, etc.)
Please specify 20

.....

Name of person making this report ..... Official position .....

Business address ..... Date of this report .....

If additional space is required for explanatory notes, please use reverse side of form

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FORM A1 – ACTUAL 1962

INSTRUCTIONS

Complete in duplicate. Keep copy marked "File Copy" and return original in the enclosed envelope within 8 WEEKS of receipt of the questionnaires to the Dominion Bureau of Statistics, Ottawa. If no such expenditures were made in 1962, please submit a "Nil" report to enable us to close your file for this survey. Individual reports will be treated as CONFIDENTIAL and used only for the purpose of arriving at group totals.

CONFIDENTIAL KEEP FILE COPY

DOMINION BUREAU OF STATISTICS, OTTAWA

BUSINESS FINANCE DIVISION

CAPITAL AND REPAIR EXPENDITURES ACTUAL 1962

Taken in conformity with the requirements of the Statistics Act, Chap. 257, of the Revised Statutes of Canada, 1952.

REPORTS REQUIRED:

Separate reports are required for each type of operation in which your organization is engaged. Type of operations are, e.g. manufacturing, wholesale, motor transportation, warehousing, electric utility, waterworks, mining, hospitals, universities and colleges.

(a) A consolidated report for each province in which activities are conducted should be submitted for firms engaged in all industries except manufacturing.

(b) A separate report for each establishment, or area of operation, should be submitted by all manufacturing firms.

NOTE: 1. To make these statistics as comprehensive as possible each firm should report ALL of their capital and repair expenditures. If sufficient forms have not been provided, please advise.

2. Include only expenditures made on establishments and properties located in Canada. In addition to expenditures made on the main operations, include also those made on townsite and employee facilities, such as canteens, stores, schools, streets, etc., which form a part of the entire establishment, WITH THE EXCEPTION OF PERMANENT RESIDENTIAL HOUSING.

3. In leasing arrangements, e.g. lease-back and net-lease, for the construction of "revenue" or "leasehold" buildings, the firm paying for the work should report the total expenditure made.

1. Principal operation or type of institution .....

2. Part of operations covered by this report .....

3. Location of operations, or institution, for which this report is made .....

4. Name under which operation is carried on (Please Print) .....

5. Correct mailing address .....
(Give street and number in cities and large towns)

6. Head office address .....

Check type of Organization: ☐ Individual ☐ Partnership ☐ Incorporated Company ☐ Incorporated Co-operative ☐ Unincorporated Co-operative

If government-owned, state whether Federal, Provincial or Municipal .....

Period covered by this report ..... 19 ..... to ..... 19 .....
(calendar year figures are preferable)

CAPITAL AND REPAIR EXPENDITURES (See Page 4 for Definitions)	Actual Expenditures 1962 $ (omit cents)	Department Use
1. Capital expenditures on NEW building, marine and engineering construction Including replacements, additions and major alterations		
2. Capital expenditures on NEW machinery and equipment Including automobiles, trucks and office equipment.		
3. Repair expenditures on all building, marine and engineering structures		
4. Repair expenditures on machinery and equipment		
TOTAL 1, 2, 3 and 4		

Expenditures entered in Questions 5 and 6 are not to be included in Questions 1 to 4 above	Buildings, Engineering structures and land $	Machinery and Equipment $
5. Expenditures for the Purchase of USED and EXISTING assets:		
(a) Purchase of assets used previously IN Canada		
(b) Purchase of assets used previously OUTSIDE OF Canada		
(c) Purchase of land		
6. Receipts from the sale of used or existing assets:		
(a) Receipts from the sale of used or existing buildings, engineering structures, machinery and equipment		
(b) Receipts from the sale of land		

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CONSTRUCTION EXPENDITURES ONLY BY TYPE OF STRUCTURE

"GRAND TOTAL" OF SECTION B, PAGE 3, SHOULD EQUAL AMOUNTS SHOWN IN SECTION A, ITEM 1 AND 3.

NOTE: – In this section, please show expenditures on new and repair construction as reported in Section A, Items 1 and 3 respectively, by type of structure. Do not report a single value for a combination of structures, such as those comprising "CENTRAL ELECTRIC STATIONS" or a "TOWNSITE" when it is possible to provide a breakdown by the types of structure listed. If none of the specified types of structure are appropriate please enter the correct description and data in the space provided.

Capital Expenditures on New Construction 1962		EXPENDITURES ON BUILDING CONSTRUCTION (Exclude Permanent Dwellings, Machinery and Equipment)		Repair Expenditures on Structures 1962
	1	Factories, plants, workshops, food canneries, smelters	1	
	2	Mine and mine mill buildings	2	
	3	Railway stations, offices, roadway buildings	3	
	4	Railway shops, engine houses, water and fuel stations	4	
	5	Warehouses, storehouses, refrigerated storage, etc.	5	
	6	Grain elevators	6	
	7	Hotels, clubs, restaurants, cafeterias, tourist cabins	7	
	8	Office buildings	8	
	9	Stores, retail and wholesale	9	
	10	Garages and service stations	10	
	11	Theatres, arenas, amusement and recreational buildings	11	
	12	Laundries and dry cleaning establishments	12	
	13	Schools and other educational buildings	13	
	14	Churches and other religious buildings	14	
	15	Hospitals, sanatoria, clinics, first-aid stations, etc.	15	
	16	Other institutional buildings	16	
	17	Farm buildings (excluding dwellings)	17	
	18	Broadcasting, radio & television relay and booster stations, telephone exchanges	18	
	19	Aeroplane hangars	19	
	20	Passenger terminals, bus, boat or air	20	
	21	Armouries, barracks, drill halls, etc.	21	
	22	Bunkhouses, dormitories, camp cookeries, bush depots and camps	22	
	30	Other building construction, please specify below	30	
$		I. SUB-TOTAL – Value of all building construction	$	
		EXPENDITURES ON MARINE CONSTRUCTION (Exclude ships and machinery)		
	31	Docks, wharves, piers, breakwaters	31	
	32	Retaining walls, embankments, riprapping	32	
	33	Canals and waterways	33	
	34	Dredging and pile driving	34	
	35	Dykes	35	
	36	Logging booms	36	
	40	Other marine construction, please specify below	40	
$		II. SUB-TOTAL – Value of all marine construction	$	

Capital Expenditures on New Construction 1962		EXPENDITURES ON ENGINEERING CONSTRUCTION (Exclude machinery and equipment)		Repair Expenditures on Structures 1962
	41	Hard surfaced or paved streets, highways, parking lots, etc.	41	
	42	Gravel or stone streets, highways, roads, parking lots, etc.	42	
	43	Dirt, clay or other streets, roads, parking lots, etc. (logging roads, if applicable)	43	
	44	Grading, scraping, oiling, filling	44	
	45	Sidewalks, paths	45	
	46	Aerodromes, landing fields, runways, tarmac	46	
	47	Tile drains, drainage ditches, storm sewers	47	
	48	Water mains, hydrants and services	48	
	49	Sewage systems, disposal plants and connections	49	
	50	Water pumping stations and filtration plants	50	
	51	Water storage tanks	51	
	52	Dams and reservoirs	52	
	53	Irrigation and land reclamation projects	53	
	54	Electric power generating plants, including water conveying and controlling structures	54	
	55	Electric transformer stations	55	
	56	Power transmission and distribution lines, trolley wires	56	
	57	Street lighting (standards, brackets and luminaires)	57	
	58	Railway track and roadbed	58	
	59	Signals and interlockers	59	
	60	Telegraph and telephone lines, underground and marine cables	60	
	61	Gas mains and services	61	
	62	Pumping stations, oil	62	
	63	Pumping stations, gas	63	
	64	Oil storage tanks	64	
	65	Gas storage tanks	65	
	66	Oil pipe lines	66	
	67	Gas pipe lines	67	
	68	Oil wells	68	
	69	Gas wells	69	
	70	Oil refinery – processing units	70	
	71	Natural gas processing plants	71	
	72	Bridges, trestles, culverts, overpasses, viaducts	72	
	73	Tunnels and subways	73	
	74	Incinerators	74	
	75	Park systems, landscaping, sodding, etc.	75	
	76	Swimming pools, tennis courts, outdoor recreation facilities	76	
	77	Mine shafts and other below surface workings	77	
	78	Fences, snowsheds, signs, guard rails	78	
	90	Other engineering construction, please specify below (Not to include machinery or repairs to machinery)	90	
$		III. SUB-TOTAL – Value of All Engineering Construction	$	
$		GRAND TOTAL – Sum of sub-totals, I, II and III	$	

Office Use

BE SURE TO COMPLETE SECTION C OPPOSITE

Office Use

SECTION C – OWN ACCOUNT AND CONTRACT CONSTRUCTION WORK

	New $ (Omit cents)	Repair $ (Omit cents)
1. (a) Value of all construction work as reported in Section A, Items 1 and 3		
1. (b) Amount of above construction work done by contract Include payments made to construction contractors and the value of materials purchased by your firm and put-in-place by a construction contractor.		
1. (c) Balance: Own-Account Construction Work		
1. (d) Amount of 1(c) Devoted to: (i) Building Construction		
(ii) Engineering and Marine Construction (the sum of these two items should equal 1(c) above.)		

OWN-ACCOUNT CONSTRUCTION WORK should include all costs involved in new and repair construction expenditures except those expenditures already entered in 1(b) above. The costs that would be included in own-account construction work would be salaries and wages paid to employees of your firm engaged in construction work, as defined in Section A, Item 1 and 3, the cost of materials used by these employees, architectural, legal and engineering fees, insurance and other indirect costs.

	New $ (Omit cents)	Repair $ (Omit cents)
2. Salaries and wages paid on new and repair construction – show separately, if available Show the total value of salaries and wages paid to your employees engaged in construction work. In the case of an employee engaged in both construction and some other type of work, include only that portion of his salary or wages paid for construction work. Report gross earnings before deductions for income tax, social services, pension plan, sickness and accident insurance, etc. Include holiday pay, allowance for board, lodging, and other forms of subsistence provided in lieu of or supplementary to cash remuneration.		
3. Cost of construction materials used on new and repair construction – show separately, if available Report total cost, delivered at the job, of all materials and supplies used by your own employees in own-account construction work. Exclude the cost of materials supplied by you to contractors, which should be reported in 1(b) above.		
4. Overhead expense related to work performed by your own employees Report in this question all expenses other than salaries and wages paid and materials used as outlined in Items 3 and 4 above, which are related to new and repair construction work carried out by your own employees.		
5. Miscellaneous expenses on new and repair construction Include in this question payments made to firms other than construction contractors, and to individuals not in your employ such as architects, engineers, etc., and general overhead expense which is applicable to contract construction as well as to work performed by your own employees		

Note: Items 2, 3, 4 and 5 should equal 1(c) above.

DEFINITIONS

CAPITAL EXPENDITURES: Report gross expenditures on new physical assets or facilities used in the operation of your organization including additions, replacements, and major alterations. Include all costs charged to capital account, such as architectural, legal and engineering fees as well as work done by your own labour force; do not deduct receipts from insurance claims or allowances for scrap or trade-in.

1. New construction: Report construction carried out during the year irrespective of the time final payment is made. For type of structures see section B of this form, pages 2 and 3. Include, the cost of elevators, heating systems, air and water lines, etc., which may be considered an integral part of the structure. Exclude expenditures for acquisition of existing assets and the value of land purchased. However, include cost of site preparation and land improvements.

2. New machinery and equipment: Report total delivered and installed cost of all new machinery and equipment, such as motors, generators, transformers, technical apparatus, cars, trucks, office furniture, etc., whether for your own use or rent to others. Include any balance owing, or hold-backs, in the year of acquisition. Exclude expenditures on used machinery and equipment.

3, 4. Repair expenditures: Report gross repair expenditures, including all material and labour costs. Include the value of work done by your own employees, as well as payments to persons outside your employ. Do not include here replacement of capital assets; these should be shown as capital expenditures in item 1 or 2 of section A. Do not include routine maintenance costs, such as char service, oiling or cleaning of machinery, sand or snow removal.

RESPONDENTS EXPLANATORY NOTES: .....

Name of person responsible for this report	Official position	Department Use Edited
Business address	Date of this report	Checked
		Entered

APPENDIX III(b) - Continued

Source: Questionnaire forms supplied by the Business Finance Division of the Dominion Bureau of Statistics

APPENDIX IV(a)

I. COMPUTATIONS IN THE DETERMINATION OF THE CO-EFFICIENT OF CORRELATION BETWEEN CAPITAL AND REPAIR EXPENDITURES OF CONSTRUCTION FOR BUSINESS ENTERPRISES

(IN APPROXIMATE FIGURES)

Year	Capital Expenditure ($ millions) X	Repair Expenditure ($ millions) Y	XY	X^2	Y^2
1946	340	228	77,000	116,000	52,000
1947	466	241	112,000	216,000	58,000
1948	595	278	165,000	354,000	77,000
1949	596	309	184,000	355,000	95,500
1950	699	305	213,000	489,000	93,000
1951	931	364	340,000	867,000	132,000
1952	1,149	365	420,000	1,320,000	135,000
1953	1,235	384	472,000	1,530,000	147,000
1954	1,161	367	427,000	1,350,000	134,000
1955	1,268	367	466,000	1,600,000	134,000
1956	1,803	397	718,000	3,250,000	158,000
1957	2,082	409	850,000	4,350,000	167,000
12	12,325	4,014	4,444,000	15,797,000	1,381,500

Source: Capital and Repair Expenditures Data Obtained from D.B.S., Private and Public Investment, 1946-1957.

Using the Product Moment Formula

$$r = \frac{p}{\sigma x \, \sigma y}$$

where r = the co-efficient of correlation

$$p = \frac{\Sigma(XY)}{N} - \left(\frac{\Sigma(X)}{N}\right)\left(\frac{\Sigma(Y)}{N}\right)$$

$$= \frac{4,444,000}{12} - \left(\frac{12,325}{12}\right)\left(\frac{4,014}{12}\right)$$

$$= 370,333 - 343,018$$

$$= 27,315$$

$$\sigma x = \sqrt{\frac{\Sigma(X^2)}{N} - \left(\frac{\Sigma X}{N}\right)^2}$$

$$= \sqrt{\frac{15,797,000}{12} - \left(\frac{12,325}{12}\right)^2}$$

$$= \sqrt{1,316,417 - 1,054,729}$$

$$= \sqrt{261,688}$$

$$= 512$$

$$\sigma y = \sqrt{\frac{\Sigma(Y^2)}{N} - \left(\frac{\Sigma Y}{N}\right)^2}$$

$$= \sqrt{\frac{1,381,500}{12} - \left(\frac{4,014}{12}\right)^2}$$

$$= \sqrt{115,125 - 11,600}$$

$$= \sqrt{3,525}$$

$$= 59$$

By substitution

$$r = \frac{p}{\sigma x \, \sigma y}$$

$$= \frac{27,315}{512 \times 59}$$

$$= \frac{27,315}{30,208}$$

$$= 90\%$$

APPENDIX IV(a)

II. COMPUTATIONS IN THE DETERMINATION OF THE CO-EFFICIENT OF CORRELATION BETWEEN CAPITAL AND REPAIR EXPENDITURES OF MACHINERY AND EQUIPMENT FOR BUSINESS ENTERPRISES

(IN APPROXIMATE FIGURES)

Year	Capital Expenditure ($ millions) X	Repair Expenditure ($ millions) Y	XY	X^2	Y^2
1946	548	462	254,000	300,000	213,000
1947	903	527	475,000	812,000	277,000
1948	1,062	604	642,000	1,130,000	362,000
1949	1,170	672	785,000	1,360,000	452,000
1950	1,253	734	920,000	1,560,000	540,000
1951	1,537	811	1,204,000	2,360,000	658,000
1952	1,684	876	1,480,000	2,840,000	770,000
1953	1,814	923	1,680,000	3,300,000	850,000
1954	1,582	916	1,450,000	2,500,000	840,000
1955	1,771	989	1,750,000	3,140,000	975,000
1956	2,323	1,130	2,640,000	5,400,000	1,280,000
1957	2,443	1,156	2,810,000	6,000,000	1,340,000
12	18,090	9,800	16,090,000	30,702,000	8,557,000

Source: Capital and Repair Expenditures Data Obtained from D.B.S., Private and Public Investment, 1946-1957.

Using the Product Moment Formula

$$r = \frac{p}{\sigma x \, \sigma y}$$

where r = the co-efficient of correlation

$$p = \frac{\Sigma(XY)}{N} - \left(\frac{\Sigma(X)}{N}\right)\left(\frac{\Sigma(Y)}{N}\right)$$

$$= \frac{16,090,000}{12} - \left(\frac{18,090}{12}\right)\left(\frac{9,800}{12}\right)$$

$$= 1,340,833 - 1,234,036$$

$$= 106,797$$

$$\sigma x = \sqrt{\frac{\Sigma(X^2)}{N} - \left(\frac{\Sigma X}{N}\right)^2}$$

$$= \sqrt{\frac{30,702,000}{12} - \left(\frac{18,090}{12}\right)^2}$$

$$= \sqrt{2,358,500 - 2,305,000}$$

$$= \sqrt{253,500}$$

$$= 503$$

$$\sigma y = \sqrt{\frac{\Sigma(Y^2)}{N} - \left(\frac{\Sigma Y}{N}\right)^2}$$

$$= \sqrt{\frac{8,557,000}{12} - \left(\frac{9,800}{12}\right)^2}$$

$$= \sqrt{713,083 - 667,500}$$

$$= \sqrt{45,583}$$

$$= 213$$

By substitution

$$r = \frac{p}{\sigma x \ \sigma y}$$

$$= \frac{106,797}{503 \times 213}$$

$$= \frac{106,797}{107.139}$$

$$= 99.5\%$$

APPENDIX IV(b)

I. COMPUTATIONS IN THE DETERMINATION OF THE CO-EFFICIENT OF CORRELATION BETWEEN CAPITAL AND REPAIR EXPENDITURES OF CONSTRUCTION FOR MANUFACTURING

(IN APPROXIMATE FIGURES)

Year	Capital Expenditure ($ millions) X	Repair Expenditure ($ millions) Y	XY	X^2	Y^2
1946	132	57	7,520	17,400	3,250
1947	185	62	11,500	34,200	3,850
1948	181	76	13,800	32,700	5,870
1949	157	70	11,000	24,600	4,900
1950	135	68	9,150	18,200	4,620
1951	268	85	22,700	72,000	7,220
1952	344	95	32,600	118,000	9,000
1953	325	95	30,900	106,000	9,000
1954	288	98	28,300	83,000	9,600
1955	345	100	34,500	119,000	10,000
1956	488	112	54,600	238,000	12,600
1957	520	115	59,800	270,000	13,200
12	3,368	1,033	316,370	1,133,100	93,020

Source: Capital and Repair Expenditures Data Obtained from D.B.S., Private and Public Investment, 1946-1957.

Using the Product Moment Formula

$$r = \frac{p}{\sigma x \, \sigma y}$$

where r = the co-efficient of correlation

$$p = \frac{\Sigma(XY)}{N} - \left(\frac{\Sigma(X)}{N}\right)\left(\frac{\Sigma(Y)}{N}\right)$$

$$= \frac{316,370}{12} - \left(\frac{3,368}{12}\right)\left(\frac{1,033}{12}\right)$$

$$= 26,364 - 24,166$$

$$= 2,198$$

$$\sigma x = \sqrt{\frac{\Sigma(X^2)}{N} - \left(\frac{\Sigma X}{N}\right)^2}$$

$$= \sqrt{\frac{1,133,100}{12} - \left(\frac{3,368}{12}\right)^2}$$

$$= \sqrt{94,425 - 78,960}$$

$$= \sqrt{15,465}$$

$$= 124$$

$$\sigma y = \sqrt{\frac{\Sigma(Y^2)}{N} - \left(\frac{\Sigma Y}{N}\right)^2}$$

$$= \sqrt{\frac{93,020}{12} - \left(\frac{1,033}{12}\right)^2}$$

$$= \sqrt{7,752 - 7,396}$$

$$= \sqrt{356}$$

$$= 18.87$$

By substitution

$$r = \frac{p}{\sigma x \, \sigma y}$$

$$= \frac{2,198}{124 \times 18.87}$$

$$= \frac{2,198}{2,339}$$

$$= 94\%$$

APPENDIX IV(b)

II. COMPUTATIONS IN THE DETERMINATION OF THE CO-EFFICIENT OF CORRELATION BETWEEN CAPITAL AND REPAIR EXPENDITURES OF MACHINERY AND EQUIPMENT FOR MANUFACTURING

(IN APPROXIMATE FIGURES)

Year	Capital Expenditure ($ millions) X	Repair Expenditure ($ millions) Y	XY	X^2	Y^2
1946	205	164	33,500	42,000	26,900
1947	343	211	72,600	118,000	44,500
1948	392	253	99,000	154,000	64,000
1949	379	269	102,000	144,000	72,100
1950	367	279	102,000	134,000	78,000
1951	525	337	177,000	275,000	114,000
1952	629	364	227,000	395,000	132,000
1953	644	385	248,000	414,000	148,000
1954	634	391	248,000	402,000	153,000
1955	102	413	249,000	363,000	171,000
1956	906	466	421,000	820,000	217,000
1957	959	498	476,000	920,000	248,000
12	6,585	4,030	2,455,100	4,181,000	1,468,500

Source: Capital and Repair Expenditures Data Obtained from D.B.S., Private and Public Investment, 1946-1957.

Using the Product Moment Formula

$$r = \frac{p}{\sigma x \; \sigma y}$$

where r = the coefficient of correlation

$$p = \frac{\Sigma(XY)}{N} - \left(\frac{\Sigma(X)}{N}\right)\left(\frac{\Sigma(Y)}{N}\right)$$

$$= \frac{2,455,100}{12} - \left(\frac{6,585}{12}\right)\left(\frac{4,030}{12}\right)$$

$$= 204,592 - 184,464$$

$$= 20,128$$

$$\sigma x = \sqrt{\frac{\Sigma(X^2)}{N} - \left(\frac{\Sigma X}{N}\right)^2}$$

$$= \sqrt{\frac{4,181,000}{12} - \left(\frac{6,585}{12}\right)^2}$$

$$= \sqrt{348,417 - 301,400}$$

$$= \sqrt{47,017}$$

$$= 217$$

$$\sigma y = \sqrt{\frac{\Sigma(Y^2)}{N} - \left(\frac{\Sigma Y}{N}\right)^2}$$

$$= \sqrt{\frac{1,468,500}{12} - \left(\frac{4,030}{12}\right)^2}$$

$$= \sqrt{122,375 - 112,900}$$

$$= \sqrt{9,475}$$

$$= 97.34$$

By substitution

$$r = \frac{p}{\sigma x \, \sigma y}$$

$$= \frac{20{,}128}{217 \times 97.34}$$

$$= \frac{20{,}128}{21{,}124}$$

$$= 95\%$$

APPENDIX IV(c)

I. COMPUTATIONS IN THE DETERMINATION OF THE CO-EFFICIENT OF CORRELATION BETWEEN CAPITAL AND REPAIR EXPENDITURES OF CONSTRUCTION FOR THE PAPER INDUSTRY

(IN APPROXIMATE FIGURES)

Year	Capital Expenditure ($ millions) X	Repair Expenditure ($ millions) Y	XY	X^2	Y^2
1946	27.2	5.3	144	740	28
1947	31.2	6.4	200	972	41
1948	29.1	7.0	203	845	49
1949	26.8	8.7	233	720	76
1950	21.1	8.0	168	445	64
1951	41.9	9.7	405	1,760	94
1952	33.6	8.3	280	1,130	69
1953	22.5	7.0	158	505	49
1954	21.6	8.2	178	466	67
1955	33.1	8.9	295	1,100	79
1956	85.1	10.3	873	7,230	106
1957	66.3	8.1	537	4,400	66
12	439.5	95.9	3,674	20,313	788

Source: Capital and Repair Expenditures Data Obtained from D.B.S., Private and Public Investment, 1946-1957.

Using the Product Moment Formula

$$r = \frac{p}{\sigma x \, \sigma y}$$

where r = the co-efficient of correlation

$$p = \frac{\Sigma(XY)}{N} - \left(\frac{\Sigma(X)}{N}\right)\left(\frac{\Sigma(Y)}{N}\right)$$

$$= \frac{3,674}{12} - \left(\frac{439.5}{12}\right)\left(\frac{95.9}{12}\right)$$

$$= 306 - 292.8$$

$$= 13.2$$

$$\sigma x = \sqrt{\frac{\Sigma(X^2)}{N} - \left(\frac{\Sigma X}{N}\right)^2}$$

$$= \sqrt{\frac{20,313}{12} - \left(\frac{439.5}{12}\right)^2}$$

$$= \sqrt{1,693 - 1,340}$$

$$= \sqrt{353}$$

$$= 18.79$$

$$\sigma y = \sqrt{\frac{\Sigma(Y^2)}{N} - \left(\frac{\Sigma Y}{N}\right)^2}$$

$$= \sqrt{\frac{788}{12} - \left(\frac{95.9}{12}\right)^2}$$

$$= \sqrt{65.7 - 64}$$

$$= \sqrt{1.7}$$

$$= 1,304$$

By substitution

$$r = \frac{p}{\sigma x \, \sigma y}$$

$$= \frac{13.2}{18.79 \times 1.304}$$

$$= \frac{13.2}{24.5}$$

$$= 54\%$$

APPENDIX IV(c)

II. COMPUTATIONS IN THE DETERMINATION OF THE CO-EFFICIENT OF CORRELATION BETWEEN CAPITAL AND REPAIR EXPENDITURES OF MACHINERY AND EQUIPMENT FOR THE PAPER INDUSTRY

(IN APPROXIMATE FIGURES)

Year	Capital Expenditure ($ millions) X	Repair Expenditure ($ millions) Y	XY	X^2	Y^2
1946	27.8	28.4	790	772	815
1947	49.8	37.3	1,850	2,400	1,390
1948	60.4	47.3	2,850	3,650	2,240
1949	54.7	51.1	2,800	2,990	2,610
1950	57.4	51.7	2,960	3,290	2,670
1951	83.4	69.1	5,750	6,940	4,800
1952	95.9	72.3	7,240	9,200	5,220
1953	81.6	69.7	5,660	6,660	4,850
1954	65.7	75.1	4,940	4,320	5,650
1955	105.8	75.1	7,920	11,200	5,650
1956	172.3	85.6	14,700	29,200	7,330
1957	200.0	90.1	18,000	40,000	8,120
12	1,054.8	752.8	75,460	120,622	51,345

Source: Capital and Repair Expenditures Data Obtained from D.B.S., Private and Public Investment, 1946-1957.

Using the Product Moment Formula

$$r = \frac{p}{\sigma x \, \sigma y}$$

where r = the co-efficient of correlation

$$p = \frac{\Sigma(XY)}{N} - \left(\frac{\Sigma(X)}{N}\right)\left(\frac{\Sigma(Y)}{N}\right)$$

$$= \frac{75,460}{12} - \left(\frac{1,054.8}{12}\right)\left(\frac{752.8}{12}\right)$$

$$= 6,288 - 5,514$$

$$= 774$$

$$\sigma x = \sqrt{\frac{\Sigma(X^2)}{N} - \left(\frac{\Sigma X}{N}\right)^2}$$

$$= \sqrt{\frac{120,622}{12} - \left(\frac{1,054.8}{12}\right)^2}$$

$$= \sqrt{10,052 - 7,726}$$

$$= \sqrt{2,326}$$

$$= 48.23$$

$$\sigma y = \sqrt{\frac{\Sigma(Y^2)}{N} - \left(\frac{\Sigma Y}{N}\right)^2}$$

$$= \sqrt{\frac{51,345}{12} - \left(\frac{752.8}{12}\right)^2}$$

$$= \sqrt{4,279 - 3,931}$$

$$= \sqrt{348}$$

$$= 18.65$$

By substitution

$$r = \frac{p}{\sigma x \ \sigma y}$$

$$= \frac{774}{48.23 \times 18.65}$$

$$= \frac{774}{899.5}$$

$$= 86\%$$

APPENDIX V

ESTIMATION OF THE ANTICIPATED CAPITAL AND REPAIR EXPENDITURES FOR THE PAPER INDUSTRY IN BRITISH COLUMBIA, 1963, -- AN ILLUSTRATION OF THE "BLOW-UP" TECHNIQUE

(IN THOUSANDS OF DOLLARS)

British Columbia	CAPITAL		REPAIR	
	Construction	Machinery	Construction	Machinery
	Total G.V.P. / Reported G.V.P. = 294,084 / 285,659 = 1.0295 Blow-Up Factor			
Reported Expenditures	14,777	55,716	3,344	14,673
Inflated Expenditures	15,213	57,360	3,443	15,106
Add: Firms without G.V.P.	5,100	18,894	25	1,794
New Firms				
Total Expenditures	20,313	76,254	3,468	16,900

Source: Data and Format supplied by the Business Finance Division of the Dominion Bureau of Statistics