POTENTIAL OUTPUT IN THE ONTARIO ECONOMY

TO 1977

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A Thesis

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by

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ABSTRACT

This study has been undertaken in recognition of the void
that exists in analyzing economies at the sub-national level.
As provincial economies have become more sophisticated and complex,
and provincial governments more concerned about their role in influ-
encing economic growth, the obvious lack of a sound framework for
analysis has become strikingly obvious.

Despite the fact that Statistics Canada (formerly the Dominion
Bureau of Statistics) has created one of the most comprehensive sets
of national accounts of any industrialized nation, little has been
done to extend this system to the provincial or regional level.

The pursuit of appropriate economic policy requires additionally
some means of measuring the performance of the economy. Over the
past decade, the body of research into potential output--the volume
of production consistent with full utilization of an economy's
resources--has increased dramatically at the national level. The
development of techniques for measuring performance would serve
well at the provincial level as well, provided the basic foundation
for measurement were available.

This thesis attempts to develop such a technique, in large
part based upon the work which has gone on before. The evolution
of the study begins with an examination of economic accounting concepts
at the national level, proceeding to a discussion of the applicability

of these to the provincial setting. Various efforts at provincial

accounting are discussed, finally leading to the basic approach to

the measurement of real production which is adopted in this thesis.

The detailed methodology is outlined, setting out at the same

time two separate sets of indexes of real production consistent with

the 1948 and 1960 standard industrial classifications. These cover

the entire post-war period from 1947 onward and represent the bulk

of the data available on a reasonably consistent historical basis.

The final establishment of statistical real production series

is followed by an examination of population and labour force trends

to establish likely growth over the period to 1977 under considera-

tion. Such trends then form part of the basis for the derivation

of estimated potential output in the Ontario economy. This measure

of potential provides the framework for the evaluation of economic

performance.

By virtue of the tremendous problems inherent in this type

of undertaking on a provincial basis, all results are presented

without any claim to infallibility. Only when there is complete

co-operation among the various government bodies charged with

providing the statistical and analytical tools for evaluating problems

and policies will it be possible to achieve the desired level of

confidence in the statistical measures.

In the course of establishing provincial indexes of real
production in Ontario, it has been observed that Ontario's prominent
position in Canada has resulted in it exerting a strong influence
on national trends. Ontario experienced the same characteristic
peaks and troughs in economic activity in the course of its secular
4.9 per cent trend rate of growth over the period 1947 to 1970.
During the period 1961 to 1970, when conditions were extremely buoyant
due to the demand pressures generated largely in the United States,
Ontario's trend rate of growth in real production approached six
per cent annually.

The indexes of real production reveal that the main generators
of growth in the Ontario economy have been manufacturing and electric
power, gas and water utilities, two of the important components in
the important "index of industrial production" at the national level.
Their rapid advances have sustained a high rate of growth in the
goods producing industries category, which exceeded five per cent
annually over the 1947 to 1970 period.

The population and labour force analysis has been carried out
in accordance with accepted procedures. In the case of the former,
patterns of growth in mortality, fertility and migration reveal a
likely slowing in the growth of overall population in Ontario between
1971 and 1977. While the potential population of working age will
advance more rapidly than the population as a whole, its growth will
decelerate over the period in question. The application of estimated

labour force participation rates yields the expectation of annual
rises of between 2.6 per cent and 2.8 per cent in the total labour
force--down from the very large increases of the 1960's.

Based upon the expected more moderate demographic trends
for the 1970's, Ontario's potential output has been derived according
to the extrapolated linear growth method applied to the Canadian
setting by Drabble. According to the methodology adopted, the
expectation is that Ontario will have an annual potential rate of
growth of 5.1 per cent.

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CHAPTER I

INTRODUCTION

Economic growth has been the object of increasing attention over the past decade, particularly from the public sector. While concern over short run problems of economic deceleration or inflation has been --and continues to be--pre-eminent in the minds of economists and politicians alike, there has steadily evolved a growing awareness of the importance of longer-run growth characteristics. It has become more obvious that a broader perspective reveals much about an economy's capabilities, providing the framework for more enlightened contra-cyclical analysis and policy formulation.

Interest in longer run growth both as a perspective for stabilization policy and as a tool for economic goal setting has yielded a new focus of attention: the phenomenon of potential output. In arriving at a concept of an economy's potential, economists have created at the same time a guidepost against which to measure economic performance and a target for government economic policy.

It has been only within the last decade that serious work has been undertaken on a reasonably large scale to determine the potential of an economy. Arthur M. Okun, the eminent U.S. economist, laid out the concept of potential gross national product and an approach to its

measurement in an important milestone article.[1] In Canada, the potential and actual courses of the Canadian economy came under scrutiny in 1964 in a major study[2] which provided the methodological foundation for the First Annual Review of the newly created Economic Council of Canada. The latter contained estimates of potential output for the Canadian economy to 1970.

Economic potential is simply the rate of growth in real economic output (or the physical volume of output) which an economy is capable of attaining under assumptions of satisfactory utilization of available economic resources. A more elaborate description was provided in the above-mentioned First Annual Review: Economic Goals for Canada to 1970:

> The potential of an economy may be broadly defined as its inherent capacity for development or achievement. It generally refers to a calculated measure of the total volume of production consistent with reasonably full and efficient use of the economic resources available to a nation. Thus it is essentially a measurement of the supply factors and capabilities of the economy, and assumes that the favourable and appropriate demand conditions necessary for its actual achievement can be generated.[3]

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[1]Arthur M. Okun, "Potential GNP: Its Measurement and Significance," Proceedings of the Business and Economic Statistics Section, American Statistical Association, Washington, 1962.

[2]B. J. Drabble, Potential Output 1946 to 1970, Staff Study No. 2, Economic Council of Canada (Ottawa: Queen's Printer, 1964).

[3]Economic Council of Canada, First Annual Review: Economic Goals for Canada to 1970 (Ottawa: Queen's Printer, 1964), p. 31.

The methods of measurement used to arrive at estimated potential output will be discussed in Chapter VI.

Concern with economic growth and stabilization policy has not been limited to national governments alone. In economic terms, Canada is not one homogeneous entity, but a nation of five distinct regions (and ten individual provincial authorities). Each is different in certain respects, such as the size and characteristics of its population, physical size, natural resource endowment, degree of industrial development and extent of urbanization. Within the context of its authority, each provincial government strives to promote rising income and employment as well as industrial development to enhance the social and economic well-being of its residents. In attempting to optimize the utilization of its resources, each government implicitly or explicitly addresses itself to the same problems of identifying and striving for its economic potential.

I. OBJECTIVES

The objective of this study is to establish a methodology for measuring potential output in the Province of Ontario and to apply this methodology to the period ended 1977.

The difficulties associated with such a task tend to be considerably greater than those associated with the determination of national potential output. Problems are both conceptual and statistical in nature. On a conceptual basis, the major difficulties relate to

the fluidity which is characteristic of economic interactions between and among provinces. Whereas Canada, like any nation, has international boundaries which can inhibit mobility, there is relatively free access among the various provinces with their more open economies. Thus international transactions and goods movements may be checked and recorded, while interprovincial movements of commerce flow freely and totally unchecked.[4] This gives rise to problems of allocating measurements of production, consumption, imports and exports, to name just a few, to the specific province or region in question. A multi-establishment firm engaged in some form of economic activity across Canada actually divides its output among provinces: the difficulty is in allocating it. When examined from an income approach, corporate profits as recorded by a firm or enterprise may not be disaggregated according to establishment, consequently introducing problems of provincial allocation. Should profits be allocated to the "province of residence" of the head office? Or should profits be allocated according to some arbitrary factor which attempts to reflect the different proportions of output by province? Such problems remain among the most difficult of all regional accounting concerns.

On a statistical basis, provincial accounts suffer from tremendous gaps in available information. Statistics Canada (formerly the Dominion Bureau of Statistics) is overwhelmingly the major data

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[4]The existence of sales tax differentials in neighbouring provincial border cities or towns has in the past led to difficulties because of interprovincial mobility.

gathering organ in Canada. As an instrument of the federal government it has naturally emphasized aggregate data at the national level. While it has in many cases gathered provincial data in order to aggregate to the national level, in many instances financial considerations have forced it to either forsake or gloss over detailed provincial data. Price information, for one, is almost totally national in nature; the major exception is the Consumer Price Index, which provides details of consumer prices for ten major urban centres across Canada (including Toronto and Ottawa in Ontario).

In recognition of the above-mentioned difficulties, this examination of potential output for Ontario does not purport to develop miraculous solutions to perplexing problems. The study was borne out of the awareness that provincial data--particularly for volumes of output--are woefully inadequate. It acknowledges that simplifying assumptions and "second best" solutions must be adopted in the absence of available comprehensive regional measures. Nevertheless, each step forward in terms of data examination and manipulation does contribute to the existing body of information[5] used for provincial policy formulation and decision-making. So long as the deficiencies are recognized and acknowledged, the pitfalls of misinterpretation or of bestowing misplaced confidence in the results can be avoided.

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[5]Since the early 1960's a number of studies have been completed which attempt to derive provincial accounts for various provinces. In some instances these include the use of econometric techniques and input/output analysis.

II. METHODOLOGICAL FOUNDATIONS

In attempting to estimate potential output for the Province of Ontario, it has been necessary to go beyond the usual aggregate measures available on a provincial basis--typically personal income and unemployment--and to develop estimated indexes of Ontario real domestic product. Only with such indexes has it been possible to derive estimates of potential industrial output.

The approach employed in this study is eclectic in nature, drawing from a number of relevant studies. In particular, the derivation of indexes of real domestic product on a provincial basis makes use of much of the methodology employed in a significant study by W. G. R. Cameron for the Government of Ontario.[6]

The derivation of potential output has been based largely upon the work of B. J. Drabble[7] which initially formed the basis for analysis by the Economic Council of Canada. That study examined post World War II measures of Canada's industrial output and output per person employed. The adoption of given rates of unemployment to represent "full employment"[8] permitted the calculation of potential "full

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[6]W. G. R. Cameron, "Preliminary Indexes of Production in Ontario," Ontario Economic Review (October, 1964).

[7]Drabble, op. cit.

[8]The concept of full employment must allow for some frictional unemployment, or unemployment due to norr 1 job-turnover, even under ideal conditions.

employment" output, assuming equivalent productivity under full re-
source utilization.[9] Exponential trends provided the basis for
projecting potential output per employed person to the "target year"
1970.

This study, in encompassing the period to 1977, has adopted an
equivalent time span of approximately seven years (from the last year
of available data to the target year).

Population and employment data have, to a certain extent, been
drawn from various Government of Ontario publications.

III. STUDY OUTLINE

Chapter II is the first of three chapters which deal with the
fundamental economic data base. It examines the various types of
economic statistics available at the national level and distinguishes
among various methods of aggregate economic accounting.

In Chapter III attention is turned to the relationship between
data concepts at the national and provincial levels. Problems of

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[9]Reliance upon a sole labour input measurement raises obvious
questions concerning the roles of capital, land and other contri-
butors to rising output. Pioneering work on sources of growth has
been carried out by E. F. Denison and has more recently been adapted
to the Canadian setting by Dorothy Walters of the Economic Council
of Canada. While the pros and cons of these approaches have been
subject to debate, there are obviously numerous advantages to the
inclusion of other-than-labour inputs. Unfortunately, the total
absence of adequate capital stock data for Ontario has prevented the
isolation of capital's contribution to economic growth. All pro-
ductivity is simply represented as a function of the labour input.

regional accounting are examined. In the concluding portion of the chapter a brief summary is presented of various efforts at provincial accounts.

Following directly upon this discussion, Chapter IV outlines the methodology employed in arriving at an Ontario index of production.

A discussion of population and labour force is the subject of Chapter V, providing the additional elements needed for the ultimate consideration of potential output, which is undertaken in Chapter VI.

Chapter VII evaluates the general results of the derivation of Ontario's potential output, commenting on possible avenues of interest for public policy.

CHAPTER II

OUTPUT MEASUREMENT: THE DATA BASE

The measurement of output is of vital importance to this study
because it is a basic "building block" upon which rests the validity
of much of the analysis.   It is a complex subject which normally is
associated with aggregate analysis at a national level.   By examining
the various approaches to total output measurement for a nation, it
may be possible to determine the most appropriate approach for provin-
cial or regional analysis.

I.   GROSS NATIONAL PRODUCT

Total output has always been most closely associated with the
concept of gross national product.   Defined as the total value of
goods and services produced by the residents[1] of a country, gross
national product (or G.N.P.) actually is equivalent to each side of the
identity

Total Income = Total Expenditure

and represents an overall measurement of a country's level of economic
activity.   According to National Accounts, Income and Expenditure,
1926-1956:

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[1]"Residents" refers to individuals and institutions such
as government agencies, corporations and non-profit institutions
normally resident in Canada.

The concept of product which forms the keystone of the
National Accounts is known as the Gross National Product
at market price. It is the market value of the unduplicated
total of goods and services produced in a given period
(usually a year or a quarter) within the boundaries of pro-
duction as defined above by Canadian residents. It is pos-
sible to measure the Gross National Product in at least two
different ways. The first is by measuring the unduplicated
expenditure of Canadians plus exports and subtracting imports;
the second is to add together the incomes of Canadian residents
from the production of goods and services (the National Income),
indirect taxes less subsidies on production and imported goods,
and capital consumption allowances.[2]

This approach to the measurement of national economic activity

emphasizes the boundaries of production owned by Canadian residents.

It remains the cornerstone of modern aggregate statistics.[3]

The items shown on page 11 make up the gross national expendi-

ture and income accounts. "Gross national product" refers to the

exact income counterpart to gross national expenditure.

A statistical series on personal income, which incorporates

select income components, is often used as a measure of economic

[2]Dominion Bureau of Statistics, National Accounts, Income and
Expenditure, 1926-1956 (Ottawa: Queen's Printer, 1962), p. 107.

[3]It does so despite recently-growing concern that modern
accounts are inadequate to reflect the damage to the environment
that often accompanies the creation of goods and services. In an
article on this subject, Edward Denison acknowledged the desirability
of a comprehensive welfare-oriented set of accounts, but was careful
to point out that national product accounts are intended to measure
output and not the much less precise concept of welfare. See Edward
F. Denison, "Welfare Measurement and the G.N.P.," Survey of Current
Business (January, 1971), p. 13.

Income Approach:

Wages, salaries, and supplementary labour income

Military pay and allowances

Corporation profits before taxes

Deduct: dividends paid to non-residents

Interest, and miscellaneous investment income

Accrued net income of farm operators from farm production

Net income of non-farm unincorporated business including rent

Inventory valuation adjustment

NET NATIONAL INCOME AT FACTOR COST

Indirect taxes less subsidies

Capital consumption allowances and miscellaneous valuation adjustments

Residual error of estimate

GROSS NATIONAL PRODUCT AT MARKET PRICES

Expenditure Approach:

Personal expenditure on consumer goods and services

Government current expenditure on goods and services

Gross fixed capital formation

Government
  Residential construction
  Non-residential construction
  Machinery and equipment

Business
  Residential construction
  Non-residential construction
  Machinery and equipment

Value of physical change in inventories

Government

Business:
  Non-farm
  Farm and grain in commercial channels

Exports of goods and services

Deduct: Imports of goods and services

Residual error of estimate

GROSS NATIONAL EXPENDITURE AT MARKET PRICES

welfare at both the national and provincial level. It is obtained

by adjusting "net national income at factor cost" in the following way:

(1) Add transfer payments (excluding interest on the public

debt and charitable contributions from corporations).

(2) Add interest on the public debt.

(3) Deduct earnings not paid out to persons (undistributed

corporation profits, corporation profits taxes, withholding

taxes, government investment income, adjustment on grain trans-

actions, inventory valuation adjustment, and employer and

employee contributions to social insurance and government

pension funds).

II. GROSS DOMESTIC PRODUCT

Gross domestic product (or G.D.P.) is defined as the value of

goods and services produced within a nation's geographic boundaries,

regardless of the ownership of the means of production. Like gross

national product, it is one of the major comprehensive measures of

aggregate economic activity.

Other things being equal, gross domestic product differs

from gross national product in measuring output physically produced

in Canada rather than output produced by Canadians (whether occur-

ring in Canada or in other countries).

The reconciliation between "gross national product at market

prices" and "gross domestic product at market prices" is accomplished

in the following way: adjust gross national product at market prices

by deducting income received from non-residents and by adding income paid to non-residents. This yields gross domestic product at market prices.

Because of statistical problems, Canadian national accounts have available only investment income data to effect this reconciliation. Conceptually, other items should be included such as rental income, labour income and undistributed profits accruing on behalf of non-resident stockholders.

While G.D.P. can be arrived at by modification of G.N.P., it is usually used at a more disaggregated level in connection with the output of individual industry groups.

III. ADDITIONAL CONCEPTS

"Market Prices" versus "Factor Cost"

An important distinction in major output measurements rests in the use of the terms "at market prices" and "at factor cost." Output measured at market prices includes indirect taxes (less subsidies); output at factor cost excludes them.

Indirect taxes are a part of the market price of goods and services which is not received by factors of production. As such, net national income which indicates returns to the factors of production is measured at factor cost. Similarly, gross domestic product is usually taken at factor cost insofar as it is usually used to indicate factor income by industry group on a domestic basis.

It is therefore usually measured net of indirect taxes (less subsidies).

The indirect taxes referred to include federal excise taxes, excise duties and customs import duties; provincial retail sales taxes, gasoline taxes, motor vehicle licenses and permits, profits of liquor commissions and miscellaneous natural resource taxes; and local real and personal property taxes.

Value Added

The concept of value added by industry (or industry group) relates to the relative contribution made by each industry (or industry group) to total gross domestic product. Gross domestic product at factor cost is the sum of value added by all industries.

Value added can be measured directly by summing the factor incomes--land, labour, capital and entrepreneurship--and capital consumption allowances paid or charged by each industry; or indirectly by subtracting all intermediate goods and services from the revenue arising from the production of goods and services in each industry.

The use of this concept isolates each industry's contribution and prevents double counting by identifying each industry's contribution regardless of the interrelationships of inputs and outputs of different industries.

Industries and Industrial Production

It is possible to view the concept of value added according to the contribution of each sector of the economy (personal, government, business and non-resident). However, it is more closely associated with production on an industry (or industry group) basis.

According to National Accounts, Income and Expenditure, 1926-1956:

> An industry is a group of establishments which have sufficient common characteristics that they may be grouped together for analytical purposes.[4]

The assignment of establishments to specific industries is set forth according to the standard industrial classification. Establishments engaged in the production of goods and services are allocated to industry classes according to their principal product or activity. These groupings are not influenced by who carries on the activity (it may be a government agency or business enterprise) or by the distinction of profitability or non-profitability.

The Standard Industrial Classification Manual is employed in Canada to describe and to distinguish among the various industries. Changes in organization and technology which may create the need for changes in or additions to defined industries are accommodated by

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[4]Dominion Bureau of Statistics, op. cit., p. 134.

periodic revisions of the Manual.[5] Post World War II statistics are

in most cases linked to the 1948 and 1960 classifications. According

to the 1960 classification, total industrial output in Canada con-

sists of eleven divisions, as indicated below.

Division Number	Division Name
1	Agriculture
2	Forestry
3	Fishing and trapping
4	Mines, quarries and oil wells
5	Manufacturing
6	Construction industry
7	Transportation, communications and other utilities
8	Trade
9	Finance, insurance and real estate
10	Community, business and personal service
11	Public administration and defence.

Each division may consist of a number of "major groups" which,

in turn, are made up of smaller groups or individual industries.

The Establishment Concept

The establishment is the basic unit used to define an industry.

It must be able to report statistics on the value of its output; its

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[5]Dominion Bureau of Statistics, Standard Industrial Classifi-
cation Manual (Ottawa: Queen's Printer, 1948); also 1960 and 1970.

cost of materials, process supplies, fuel, and electricity; and its employment and payroll. It is not expected to be able to report the overhead costs charged to it and, therefore, its profit. By virtue of these requirements, the establishment is used as a basic statistical and analytical tool. Accordingly, industries are made up of those establishments whose principal activity yields value added which could be classified to that specific industry.

It should be noted, however, that some of the output or activities of an establishment may not relate to the product or activities for which an industry assignment has been made. Nevertheless, the total value of all output of an establishment classified to a specific industry is ascribed to that particular industry.[6]

The establishment basis of classification is employed in the census of industry which is a major source of industry information.[7]

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[6]This concept of main activity versus total activity reflects a breaking point in the standard industrial classification. According to the new 1960 standard industrial classification, data gathered on an establishment basis are to be collected and tabulated for all activities of each establishment and not just the main activity, as had been the case for many of the surveys used in the 1948 standard industrial classification.

[7]See especially Dominion Bureau of Statistics, Manufacturing Industries of Canada, and Survey of Production. The former presents detailed information on manufacturing industries at a disaggregated level while the latter provides census value added by province for major commodity-producing industries.

Value added for each establishment is arrived at indirectly, that is,
by subtracting intermediate goods and services from each establish-
ment's revenue arising from the production of goods and services.
Unfortunately, it is not possible to obtain information on all
intermediate services on an establishment basis and the resulting
"census value added" must be taken as only an approximation of gross
domestic product at factor cost. As explained in Survey of Production:

> Census value added is obtained by deducting from gross value
> (exclusive of excise and other sales taxes) of shipments
> (adjusted for changes in inventory of finished goods and
> goods-in-process) or accrued operating revenue, the cost
> of intermediate materials and process supplies used, fuel
> and electricity consumed and customs charges.[8]

Census value added thus differs from gross domestic product by
containing miscellaneous indirect taxes such as licenses and property
taxes as well as the cost of such services as insurance, advertising
and communications which originate in the service-producing industries.
As a result census value added for a particular industry exceeds the
corresponding G.D.P. at factor cost.

The Enterprise

An alternative to the establishment basis of industrial
classification is represented by the enterprise (or company). An

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[8]Dominion Bureau of Statistics, Survey of Production, 1969
(Ottawa: Information Canada (formerly Queen's Printer), 1971), p. 7.

enterprise is taken to be the business unit which files a separate taxation return and for which corporation profits and other items are tabulated separately.

Because enterprise data must be comprehensive for taxation and accounting purposes, it is possible to obtain all components of value added for an enterprise, including financial statistics such as profits and overhead costs. Enterprise data are in some instances inadequate for industry analysis, however, since an enter-. prise may consist of more than one establishment. Each establishment of a multi-establishment company could conceivably be classified to a different industry, rendering the enterprise data (particularly financial data) inappropriate for production studies.

In actuality, enterprise data are used in Canada's National Accounts to fill the data gaps created by the absence of establishment-based statistics. Gross domestic product is based upon labour income and inventory valuation adjustment data on an establishment basis; and upon enterprise-based statistics on corporation profits, rent, interest, miscellaneous investment income, net income of unincorporated business, capital consumption allowances and miscellaneous valuation adjustments.[9]

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[9]Dominion Bureau of Statistics, National Accounts, Income and Expenditure, 1926-1956, p. 56 and pp. 135-137. Combined enterprise and establishment data were also used to estimate gross domestic product at factor cost on a comprehensive basis in Dominion Bureau of Statistics, The Inter-Industry Flow of Goods and Services, Canada, 1949 (Ottawa: Queen's Printer, 1956).

Because enterprise data are used, manufacturing enterprises which are integrated forward into retailing, wholesaling or other service industries, or backward into resource industries will show a larger proportion of productive resources engaged in manufacturing than would have been the case were establishment data available for all aspects of value added.

Output in Constant Dollars

Changes in the value of output over time represent the combined effect of two basic factors; price changes and changes in the actual volume of output. While value-based statistics--such as those discussed earlier--serve a useful purpose, detailed analysis of aggregate data requires that price and volume movements be isolated to permit the examination of their magnitudes and interaction.

Price deflation is the means by which the value of output is revalued on a constant dollar basis; that is, the quantities implicit in the current value are expressed in base-period prices. This representation of changing volumes of output over time is possible because all physical volumes are expressed in common terms: constant dollar value of output.[10] Otherwise, it would not be possible to represent

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[10]Some physical volumes appear in index form, but are essentially derived from a constant dollar series of values.

physical volumes at an aggregate level, since there is no common unit aside from dollar value which can properly sum the diverse units of physical measurement. For example, bushels of wheat and tons of steel can not be combined unless it is on a dollar value basis.

The technique of deflation involves selecting an appropriate price base year and deflating values to arrive at a volume of output measured in the prices of that base year. At various times throughout the past several decades the price bases have been: the average of 1935-1939; 1949; 1957; and 1961. Individual series are linked at appropriate years where data on two separate bases overlap.

The most desirable form of price index is one which is currently weighted; that is, where the weights for individual components in a given year reflect the distribution of expenditure in that year. Most existing methods of deflation use these current weights.

Two major measures of output in particular are represented in physical volume terms. These are gross national expenditure and real domestic product. The former is represented in terms of 1961 prices while the latter is published as an index of physical output in which the 1961 volume is equated with 100.

The representation of gross national expenditure is carried out by disaggregating the current values to the maximum extent possible. As explained in the National Accounts,[11] each expenditure item defined

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[11]Dominion Bureau of Statistics, op. cit., p. 177.

is then deflated by an appropriate individual price index. That

index is so constructed as to reflect the commodity content and

weighting pattern of the value data. The resulting constant dollar

values of individual items are then combined to form the major

aggregates of gross national expenditure, such as personal expenditure

on consumer goods and services, government current expenditure on

goods and services and so on. These totals yield gross national

expenditure in constant (say, 1961) dollars. Implicit price indexes

are the result of the division of current dollar expenditure by con-

stant dollar expenditure for any or all of the major expenditure

categories. Such indexes reflect the combined effects of price

changes and changing expenditure patterns. In the absence of pro-

nounced expenditure pattern changes, implicit price indexes fairly

reflect price changes over time.

The measurement of real domestic product[12] is a second major

area where output is represented in volume terms. Unlike the income

and expenditure approach, real domestic product estimation is based

solely upon the establishment concept and thus, even for the base

year, is not perfectly comparable with gross domestic product esti-

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[12]This represents gross domestic product measured in quantity
or constant dollar terms.

mates arising out of the former approach.[13]

Although it is theoretically possible, as explained earlier, to measure gross domestic product by industry by either direct or indirect means,[14] only the indirect approach is feasible in measuring gross domestic product in constant dollars. The direct approach of summing factor costs and capital consumption allowances by industry falls short because of the difficulty of obtaining deflators for such factors as profits and other investment income.

The indirect approach is used when estimating constant dollar G.D.P., adjusted according to a "double deflation" technique. Intermediate material and service inputs are deflated and valued at base period prices; and this is subtracted from the total output (or adjusted shipments) which is also represented in deflated base period prices. This method permits the use of currently weighted price indexes, typically represented by individual industry and commodity selling price indexes. The difference between deflated total output and deflated intermediate inputs is a measure of deflated value added.

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[13]While gross domestic product at factor cost for 1961 has been reconciled to the same total for both approaches at the highest level of aggregation, values for individual industries and industry groups differ because of the previously-explained differences in the establishment and enterprise bases of data gathering.

[14]Cf. _ante_, p. 14.

In reality, the measurement of real domestic product is fully
comprehensive only for the base year. Since the late 1940's there
have been two major studies of gross domestic product,[15] the results
of which have established the industry G.D.P. values and base weights
used for combining R.D.P. component industries. In other years a va-
riety of techniques have been used to arrive at estimates of real do-
mestic product.[16] The bases of estimation have been census value added,
gross output, material input and labour input, with gross output
representing the means of estimating approximately one half of the
1949 G.D.P.[17] Continuing improvements in measurement techniques
have reduced the reliance upon gross output indicators and increased
the emphasis upon the more appropriate net output indicators.[18]

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[15]Dominion Bureau of Statistics, The Inter-Industry Flow
of Goods and Services, Canada, 1949 (Ottawa: Queen's Printer, 1956);
and Dominion Bureau of Statistics, The Input-Output Structure of the
Canadian Economy, 1961 (Ottawa: Queen's Printer, 1969).

[16]See Dominion Bureau of Statistics, Indexes of Real Domestic
Product by Industry of Origin, 1935-61 (Ottawa: Queen's Printer, 1963),
Appendix B, pp. 103-123. Aside from annual or bench-mark measures, a
variety of current measures are used to estimate monthly and quarterly
indexes. See ibid., pp. 125-131.

[17]Ibid., pp. 52-53.

[18]Gross output indicators declined from 50.6 per cent of
1961 G.D.P. to 44.2 per cent following recent improvements in data
availability. At the same time the role of net output indicators
rose from 25.4 per cent of 1961 G.D.P. to 32.8 per cent. See Dominion
Bureau of Statistics, Indexes of Real Domestic Product by Industry,
1961-1969, 1961=100 (Ottawa: Queen's Printer, 1971), pp. 15-17.

CHAPTER III

PROVINCIAL ECONOMIC ACCOUNTS

Despite deficiencies inherent in some of the economic measures
used at the national level, Canada's system of accounts ranks as one
of the finest and most comprehensive in the world today. This has
made it all the more desirable to have provincial and regional ag-
gregate data which are integral parts of the national system and which
can be furnished for provincial analysis on a basis consistent with
other provinces and Canada as a whole.

Unfortunately, complete provincial accounts are not prepared
by Statistics Canada, which is responsible for Canada's system of
accounts. Part of the reason is that national accounts--whether
considering income, expenditure or gross domestic product--do not
lend themselves conceptually to separation on a provincial basis.
As pointed out in Chapter I,[1] the two most difficult problems relate
to (1) the necessity of dealing with multi-establishment enterprises
which transcend provincial boundaries, and (2) the open nature of
provincial economies. At present only select components of personal
income as well as total personal income and total personal disposable

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[1]Cf. ante, pp. 3-4.

income are available directly from the national accounts[2] on a
provincial basis.

I. DEFICIENCIES OF NATIONAL DATA FOR PROVINCIAL ACCOUNTS

The transfer of the concept of "national" output (as opposed
to "domestic" output) to a provincial level raises anew the problems
associated with provincial boundaries. Since this concept relates
to the output of factors of production owned by residents of a partic-
ular province, it includes some production outside that province
coming from factors of production owned by residents and it must
exclude production in the province which is produced by factors of
production owned by non-residents (i.e., residents of other provinces
and non-Canadians). This problem is particularly acute with regard
to the return to capital.

The "domestic" concept appears to be more appropriate to
analysis at the provincial level since it refers to production
actually taking place in the specific province under examination.
Most industry data are gathered on this basis. In addition, statistics
related to domestic production by province tend to be based upon
factor cost, which is usually used in connection with gross domestic
product. This eliminates the requirement to examine indirect taxes,

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[2]Items included in total personal incor.. but not published
separately include: employer and employr: contributions to social
insurance and government pension funds, military pay and allowances,
and charitable contributions from corporations. See Dominion Bureau
of Statistics, National Accounts, Income and Expenditure, 1926-1956,
pp. 173-175.

which may differ from province to province and which create potential

dangers whereever it is necessary to derive individual provincial

statistics from national aggregates.

Use of the domestic concept, however, does have its shortcomings.

Ideally, establishment data should be used in deriving gross domestic

product. Estimates of G.D.P. published in National Accounts, Income

and Expenditure, 1926-1956 nevertheless are based upon both establish-

ment and enterprise data, since certain information is not available

from multi-establishment enterprises.[3] This need to deal with multi-

establishment enterprises creates greater problems at the provincial

level than at the national level, since the impact of distorted

allocation is all the more severe when part of a smaller universe.

In order to adhere to the domestic concept, various multi-establish-

ment enterprise data have to be allocated to individual provinces

by the best means possible.[4] In many instances this is necessarily

arbitrary.

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[3]Cf. ante, p. 4 and pp. 18-19.

[4]In recent years taxable income for a corporation, commonly
used in provincial accounts estimation, has been apportioned among
provinces by relating revenues and wages and salaries of a permanent
establishment in a particular province to the corporation's corre-
sponding Canadian revenues and wage and salary bill. For specific
formulation see Statistics Canada, Corporation Tax Statistics, 1969
(Ottawa: Queen's Printer, 1972), pp. 20-21.

Income and expenditure accounts, whether derived on a "national" or "domestic" basis, suffer from other deficiencies which must also be compensated for. For example, exports and imports are available with respect to international trade, but are not easily estimated from the point of view of a province. Again, while published provincial personal income information is very helpful in estimating the income side of the income and expenditure account, a comprehensive sectoral approach requires disaggregation of components of personal income by sector.

The problem of estimating real output (i.e., the volume of output in base year prices) compounds the difficulties already noted in compiling provincial economic accounts. Aside from consumer price indexes available for ten major Canadian cities (including Toronto and Ottawa in Ontario), there are no major aggregate price indexes available on a provincial or regional basis. Consumer prices have commonly been used as a deflator at the national level when attempting to deflate specific personal income measures; in some instances urban indexes have been used as a proxy for provincial deflators.[5]

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[5]In a 1966 study, S. E. Chernick devised a set of spatially and temporally interrelated consumer price indexes for all ten provinces, using a common set of commodities for comparison. Indexes for major urban centres were apparently used to represent the provinces as a whole. See S. E. Chernick, Interregional Disparities in Income, Staff Study No. 14, Economic Council of Canada (Ottawa: Queen's Printer, 1966), pp. 47-48 and pp. 88-89. Elaborate explanations of the methodology used in inter-city retail price comparisons are contained in Dominion Bureau of Statistics, Prices and Price Indexes, November, 1968 and November, 1969.

Although specific details of provincial output estimates are not always available, most estimates of the physical volume of gross provincial product have been deflated by the application of national implicit price index deflators.

II. SELECTED APPROACHES TO PROVINCIAL ACCOUNTS

The evolution of provincial accounting by provincial authorities and research bodies has resulted in increasing levels of complexity and sophistication in these accounts. The development of input-output tables as well as econometric analysis has aided in this evolution where it has been possible to attach sufficient confidence in the relationships established. In almost all instances, estimates have been made in current dollars.

Most of the early attempts at deriving economic accounts have used available personal income component data as the initial focal point.[6] In 1959 the Atlantic Provinces Economic Council arrived at estimates of gross provincial product at market prices in this fashion for the four Atlantic provinces, estimating net provincial income at factor cost and then adding further estimates of capital consumption

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[6]Part of the description which follows is based upon information presented in Hans J. Adler, "Approaches to Regional Economic Accounting in Canada," _The Review of Income and Wealth_, Series 16, No. 2, June, 1970, pp. 185-208.

allowances and indirect taxes less subsidies.[7] Estimates of net
provincial income at factor cost were arrived at from personal income
by (a) deducting published personal transfer payments to the provinces;
(b) deducting a provincial portion of Canada's interest on the public
debt;[8] and (c) adding a provincial portion of earnings not paid out
to persons.[9] Capital consumption allowances were arrived at by
applying to the Canadian data a ten year average ratio of capital
formation in the provinces to that of Canada. Indirect taxes less
subsidies were estimated by applying to the derived provincial product
at factor cost (for any given year) the ratio of Canada G.N.P. at
market prices to Canada G.N.P. at factor cost.

A later study of New Brunswick gross provincial product[10]
estimated the income side in basically the same fashion, the major
exception being the use of a corporation profits ratio (New Brunswick
to Canada) to determine the provincial share of earnings not paid out
to individuals.

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[7]A. C. Parks, The Economy of the Atlantic Provinces, 1940-
1957, Atlantic Province Economic Council, Halifax, Nova Scotia and
Fredericton, New Brunswick, 1959.

[8]The provincial share was determined by multiplying the Canadian
data by the provincial ratio of Canadian interest, dividends and net
rental income of persons.

[9]Cf. ante, footnote 8.

[10]N. G. Mulder and R. L. Simpson, "Gros Provincial Product:
Methods and Estimates, New Brunswick, 1956-1964," New Brunswick
Economic Statistics No. 7 (Fredericton, Office of the Economic Advisor,
June, 1966).

More recently, a number of publications on the Nova Scotia
economy have developed and outlined the methodology employed in
estimating gross product on a fairly comprehensive basis.[11] In
the updated set of Nova Scotia accounts, K. S. Wood[12] has carried on
the multi-sectoral approach originally developed by Czamanski.[13]
The government sector has been divided into local and non-local
government accounts, the latter of which is defined as the local
operations of non-local governments (mainly the federal government).
The entire study is noteworthy not only for the great level of dis-
aggregation but also for the varied sources employed. On the ex-
penditure side, for example, personal expenditure estimates for the
province have been constructed from information in D.B.S. Market
Research Handbook and in D.B.S. Urban Family Expenditure, 1959
as well as census data. One distinctive feature has been the use
of a local "production-consumption" technique to determine the main
elements of Nova Scotia's trade with the "rest of the world."

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[11]See especially K. S. Wood, Income and Product Accounts of
Nova Scotia, Institute of Public Affairs, Dalhousie University,
Halifax, 1970. Also see Stanislaw Czamanski, Structure of the Nova
Scotia Economy: Analysis of Income and Product Accounts, Institute
of Public Affairs, Dalhousie University, Halifax, 1970.

[12]Wood, op. cit.

[13]Stanislaw Czamanski, Regional Income and Product Accounts
of North Eastern Nova Scotia, Institute of Public Affairs,
Dalhousie University, Halifax, 1968.

While numerous refinements and adjustments have been made, the basic
approach has been to compare local production and consumption estimates;
where production exceeds consumption, it is assumed the difference
represents exports of that product, while the excess of consumption
over production represents imports of that product.[14]

Quebec provincial accounts, published by the Government of
Quebec,[15] have put forward three basic approaches to the measure-
ment of provincial product. Of the three--income, expenditure and
value added--only the last has departed from previous efforts by
utilizing the domestic concept at factor cost rather than the nation-
al concept.

In this last approach four basic requirements have been set
out for each industry group: (a) wages and salaries; (b) corporate
profits; (c) return on investment; and (d) depreciation and inventory
valuation adjustment. Within the Canadian context all elements ex-
cluding depreciation and inventory valuation adjustment are avail-
able; and it is possible to arrive at an estimate of depreciation by
subtracting the other components from gross domestic product. Quebec

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[14]An elaboration is provided in Wood, op. cit., especially
Technical Appendix D, pp. 118-132.

[15]Tableaux Types des Comptes Économiques du Québec, Revenus
et Dépenses, 1946-1969, Gouvernement du Québec, Ministère de
l'Industrie et du Commerce, Direction des Études Économiques, Quebec,
1970.

components for each of the four groups have been estimated in relation

to available Canadian statistics, using such existing provincial data

as employment, average wages and salaries and value added to determine

appropriate Quebec ratios.

Work on Ontario's provincial income and expenditure accounts

measured in current dollars has been evolving over the course of

several years.[16] Six sectors have been defined,[17] including three

sectors--the federal government, the rest of Canada and the rest

of the world--representing the otherwise single non-resident sector.

The federal government has been defined as non-resident in Ontario.

In the original published accounts, covering the period 1957 to 1969,

a "national" concept has been used, while subsequent accounts for

the period 1947 to 1969 have been based upon a "domestic" concept.

The main difference between the two, as represented in the Ontario

estimates, lies in the impact upon the business sector. In the

"national" approach, multi-regional corporations have been allocated

totally to one province on the basis of the address of the District

Taxation Office with which it files federal tax returns; in the

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[16]M. V. Chari and R. H. Frank, "The Development of Ontario
Economic Accounts," Ontario Economic Review, November/December,
1970; and Patricia S. Fromstein, "Ontario Economic Accounts:
A Dual Approach to the Measurement of Provincial Product," Ontario
Economic Review, September/October, 1971.

[17]Chari and Frank, op. cit., p. 6.

"domestic" approach, corporations are allocated to each province where they maintain a permanent establishment according to the allocation formula used for taxation purposes.[18]

While almost all attempts at measuring provincial product have been based upon current values, there has been one analytical study aimed at establishing indexes of real production for Ontario. This 1964 study,[19] carried out by W. G. R. Cameron of the Government of Ontario, has estimated indexes of the physical volume of output for Ontario from 1955 to 1963. The approach has been one of utilizing available current dollar data on a provincial and Canada-wide basis and relating them to indexes of real domestic product available at the national level.

This methodology has been adopted to a substantial degree in this thesis in order to develop indexes of aggregate output for the Province of Ontario. Further elaboration of the approach used appears in the following chapter.

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[18]Cf. ante, p. 27, footnote 4.

[19]W. G. R. Cameron, "Preliminary Indexes of Production in Ontario," Ontario Economic Review, October, 1964.

CHAPTER IV

AN APPROACH TO THE ESTIMATION OF ONTARIO
INDEXES OF REAL PRODUCTION

The preceding chapters have revealed that even at the national
level, efforts to obtain a "true" measure of output may be thwarted
by conceptual and statistical problems. A central difficulty is the
fact that the original generation of data is carried out in response
to a variety of objectives--tax requirements, financial planning,
production control, for example--only part of which may yield data
appropriate for aggregate economic analysis.

This problem is considerably magnified within the context of a
regional economy, since the acquisition of statistics is far more
difficult when confronted with the fluidity of interprovincial trans-
actions and the incompatibility of certain multi-provincial corporate
data with provincial analysis. The necessity of making simplifying
assumptions and deriving provincial aggregates from national totals
--the only source of certain aggregate data--imposes further burdens
upon regional accounting.

It is therefore not surprising that at present there exists
no completely adequate means of representing provincial product with
the same degree of reliability as exists at the national level.
Physical measures appear to be even more difficult inasmuch as almost
all price measures are carried out at the national level.

I. OBJECTIVES AND RATIONALE

In light of the problems associated with provincial economic accounts, any attempt to derive regional production data must necessarily be viewed as experimental and a "second best" solution until such time as the machinery can be established for gathering original provincial data consistent with such accounts.

This does not imply that current efforts should be abandoned; nor does it denigrate the results of such efforts. Provincial accounts, whether constructed by a provincial authority or by Statistics Canada, will likely evolve in a piecemeal fashion built upon the foundation of already-existing provincial data. Any current attempts to formulate a system of accounts may provide new insights into estimating techniques and methodology which could substantially enhance and expand the existing regional data base. Furthermore, problems may be uncovered and questions raised which will be of value to any body charged with creating a comprehensive set of accounts in the future.

As is often the case, the usefulness of provincial accounts depends upon their ultimate application. The difficulties associated with current estimates may be minimized if the ultimate purpose of the analysis is known, if the data limitations are recognized and if the application does not rely too heavily upon the most contentious elements.

The accounts being derived in this study form the base for the derivation of estimated potential output in Ontario. While not intended to represent an exact provincial counterpart of published indexes of Canada real domestic product, the provincial real production indexes will be used in the derivation of potential output just as Canada's real domestic product served as the foundation for the development of measures of Canada's potential output.[1] These measures of output will be linked to estimates of labour input to arrive at basic trends in labour productivity over time. Output measures based upon real domestic product at factor cost have been selected because they provide measures of output of various industrial groups in Ontario and because they are best suited to analysis of the provincial economy itself rather than its relationship to the national structure.

II. METHODOLOGICAL FOUNDATION FOR ONTARIO ECONOMIC ACCOUNTS

The methodology for estimating indexes of real output in the Ontario economy stems largely from the Cameron study,[2] the only known published study of real output at a sub-national level. That 1964

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[1]B. J. Drabble, Potential Output 1946 to 1970, Staff Study No. 2, Economic Council of Canada (Ottawa: Queen's Printer, 1964).

[2]Cameron, op. cit.

study, which examined total output in Ontario (and provinces outside Ontario) over the period 1955 to 1963, yielded indexes of production by industry on the basis 1955 equals 100. The derivation of provincial statistics on real output made use of existing national data as well as relevant indicators available on a provincial basis.

In the few instances where actual indexes were available on the physical volume of provincial output--namely agriculture and forestry--such information was used directly after simple conversion of the index base year.

As explained in the Appendix of the study,[3] the indexes of fishing and trapping, manufacturing and construction were based upon Ontario's proportion of net value of production, available on a provincial basis.[4] The distribution of Canada's net value of production between Ontario and all other provinces was applied to Canada's indexes of real domestic product to arrive at a time series for Ontario and another for all other provinces.

In the case of mining, indexes of mining output were compiled from existing physical volume data for individual minerals. Each index series measured a particular mineral in terms of the specific volume measure commonly used (e.g., tons, cubic feet or ounces), with

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[3]Ibid., p. 17.

[4]Dominion Bureau of Statistics, Survey of Production, 1961 (Ottawa: Queen's Printer, 1964).

the 1949 volume set equal to 100. In combining the various diverse
series making up total mineral production, weights for each individual
series were assigned in accordance with their relative dollar values
in the base year 1949.

The remaining indexes, which relate primarily to service in-
dustries, were constructed through the application of Canada "produc-
tivity ratios" (i.e., real domestic product per employee) to Ontario
employment. In almost all instances, the resulting indexes were
adjusted by a wage and salary differential factor, which was assumed
to reflect differences in productivity between Ontario and Canada.
One exception was public administration and defence, which was not
adjusted in the manner described. The other exception was finance,
insurance and real estate, where the original real estate component
was isolated and calculated by assuming the real estate component
related to personal income in Ontario in the same manner as across
Canada; it was then recombined with the index of finance and insurance
which was calculated in the manner described above.

Industry weights for 1955 were assigned in order to construct
a composite index of production for Ontario. In the case of most
commodity producing industries--agriculture, forestry, fishing and
trapping, mining, manufacturing and construction--the weights were
derived from Ontario's share of Canada's net value of production.
All remaining weights were derived from the employment ratios adjusted

for the wage and salary differential. All proportions for Ontario

were then applied to Canada's gross domestic product at factor cost

for 1955, measured in constant 1949 dollars. The values obtained

for individual industry groups in Ontario were then added and weights

allocated for each industry group in accordance with its share of

total derived Ontario output. The contribution of each industry to

total production in each year was determined by multiplying the in-

dustrial weight by the annual index for that industry. This yielded

the final index of Ontario production.

III. DISCUSSION OF CAMERON ASSUMPTIONS

The approach to measuring real output in Ontario quite clearly

represents an ambitious undertaking in light of the obvious dearth of

appropriate data. Because of these statistical shortcomings, Cameron

found it necessary to estimate real output by industry largely in

an indirect fashion, making use of the best information available.

In many instances this necessitated the adoption of a number of basic

assumptions concerning the relationship between output in Ontario

and Canada.

Price Assumption for Selected Commodity Industries

Aside from the exceptions noted, the derivation of industry

indexes falls into two categories. In the first category, used for

most commodity producing industries, it has been assumed that Ontario's

share of Canadian census value added in a given industry in any year

(based upon current dollar values) represents its corresponding share of Canadian real domestic product (in constant dollars) in that industry. In algebraic terms, the formula can be expressed as

$$\frac{CVA_{o_i}}{CVA_{c_i}} = \frac{RDP_{o_i}}{RDP_{c_i}}$$

or

$$RDP_{o_i} = \frac{CVA_{o_i}\ RDP_{c_i}}{CVA_{c_i}},$$

where

CVA_{o_i} = census valued added for industry i in Ontario;

CVA_{c_i} = census value added for industry i in Canada;

RDP_{o_i} = gross domestic product measured in constant base year dollars[5] for industry i in Ontario; and

RDP_{c_i} = gross domestic product measured in constant base year dollars for industry i in Canada.

In the above formulation the assumption has been made that the movements in the price deflators applying to value added in industry i in Canada are appropriate to describe the corresponding price movements

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[5] While constant dollar real domestic product is not directly available for Canadian industries, it can been derived for any given year by multiplying published base year values of gross domestic product by the published annual index of real domestic product for any given industry.

in industry i in Ontario. Manipulation of the above equation reveals
this assumption more directly:

$$RDP_{o_i} = \frac{CVA_{o_i} \, RDP_{c_i}}{CVA_{c_i}}$$

This may alternatively be expressed as:

$$RDP_{o_i} = \frac{CVA_{o_i}}{\dfrac{CVA_{c_i}}{\overline{RDP_{c_i}}}}$$

where $\dfrac{CVA_{c_i}}{\overline{RDP_{c_i}}}$ may be assumed to reflect the price index of value added

for industry i in Canada, relative to the base year incorporated in
Canada's real domestic product. Thus a deflated value of Ontario's
value added is derived by dividing Ontario census value added by the
Canada price deflator.[6]

This assumption is made necessary by the fact that there is no
appropriate provincial counterpart to the price deflators used at the

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[6]While the value added measure in real domestic product
statistics purports to be a "pure" measure of value added, the census
value added reported in Survey of Production is not, in that it is
overstated by the amount of miscellaneous indirect taxes and such
service costs as insurance, advertising, communications, etc. Never-
theless, the assumption has been made that this discrepancy can be
ignored because (1) it is relatively insignificant in value, and
(2) price changes in these omitted items are assumed to correspond to
price changes in the value added series.

national level. Canada-wide deflators for value added actually
represent the end product of the double deflation technique, by which
deflated value added is obtained by subtracting intermediate material
and service inputs, valued at base year prices, from total output which
is similarly valued at base year prices.[7]

The assumption that trends in Canadian deflators may be applied
to Ontario is based primarily upon the fact that Ontario accounts
for a substantial proportion of national economic activity. As such
it implies that the deflators arrived at for Canada embody in large part
the appropriate Ontario price indexes. Furthermore, the relative
fluidity and mobility among provinces (as opposed to international
immobility) carries with it the implication that price characteristics
will not vary substantially between Ontario and all other provinces
combined.[8]

Once the price assumption has been accepted, it is possible to
relate trends in real output and employment to arrive at trends in
productivity or output per employee.

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[7]The double deflation technique is the only possible approach to
deflating value added, since it is not possible to deflate such factor
inputs as profits and other investment income in the alternative
approach of summing factor costs and capital consumption allowances.
See Dominion Bureau of Statistics, Indexes of Real Domestic Product
by Industry of Origin, 1935-61, pp. 36-37.

[8]An expression of reasonable confidence in the assumption of
price comparability was obtained informally from the Industrial Output
Section, National Output and Productivity Division of Statistics Canada.

Productivity Assumption for Service Industries

Because census value added data are limited to commodity pro-
ducing industries, an alternative methodology has been necessary to
estimate indexes of industrial output for other industries. The second
major approach adopted by Cameron suggests that the volume of output
per employed person in Ontario corresponds closely to that of Canada in
service producing industries. Thus for any year, gross domestic pro-
duct in base year prices has been divided by employment in Canada and
the resulting output per employee multiplied by Ontario employment.
The resulting measure of total output for the particular Ontario
service industry has then been multiplied by the ratio of Ontario
average weekly wages and salaries to that of Canada.

This derivation of output in Ontario contrasts with the pre-
viously described method by virtue of its basic assumption of equiva-
lent real output per employee for Canada and Ontario. Unlike the
method for estimating output in commodity producing industries, which
makes use of more adequate data, the approach to service producing
industries has been constrained by the absence of current dollar es-
timates of value added. The acceptability of the basic assumption
of almost-equivalent real output per employee is predicated upon the
fact that (a) service industry productivity differentials between Ontario
and all other provinces are likely to be relatively small by virtue
of the less prominent role of capital equipment in influencing service
industry output, and (b) in several instances output in Canadian service

industries is originally derived as a direct function of employment, assuming unchanging unit productivity.

The "productivity adjustment factor" which effects a small differential in productivity between Ontario and Canada assumes that differences in productivity are reflected by relative differences in average weekly wages and salaries. This manipulation, while admittedly crude, is nevertheless a valid adjustment. To the extent that the ratio of average weekly wages and salaries between Ontario and Canada is an adequate proxy for the corresponding ratio of wage rates, the trends in this ratio reflect the productivity performance gap between Ontario and Canada over time.[9] This follows from accepted perfect competition theory, according to which real wages are equal to the marginal real product of labour and are a function of the average real productivity of labour. Money wages are additionally a function of price levels. For the purposes of this study, the minor effects of price differentials and the existence of imperfect competition have been ignored.

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[9]Because of inadequate provincial data, it has not been possible to refine average weekly wages and salaries to correspond with a wage rate concept. While the differences may be small, changes in average weekly wages and salaries reflect not only changing wage rates, but also variations in the number of hours worked and the possible distortions of overtime wage rates.

IV. THE FRAMEWORK FOR ESTIMATION OF ONTARIO

INDEXES OF REAL PRODUCTION

In order to provide an adequate historical data base for the examination of trends in output per employed person, it is desirable to maximize the span of years covered by the provincial accounts. For Ontario, as for Canada, appropriate data series generally extend back only as far as the late 1940's, when data gathering took on greater momentum in response to post-war recovery. In several instances even these series contain discontinuities brought about by the statistical adjustments to structural change and economic and technological growth.

As a consequence, the period 1947 to 1970 has been selected for the derivation of indexes of real production by industry.

Selection of Reference Base Years

The use of indexes to measure time series requires the establishment of a reference point or base year to which all other annual data are to be related. It is usually desirable to select a base year which is regarded as "average," such as one situated in the middle of the business cycle. In the case of the Cameron study, all data from 1955 to 1963 were referenced to the base year 1955 "because it was a fairly normal year, between the recession of 1954 and the investment boom of 1956-1957."[10]

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[10]Cameron, op. cit., p. 5.

This type of rationale, however, is not always applied. The main reference years of the post-war period adopted by Statistics Canada have been 1949 and 1961. The latter year is generally recognized as a year in which Canada's economic performance was relatively weak. The individual selection of these two years was based not upon the economic performance observed but upon the fact that extensive analysis had been carried out on inter-industry relationships.[11] Each study itself followed directly upon the adoption of a new standard industrial classification in the preceding year. The intent of classification revisions has been to adjust to the structural changes which take place over time in a growing economy.

Because the estimation of Ontario indexes of real production relies heavily upon the allocation of Canada's real domestic product by means of some provincial indicator, the decision has been taken to adopt the same national base years in deriving Ontario indexes. All data series for the period 1947 to 1961 have been compiled on the basis of 1949 equals 100; from 1961 onward all data have been indexed on the basis of 1961 equals 100. For the purpose of representing the trends of broad aggregates over time, the earlier series have been linked at 1961 and all data finally represented in terms of 1961 equals 100.

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[11]Dominion Bureau of Statistics, The Inter-Industry Flow of Goods and Services, Canada, 1949 (Ottawa: Queen's Printer, 1956); and Dominion Bureau of Statistics, The Input-Output Structure of the Canadian Economy, 1961 (Ottawa: Queen's Printer, 1969).

Base Year Weights and Industrial Classification

The importance of index base years rests with the weights or
relative prominence attached to each index when individual indexes
are aggregated. Thus the use of a 1949 base results in aggregate
series based upon the relative prominence of industries observed in
1949. Similarly, aggregate data series based upon 1961 equals 100
combine individual industries according to their relative prominence
in 1961. In this way each set of indexes represents more accurately
the relative importance of individual industries in the given period.

Separately based series may be warranted for yet another reason.
Revisions to the standard industrial classification may render certain
data series discontinuous, resulting in the necessity of relating the
new data series to a newly defined base.

While separately based indexes more accurately represent the
structure of the economy over a given period of time, it is often
desirable to establish long run continuity for major aggregates. This
is normally accomplished by a linking procedure which converts all
data series to a common base year and weight base.[12] In most instances
there is sufficient continuity to permit the linking of individual
series; where this is not possible, reasonable continuity may be achieved

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[12]A description of the linking procedure appears in Dominion
Bureau of Statistics, Indexes of Real Domestic Product by Industry
of Origin, 1935-61 (Ottawa: Queen's Printer, 1963), pp. 48-52.

by comparing combinations of indexes.[13]

This study follows closely the indexes and linkages used in

Indexes of Real Domestic Product by Industry,[14] since Canada indexes

are often used to derive the Ontario indexes.

Further elaboration of the derivation of individual indexes is

provided throughout the remainder of Chapter IV.

V. DERIVATION OF ONTARIO ESTIMATES BY INDUSTRY

Agriculture

An index of Ontario agricultural output is directly available

from Index of Farm Production.[15] The series, which is based upon 1949

equals 100, provides index numbers of the physical volume of agricul-

tural production by province. Laspeyres volume indexes are used, expres-

sing the current gross output of agricultural products as a percentage

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[13]The latter situation has applied in the linking of major
groups of the 1948 S.I.C. with the 1960 S.I.C. in deriving indexes
of real domestic product for Canada. The 1948 S.I.C. groups covering
iron and steel products and non-ferrous metal products have been con-
sidered sufficiently compatible with the following 1960 S.I.C. groups:
primary metal industries; metal fabricating industries (excluding
machinery and transportation equipment industries); and machinery
industries (excluding electrical machinery). See Dominion Bureau of
Statistics, Indexes of Real Domestic Product by Industry (1961 Base)
(Ottawa: Queen's Printer, 1968), pp. 207-208.

[14]Ibid., pp. 204-221. Weights for 1961 are derived from the
distribution of 1961 gross domestic product as indicated in Dominion
Bureau of Statistics, Indexes of Real Domestic Product by Industry,
1961-1969, 1961=100 (Ottawa: Information Canad-, 1971), pp. 86-89.

[15]Dominion Bureau of Statistics, Index of Farm Production,
1970 (Ottawa: Queen's Printer, 1971).

of the gross output in the base period.[16]

The index, which has been developed to represent unduplicated gross farm production, has been adjusted to avoid double counting. Such double counting may result from the use of agricultural output (such as feed grains) as agricultural input (feed for livestock). Intraprovincial duplication is avoided by including only three specific quantities: (1) farm products sold by farmers (except direct inter-farm sales); (2) amounts consumed in farm homes on farms where produced; and (3) amounts equal to changes in farm-held inventories of grain and livestock.

According to work sheets on the construction of the indexes for 1949 and 1970[17], the items used in the index include various grains, livestock, poultry, dairy products, fruits and vegetables and other products.

This index has been incorporated directly in the Ontario indexes of real production. While the period 1947 to 1961 has been kept on a 1949 basis, the series from 1961 onward has been converted arithmetically to a 1961 base. The annual indexes appear in Tables VII and VIII on pages 79 and 80, which represent the two major series on total real production in Ontario.

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[16]Ibid. p. 3.

[17]Work sheets have been made available by the Agriculture Division, Statistics Canada.

Forestry

Forestry is the one other industry for which a measure of the physical volume of output already exists. The data, published annually in Logging,[18] provide estimates of total forest production on the basis of the conventional unit of physical measurement. The various products and units of measurement are provided below:

Product	Unit of Measurement
Logs and bolts	thousand feet board measure
Pulpwood	cord
Fuelwood	cord
Poles and piling	thousand cubic feet
Round mining timber	cord
Fence posts	number
Fence rails	number
Wood for charcoal	cord
Miscellaneous roundwood	thousand cubic feet

The summation of individual categories is made possible through the conversion of all physical measures to a common unit: equivalent volume in merchantable timber (thousands of cubic feet).

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[18]Dominion Bureau of Statistics, Logging, 1968 (Ottawa: Queen's Printer, 1971), pp. 11-13. A complete series has been made available directly from the Manufacturing and Primary Industries Division, Statistics Canada.

The estimates are based largely upon annual Crownland production data; farm woodlot production data from the decennial and quinquennial censuses and annual June crop surveys; data on pulpwood production for domestic consumption supplied by pulp and paper mills; wood consumption data in conjunction with import and export statistics; and other provincial surveys pertaining to production from private lands.

While the physical volume statistics represent total production rather than value added, they have been selected as the measure for the Ontario indexes because of difficulties arising out of the use of value added data. The derivation of constant dollar value added for forestry in Ontario[19] would involve assuming equivalent price characteristics across Canada. Because of the prominence of British Columbia's forestry industry and its different characteristics, as well as Ontario's relatively small proportion of the total Canadian industry, this assumption has been regarded as somewhat tenuous. Instead the adopted series --which represents trends over time--simply assumes that there is a direct relationship between the output and input such that movements in constant dollar value added correspond to movements in the physical output of basic forestry products.

As in the case of agricultural output, individual series have

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[19]The normal method would be to multiply Ontario's share of Canada's current dollar value added (from Survey of Production) by Canada's gross domestic product measured in constant base year dollars.

been established for the periods 1947 to 1961 and from 1961 onward,
the former on a 1949 basis and the latter on a 1961 basis. For
example, total forest production in Ontario was estimated at the
equivalent of 621,645,000 cubic feet of merchantable timber in 1969,
25.8 per cent greater than the 494,048,000 cubic feet estimated for
1961. As a result, the Ontario forestry index was established at
125.8 for 1969, based on 1961 equals 100. Tables VII and VIII
indicate the trends over the two periods under consideration.

Fishing and Trapping

This relatively small industry grouping has been estimated on
the basis of Ontario's share of census value added, available from
Survey of Production. Although available for each industry, current
dollar values for census value added in fishing and trapping have
been combined, since Canada real domestic product is available only
for fishing and trapping as a whole.

Ontario's share of Canada census value added is multiplied by
the fishing and trapping component of the Canada real domestic product
(or gross domestic product in constant base year prices). For the
period 1947 to 1961, Canada real domestic product has been calculated
by multiplying the 1949 gross domestic product in fishing and trapping
by annual indexes of fishing and trapping (based on 1949 equals 100)
published in Indexes of Real Domestic Product by Industry.

In the absence of appropriate value added data, annual measures in both <u>Survey of Production</u> and <u>Indexes of Real Domestic Product by Industry</u> are based upon the value of gross output, the latter being appropriately deflated to provide constant dollar estimates. Fishing relates to the total value of the catch of sea and inland fish before processing. Trapping data are based upon the number and values of wild life pelts produced.

The following example illustrates the method used to arrive at the Ontario index of fishing and trapping for 1965:

Given for fishing and trapping:

 (a) Ontario census value added, 1965................$ 9,284,000

 (b) Canada census value added, 1965................$171,886,000

 (c) Ontario census value added, 1961...............$ 8,216,000

 (d) Canada census value added, 1961................$122,892,000

 (e) Canada gross domestic product, 1961............$ 90,600,000

 (f) Canada index of real domestic product,

   (1961=100), 1965............................... 106.6

$$\text{Solving:} \quad 1965: \quad \frac{(a)}{(b)} \cdot \frac{(e)(f)}{100} \quad = \quad \frac{9,284,000}{171,886,000} \cdot \frac{(90,600,000)(106.6)}{100}$$

$$= \ \$5.2 \text{ million}$$

$$1961: \quad \frac{(c)}{(d)} \cdot (e) \quad = \quad \frac{8,216,000}{122,892,000} \cdot (90,600,000)$$

$$= \ \$6.1 \text{ million}$$

$$\text{Index for 1965:} \quad \frac{5.2}{6.1} \cdot 100 \quad = \quad 85.2 \quad (1961=100)$$

Accordingly, the Ontario index of real production for fishing and trapping is 85.2 for 1965 (1961=100). Each successive annual index is arrived at in this manner.

Mining

Indexes for real production in Ontario's mining industry have constructed on the basis of the physical volumes of mineral production reported in General Review of the Mineral Industries.[20] Indexes relate to gross output, corresponding to the measure used by, and described in, Real Domestic Product by Industry of Origin, 1935-61.[21]

The physical measure of output of individual minerals has been indexed with reference to a base year. As in the case of other industries, two sets of indexes have been constructed, one on the basis of 1949 equals 100 and the other on the basis of 1961 equals 100. Thus all reported physical units for 1947 to 1961 have been indexed to the corresponding physical units reported in 1949, while those from 1961 onward have been indexed to the recorded 1961 volume of output. The overlap in 1961 makes possible the eventual linking of the two series for representation on a common base for long run trends.

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[20]Dominion Bureau of Statistics, General Review of the Mineral Industries, 1968 (Ottawa: Information Canada, 1972), and earlier issues. For more recent data see also Dominion Bureau of Statistics, Canada's Mineral Production, Preliminary Estimate, 1971 (Ottawa: Information Canada, 1972), and earlier issues.

[21]Dominion Bureau of Statistics, Real Domestic Product by Industry of Origin, 1935-61, pp. 106-107.

As indicated in Tables I and II on pages 57 and 58, almost all major minerals have been shown separately. The prominent exceptions are uranium and zinc, which are not listed individually in the 1949 based series. Because there are no available statistics on production of these metals for 1949, they have been included in the "other minerals" category, which consists of relatively minor minerals and minerals not produced in 1949.

Individual series are combined into an index of total production by means of the same base-weighted Laspeyres formula used in the construction of indexes of agricultural output. Base year weights reflect the relative importance of the value of output of each mineral in the base year, whether 1949 for the earlier series or 1961 for the more recent series.

Special treatment has been required for the residual grouping "other minerals". While the base year weight is appropriately established as the value of the component minerals relative to all minerals in the base year, the actual construction of a single index series from the diverse elements comprising "other minerals" has necessitated the use of a unique procedure.

In combining the various items within this miscellaneous group on a weighted basis, it has not been possible to allocate weights to each item for the base year, since several minerals were not produced in the base year. To circumvent this problem the weight for each item within "other minerals" was assigned according to the ratio of its total

TABLE I

INDEXES OF THE PHYSICAL VOLUME OF MINERAL
PRODUCTION IN ONTARIO,
1947-1961

INDEXES: 1949 = 100

	1949 Value Based Weight	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Calcium	.322	115.8	172.0	100.0	...	...	...	...	...	...	75.9	42.5	4.8	13.0	25.9	19.1
Cobalt	.295	92.5	249.5	100.0	94.3	153.7	229.7	258.9	363.9	532.5	548.0	605.8	393.5	458.1	526.3	465.9
Copper	13.811	100.8	106.5	100.0	103.7	113.9	110.9	115.5	124.5	129.5	138.2	151.9	125.6	166.5	182.5	187.2
Gold	26.212	82.6	89.0	100.0	105.4	104.6	106.8	92.7	100.3	107.2	106.8	109.5	115.4	114.0	116.1	112.0
Iron ore	4.080	95.4	66.4	100.0	121.1	141.3	135.1	140.8	120.1	216.8	276.3	241.9	181.2	299.1	264.7	286.9
Nickel	30.659	92.2	102.4	100.0	96.1	107.2	109.2	111.7	122.8	125.2	130.2	137.8	93.8	135.2	156.7	152.5
Platinum group	6.149	61.0	80.2	100.0	81.3	94.8	83.3	90.4	102.3	114.5	93.7	123.9	89.4	97.7	144.0	124.5
Selenium	.055	168.6	125.5	100.0	73.4	94.9	93.9	106.7	109.2	108.8	125.7	99.6	104.0	116.8	165.4	189.8
Silver	.589	91.4	125.3	100.0	172.0	176.4	253.3	201.1	212.4	236.1	258.6	269.6	383.0	411.3	437.8	346.1
Gypsum	.270	76.4	89.7	100.0	98.1	129.2	137.3	164.6	175.9	180.3	180.6	186.8	209.5	202.8	175.0	209.3
Mica	.010	345.0	333.0	100.0	123.8	109.2	56.6	49.7	14.6	4.4	5.0	9.7	2.6	3.8	36.6	20.6
Nepheline syenite	.193	85.0	94.4	100.0	83.3	103.0	104.9	143.9	157.0	185.4	228.5	253.9	255.5	290.3	305.4	305.0
Peat moss	.065	111.8	98.4	100.0	76.0	24.4	26.3	17.9	8.7	58.0	44.3	63.9	83.0	148.0	183.8	204.8
Quartz	.316	102.7	106.6	100.0	98.8	110.0	101.8	103.3	105.2	101.2	111.9	113.3	65.7	114.0	118.2	109.7
Salt	1.076	104.4	102.0	100.0	114.7	127.2	119.7	123.4	120.7	164.5	222.0	253.4	350.2	500.0	495.3	471.3
Pyrophyllite[1]	.050	98.8	105.2	100.0	112.2	100.7	91.6	97.9	100.7	107.3	91.0	82.6	64.2	64.7	52.9	54.5
Sulphur[2]	.039	126.3	123.1	100.0	104.1	123.6	159.8	332.5	428.8	474.7	430.2	435.2	473.4	779.0	769.3	667.2
Natural gas	2.730	97.0	107.1	100.0	99.8	105.2	103.5	121.0	124.8	135.3	159.7	179.5	201.2	209.9	211.7	181.3
Petroleum crude	.279	50.4	67.9	100.0	96.2	75.6	73.6	115.0	158.2	201.6	227.6	239.3	298.6	384.2	385.6	440.8
Clay products	2.299	80.0	93.3	100.0	116.8	119.3	125.0	146.3	161.7	170.6	174.6	163.5	199.0	189.0	167.4	162.0
Cement	2.831	76.7	79.6	100.0	115.5	118.2	121.3	153.9	156.7	166.6	180.2	274.8	298.2	296.5	249.4	276.7
Lime	1.722	92.6	95.9	100.0	107.8	116.9	117.4	124.4	115.2	131.7	127.1	144.6	190.6	213.2	186.8	163.2
Sand and gravel	3.468	90.6	92.2	100.0	135.6	175.7	194.5	195.6	208.0	230.7	275.2	296.3	302.3	331.4	347.9	314.5
Stone	2.282	85.8	88.8	100.0	101.2	143.0	145.5	156.1	179.5	225.5	278.5	307.8	278.9	306.0	317.5	325.0
Other minerals[3]	.188	113.7	141.9	100.0	815.3	1,784.6	1,914.1	1,988.0	1,869.3	2,052.9	4,102.9	19,863.6	47,593.4	59,649.7	47,491.6	37,340.0
Total Minerals	100.000	88.5	95.9	100.0	104.2	115.5	117.0	118.0	126.2	138.7	151.1	191.6	228.5	277.5	264.4	241.0

[1] Includes soapstone and talc. [2] In smelter gas.

[3] Includes: bismuth, tellurium, magnesium, lead, mineral water, arsenic, uranium, zinc, asbestos, silica brick, feldspar and graphite.

TABLE II

INDEXES OF THE PHYSICAL VOLUME OF MINERAL
PRODUCTION IN ONTARIO,
1961-1970

INDEXES: 1961 = 100

	1961 Value Based Weight	1961	1962	1963	1964	1965	1966	1967	1968	1959	1970
Calcium	.011	100.0	124.3	99.3	139.3	160.5	250.8	547.2	471.6	948.8	446.4
Cobalt	.457	100.0	91.8	74.8	76.7	90.9	93.1	101.6	111.7	88.5	128.0
Copper	12.973	100.0	89.3	84.6	93.5	102.2	95.9	130.5	139.7	112.8	139.4
Gold	9.912	100.0	91.8	88.7	81.7	73.8	63.0	56.7	52.3	46.6	44.1
Iron ore	6.607	100.0	111.1	116.9	139.4	146.8	141.1	149.8	188.9	182.2	204.9
Lead	.018	100.0	136.9	184.2	242.7	232.7	237.7	662.0	1,544.5	1,443.2	1,431.9
Magnesium	.457	100.0	115.5	116.6	122.5	132.4	88.0	116.4	130.0	139.3	135.6
Nickel	31.306	100.0	84.9	76.0	82.6	97.5	81.7	96.9	103.8	74.8	114.3
Platinum group	2.600	100.0	112.6	85.5	89.9	110.7	94.7	95.6	115.9	73.7	115.3
Selenium	.114	100.0	86.7	57.7	63.7	74.7	67.4	81.8	77.4	51.0	79.8
Silver	.886	100.0	105.8	108.2	111.9	122.0	122.9	161.3	246.3	251.0	224.1
Uranium	16.008	100.0	85.5	85.3	78.9	45.6	39.2	36.4	35.8	39.0	44.6
Zinc	1.386	100.0	121.6	128.0	138.8	116.8	158.6	517.0	667.7	673.7	655.1
Asbestos	.462	100.0	141.9	134.6	61.9	7.0	6.8	6.5	70.1	144.0	155.8
Gypsum	.105	100.0	102.3	103.3	121.6	125.1	132.9	126.1	134.2	146.3	126.3
Nepheline syenite	.273	100.0	105.9	105.7	120.8	141.5	152.6	167.1	177.5	208.3	202.5
Peat moss	.027	100.0	164.1	202.9	179.1	133.1	11.2	24.8	118.3	150.8	147.1
Quartz	.088	100.0	87.8	61.8	73.2	84.5	75.4	77.5	78.3	56.2	113.5
Salt	1.440	100.0	110.3	111.4	116.6	136.3	119.5	150.5	144.8	131.4	145.3
Pyrophyllite[1]	.011	100.0	109.0	93.1	108.7	108.2	182.1	207.6	300.6	293.8	284.9
Sulphur[2]	.087	100.0	102.9	169.0	205.5	164.8	190.6	277.7	363.5	298.7	391.1
Natural gas	.595	100.0	107.6	109.5	95.0	87.3	106.8	97.8	89.8	77.3	117.3
Petroleum crude	.376	100.0	98.7	104.9	108.5	111.3	115.2	107.9	100.2	101.1	91.2
Clay products	2.017	100.0	104.1	112.0	121.2	127.3	127.3	132.3	142.9	140.7	109.3
Cement	3.780	100.0	112.7	114.6	136.7	141.3	145.6	130.0	139.4	139.8	141.1
Lime	1.224	100.0	105.3	110.2	121.3	120.9	124.6	112.6	117.2	130.5	134.5
Sand & gravel	4.275	100.0	109.1	114.3	109.6	126.1	134.1	135.0	119.8	117.7	118.0
Stone	2.490	100.0	102.4	111.1	129.9	134.3	140.0	140.2	156.0	147.2	150.7
Other minerals[3]	.015	100.0	26.4	34.1	206.9	361.7	544.4	3,730.2	4,538.3	4,776.5	3,416.4
Total Minerals	100.000	100.0	93.7	90.4	95.0	96.9	89.1	103.9	113.7	99.5	118.1

[1] Includes soapstone and talc   [2] In smelter gas

[3] Includes: bismuth, tellurium, arsenious oxide, fluorspar, mica, mineral water and elemental sulphur.

value over the entire period[22] to the total value for all items within "other minerals" over the same period. The actual physical volume index base has been set at the average annual volume over the period and annual volumes--where they exist--have been indexed to it. All components have then been summed for each year according to their allocated weights. The final annual series has then been converted to a 1949 (or 1961) index base.

Because uranium and lead have been produced continuously for the period 1961 to date, they have been included individually in the 1961 based index series. Footnotes to Tables I and II indicate the composition of "other minerals" for each of the two series.

Manufacturing

In keeping with the relative prominence of manufacturing in the economy of Ontario, detailed indexes of real production have been constructed to represent trends in Ontario of manufacturing.

Canada indexes of real domestic product in manufacturing represent the national counterpart to what is desirable at a provincial level. In order to estimate a constant dollar measure of value added, extensive use has been made of published data on the census of manufacturing industries,[23] which measures current dollar census value

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[22]That is, either 1947 to 1960 or 1961 to 1970.

[23]Dominion Bureau of Statistics, General Review of the Manufacturing Industries of Canada; Manufacturing Industries of Canada, Summary for Canada; and Manufacturing Industries of Canada, Province of Ontario (Ottawa: Queen's Printer, various annual issues).

added by province and type of manufacturing industry. The method
employed is similar to that used in estimating indexes of real pro-
duction in fishing and trapping, differing by virtue of the disaggre-
gation carried out in estimating real production in manufacturing.

Tables III and IV on pages 61 and 62 illustrate the procedure
used in deriving base year (i.e., 1949 and 1961) estimates of real
production in Ontario manufacturing. For each major group of manufac-
turing industries (e.g. food and beverages), the ratio of Ontario
census value added to Canada census value added is multiplied by the
corresponding value of Canada gross domestic product to estimate the
Ontario equivalent of Canada gross domestic product. Once the major
group estimates have been totalled, the relative distribution determines
the weights used throughout the particular time series to arrive at
aggregate indexes of non-durable, durable and total manufacturing.
In any given year, Ontario's estimated value added in constant base
year dollars is arrived at by multiplying (a) the current dollar census
value added ratio by (b) the product of Canada base year gross domestic
product and the appropriate annual index of Canada real domestic product.

The use of Ontario weights has the effect of combining major
manufacturing groups in accordance with their relative prominence in
Ontario in the base year. This is particularly advantageous in light
of the diversity of manufacturing activity and Ontario's varying share
of total Canadian output. Within each manufacturing group, however,
it is simply assumed that the distribution of value added by individual

TABLE III

DERIVATION OF ONTARIO BASE YEAR (1949)
GROSS DOMESTIC PRODUCT IN MANUFACTURING

1948 S.I.C.	Industry Group	Net Value of Products Ontario $'000	Net Value of Products Canada $'000	Ratio: Ont. Value Added / Can. Value Added	Canada G.D.P. (Manufacturing) $ Million	Canada Per Cent Distribution %	Ontario Derived G.D.P. (Manufacturing) $ Million	Ontario Per Cent Distribution %
01	Food and beverages	360,567	834,018	.4323	596.1	14.0	257.7	11.8
02	Tobacco and tobacco products	7,703	58,529	.1316	38.8	0.9	5.1	0.2
03	Rubber products	83,025	101,705	.8163	67.2	1.6	54.9	2.5
04	Leather products	42,892	91,158	.4705	79.4	1.8	37.4	1.7
05	Textile products	112,180	285,641	.3927	253.7	5.9	99.6	4.6
06	Clothing	122,733	352,741	.3479	281.5	6.6	97.9	4.5
08	Paper products	192,065	532,288	.3608	414.0	9.7	149.4	6.8
09	Printing, publishing and allied industries	127,899	250,163	.5113	198.9	4.6	101.7	4.7
15	Products of petroleum and coal	55,372	117,819	.4700	80.2	1.9	37.7	1.7
16	Chemicals and allied products	158,364	288,172	.5495	212.4	5.0	116.7	5.3
17	Miscellaneous industries	61,776	94,600	.6530	81.9	1.9	53.5	2.5
	Non-durables	1,324,576	3,006,834		2,304.1	53.9	1,011.6	46.3
07	Wood products	113,809	393,929	.2869	329.5	7.7	95.2	4.4
10	Iron and steel products	518,611	760,934	.6815	629.2	14.7	428.8	19.6
11	Transportation equipment	313,002	456,529	.6709	414.3	9.7	278.0	12.7
12	N-ferrous metal products	165,630	289,125	.5729	250.2	5.9	143.3	6.6
13	Electrical apparatus and supplies	194,193	269,342	.7210	221.6	5.2	159.8	7.3
14	Non-metallic mineral products	78,733	143,873	.5472	124.1	2.9	67.9	3.1
	Durables	1,383,978	2,323,732		1,968.9	46.1	1,173.0	53.7
	Total Manufacturing	2,708,554	5,330,566		4,273.0	100.0	2,184.6	100.0

TABLE IV

DERIVATION OF ONTARIO BASE YEAR (1961)
GROSS DOMESTIC PRODUCT IN MANUFACTURING

1960 S.I.C.	Industry Group	Value Added: Total Activity Ontario	Value Added: Total Activity Canada	Ratio: Ont. Value Added / Can. Value Added	Canada G.D.P. (Manufacturing)	Canada Per Cent Distribution	Ontario Derived G.D.P. (Manufacturing)	Ontario Per Cent Distribution
		$'000	$'000		$ Million	%	$ Million	%
01	Food and beverage industries	779,303	1,762,701	.4371	1,260.7	14.4	551.1	12.5
02	Tobacco products industries	39,325	128,393	.3063	76.9	0.9	23.6	0.5
03	Rubber industries	133,318	175,685	.7588	146.5	1.7	111.2	2.5
04	Leather industries	65,909	142,136	.4637	107.5	1.2	49.8	1.1
05	Textile industries	155,551	397,120	.3917	321.3	3.7	125.9	2.8
06	Knitting mills	41,998	101,206	.4150	76.1	0.9	31.6	0.7
07	Clothing industries	102,732	381,368	.2694	301.4	3.5	81.2	1.8
10	Paper and allied industries	363,230	1,082,526	.3355	944.5	10.8	316.9	7.2
11	Printing, publishing and allied industries	318,938	589,584	.5410	470.6	5.4	254.6	5.8
18	Petroleum and coal products industries	90,599	287,960	.3146	257.8	3.0	81.1	1.8
19	Chemical and chemical products industries	470,574	808,526	.5820	612.3	7.0	356.4	8.1
20	Miscellaneous manufacturing industries	244,876	369,255	.6632	296.3	3.4	196.5	4.4
	Non-durables	2,806,353	6,246,461		4,871.9	55.9	2,179.9	49.2
8	Wood industries	85,453	451,583	.1892	389.4	4.5	73.7	1.7
9	Furniture and fixture industries	91,342	187,328	.4876	157.4	1.8	76.7	1.7
12	Primary metal industries	546,517	898,608	.6082	771.8	8.8	469.4	10.6
13	Metal fabricating industries	460,972	788,347	.5847	641.6	7.4	375.2	8.5
14	Machinery industries	337,834	444,144	.7606	342.9	3.9	260.8	5.9
15	Transportation equipment industries	585,638	840,763	.6966	692.8	7.9	482.6	10.9
16	Electrical products industries	446,340	679,529	.6568	545.5	6.3	358.3	8.1
17	Non-metallic mineral products industries	192,743	394,800	.4882	308.3	3.5	150.5	3.4
	Durables	2,746,839	4,685,102		3,849.7	44.1	2,247.2	50.8
	Total Manufacturing	5,553,192	10,931,563		8,721.6	100.0	4,427.1	100.0

industry in Ontario is reasonably similar to that of Canada. While differences do undeniably exist, it has been assumed they are small enough to render unnecessary the arduous task of compiling Ontario weights on an individual industry basis.

The 1949 base year weights have been applied to data from 1949[24] to 1961, while the more recent 1961 base has been used on data from 1961 onward. The former series can then be linked to the latter for the purpose of viewing trends over the long run.

There is in fact, however, an element of discontinuity between the two series which warrants comment. In accordance with expanded data availability and the introduction of new concepts in the 1960 standard industrial classification, data prior to 1961 represent value added for only the manufacturing activity of the establishments classified to any particular manufacturing industry. From 1961 onward, the output measurement is based on total activity, which includes both manufacturing activity and other activities carried out by the establishments classified to a particular manufacturing industry. As a result, there is some discontinuity in the manufacturing series between 1960 and 1961--that is, between the two time series.

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[24]Detailed provincial manufacturing data for 1947 and 1948 are not available in a form which can be linked to data from 1949 onward. Consequently the detailed method of deriving Ontario indexes can not be applied for those years. However, estimates for total manufacturing in 1947 and 1948 have been made using the rati. of total net value of products in manufacturing. These esti--ates, which have been linked with 1949, are included in Table VII.

.. In practical terms, this discontinuty is not of major importance. To begin with, the actual value of non-manufacturing activity is relatively small. Furthermore, the statistics in question are not being used directly for time series analysis; instead it is the ratio of Ontario's value added to Canada's value added for any year that is being considered. It may be assumed that there is little difference between the ratio on a manufacturing basis and the ratio on a total activity basis.

The longer-run series on indexes of real production in manufacturing will eventually be established by linking the two separately-based series between 1960 and 1961, using the total activity weight for manufacturing for 1961.

Another adjustment has been required because of discontinuities in the 1949 based series resulting from the abandonment of the 1948 standard industrial classification prior to the release of 1961 data. In substituting 1960 S.I.C. based data in the void created, an attempt has been made to overcome possible discontinuities by: (a) converting directly to the 1948 basis all closely related series at 1959, a year for which data are available on both bases; (b) combining certain groups of diverse series from the 1948 and 1960 classifications in order to link them at higher levels of aggregation; and (c) summing the individual industry groups according to their 1949 weights, so as to effectively create a proxy set of industry data on a 1948 S.I.C. basis from data made available on the 1960 S.I.C. basis.

For the most part, major groups of manufacturing industries have been directly comparable for the 1948 and 1960 standard industrial classifications. In various instances there have been minor differences due to the shift of relatively insignificant categories from one particular industry to another; no adjustments have been possible since there has been insufficient data disaggregation to effectively compare the two classifications. However, almost all of these changes have been a relatively small proportion of the major group weight.

To achieve a sufficient degree of comparability, manufacturing census data for knitting mills and clothing industries (according to the 1960 standard industrial classification) have been combined to correspond to the comparable category used on the 1948 basis. The same approach has been used in combining wood industries and furniture and fixture industries in order to achieve comparability with the earlier wood product category. Statistics for the new primary metal industries, metal fabricating industries (except machinery and transportation equipment industries), and machinery industries (except electrical machinery) have been combined into a single series for both Ontario and Canada to achieve comparability with the sum of major groups 10 and 12 in the 1948 S.I.C.; that is, iron and steel products and non-ferrous metal products. To enhance this comparability, jewellery and silverware (1948 S.I.C. No. 343), which had been included in non-ferrous metal products but which was transferred to miscellaneous manufacturing in the 1960 standard industrial classification, has been transferred back

to the former catagory by deducting its recorded value added from the miscellaneous manufacturing category and adding it to the combined primary metals, metal fabricating and machinery industries group.

Tables V and VI on pages 67 and 68 indicate the indexes for individual major industry groups within manufacturing, the former based upon the 1948 S.I.C. and 1949 Ontario weights and the latter upon the 1960 S.I.C. and 1961 derived Ontario weights.

Construction

The same ratio of census value added method has been used in deriving indexes of real production in construction. Because data on this industry are not available in the source documents on a disaggregated basis, the method has been applied at the total industry level.

The principal source documents are Survey of Production for current dollar census value added for Ontario and Canada, and Indexes of Real Domestic Product by Industry for Canada indexes of real domestic product. The 1961 base year value of Canadian gross domestic product in construction, as for all other industries, has been obtained from the latter publication, while total G.D.P. from revised National Accounts for the period 1926 to 1969 has assisted in establishing 1949 base year data.

As in the application of the value added method to other industries, the derivation of indexes for construction assumes that trends in construction deflators follow the same pattern in Ontario as for all of Canada.

TABLE V

INDEXES OF REAL PRODUCTION IN
ONTARIO MANUFACTURING,
1949-1961

INDEXES: 1949 = 100

1948 S.I.C.	Industry Group	1949 Value Based Weight	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
01	Food and beverages	.118	100.0	105.1	106.1	114.2	115.3	120.6	127.7	132.3	145.7	147.3	157.2	161.1	167.5
02	Tobacco and tobacco products	.002	100.0	105.9	102.0	115.7	133.3	125.5	168.6	186.3	188.2	298.0	329.4	398.0	492.2
03	Rubber products	.025	100.0	119.5	125.1	116.8	134.6	115.8	138.1	157.0	150.5	153.9	176.3	145.5	135.5
04	Leather products	.017	100.0	100.0	86.4	94.7	101.1	95.7	104.8	112.8	116.6	116.3	124.1	113.4	127.5
05	Textile products	.046	100.0	110.4	117.2	110.0	124.1	106.7	134.3	134.2	138.6	132.4	153.4	152.1	160.5
06	Clothing	.045	100.0	100.1	97.8	103.2	105.2	100.6	105.7	114.8	114.0	108.7	114.9	113.9	120.0
08	Paper products	.068	100.0	107.4	115.7	109.2	115.0	116.6	125.9	136.4	136.3	133.7	137.2	141.6	140.6
09	Printing, publishing and allied industries	.047	100.0	111.8	117.3	118.2	129.5	139.7	146.1	161.2	161.9	160.1	174.4	175.4	181.5
15	Products of petroleum and coal	.017	100.0	91.8	101.1	95.0	118.6	127.6	134.5	153.8	132.4	130.2	159.4	180.6	209.5
16	Chemicals and allied products	.053	100.0	112.3	124.9	138.9	152.7	159.4	175.8	199.6	221.1	227.6	234.5	248.4	255.2
17	Miscellaneous industries	.025	100.0	115.5	129.3	135.9	172.0	175.0	180.4	204.1	219.8	223.6	245.2	250.3	284.7
	Non-durables	.463	100.0	107.6	112.4	115.1	124.7	125.1	136.3	147.5	153.7	153.9	165.8	168.2	176.9
07	Wood products	.044	100.0	97.2	101.5	109.0	117.6	110.9	121.7	128.8	129.6	124.9	133.3	136.9	145.1
10	Iron and steel products	.196	100.0	101.9	115.9	117.5	115.9	105.8	127.1	148.2	147.0	133.5	156.3	143.3[1]	150.6[1]
11	Transportation equipment	.127	100.0	125.9	141.9	148.8	165.9	133.7	153.6	160.9	151.7	134.2	137.6	128.2	125.6
12	Non-ferrous metal products	.066	100.0	108.0	126.2	116.7	119.9	111.2	121.4	120.3	131.1	116.7	136.6	[1]	[1]
13	Electrical apparatus and supplies	.073	100.0	114.1	120.8	125.8	155.4	150.8	171.5	195.3	181.4	173.8	184.9	182.0	201.8
14	Non-metallic mineral products	.031	100.0	111.9	121.8	123.6	140.9	146.4	161.3	181.0	186.9	194.7	206.6	201.3	203.1
	Durables	.537	100.0	110.2	123.1	125.6	135.2	121.9	140.2	154.5	151.7	139.9	154.4	147.8	154.2
	Total Manufacturing	1.000	100.0	109.0	118.2	120.7	130.3	123.4	138.4	151.3	152.6	146.4	159.6	157.2	164.7

[1]The combined indexes for 1948 S.I.C. groups 10 and 12 for 1960 and 1961 are indicated in the row of data for group 10. For explanation, see pp. 48-49 and pp. 65-66.

TABLE VI

INDEXES OF REAL PRODUCTION IN
ONTARIO MANUFACTURING,
1961-1969

INDEXES: 1961 = 100

1960 S.I.C.	Industry Group	1961 Value Based Weight	1961	1962	1963	1964	1965	1966	1967	1968	1969
01	Food and beverage industries	.125	100.0	107.9	110.8	120.1	124.9	130.0	137.6	141.4	142.9
02	Tobacco products industries	.005	100.0	90.3	110.2	121.2	140.7	150.4	172.9	166.1	191.9
03	Rubber industries	.025	100.0	127.2	132.4	141.9	154.7	172.8	182.2	167.0	181.6
04	Leather industries	.011	100.0	102.6	98.6	107.0	101.4	105.8	92.2	97.0	93.0
05	Textile industries	.028	100.0	112.3	119.7	131.1	139.0	147.7	152.8	179.0	204.1
06	Knitting mills	.007	100.0	100.0	105.7	113.0	114.2	109.8	99.7	107.3	107.6
07	Clothing industries	.018	100.0	101.2	106.9	111.8	115.6	119.2	114.2	120.0	117.1
10	Paper and allied industries	.072	100.0	102.6	106.2	115.5	120.0	131.3	129.9	134.9	144.1
11	Printing, publishing and allied industries	.058	100.0	101.0	101.8	103.7	110.1	117.0	121.0	122.0	126.1
18	Petroleum and coal products industries	.018	100.0	113.2	114.7	122.8	129.0	132.3	135.5	146.4	147.1
19	Chemical and chemical products industries	.081	100.0	110.3	116.0	133.2	143.0	158.6	163.7	180.3	191.0
20	Miscellaneous manufacturing industries	.044	100.0	109.0	116.1	130.5	137.3	155.9	166.7	190.8	201.4
	Non-durables	.492	100.0	107.5	111.6	121.7	128.1	137.9	142.4	150.6	157.8
08	Wood industries	.017	100.0	95.0	108.1	124.4	135.4	142.1	143.3	127.5	129.6
09	Furniture and fixture industries	.017	100.0	105.2	115.1	126.5	140.8	145.1	163.4	166.6	180.6
12	Primary metal industries	.106	100.0	104.9	116.5	126.5	141.9	146.0	142.8	162.8	151.0
13	Metal fabricating industries	.085	100.0	113.1	122.7	139.2	157.3	171.8	169.9	176.4	184.6
14	Machinery industries	.059	100.0	115.7	125.7	147.4	163.0	186.2	193.3	197.5	218.1
15	Transportation equipment industries	.109	100.0	119.9	145.4	159.0	198.8	211.1	244.0	285.3	309.4
16	Electrical products industries	.081	100.0	114.7	137.0	151.6	165.1	186.8	189.4	190.2	202.8
17	Non-metallic mineral products industries	.034	100.0	115.4	115.3	128.8	135.1	140.2	135.0	153.8	155.7
	Durables	.508	100.0	112.7	127.7	142.1	162.1	174.9	182.5	198.1	207.3
	Total Manufacturing	1.000	100.0	110.1	119.8	132.1	145.4	156.7	162.8	174.7	182.9

.Value added data on construction, whether in current or constant dollars, measures new and repair construction undertaken on a contract basis by all general, trade and sub-contractors; they are based upon information received from firms and individuals paying for the work done.

The series based upon 1949 equals 100 is not totally compatible with data from 1961 onward, in that the former also includes new own-account construction undertaken by the employees of non-construction industries. While the two series for Ontario are conceptually slightly divergent, consolidation in a long run index may be achieved by combining the two according to the more recent (and smaller) concept in exactly the same manner as followed in the Canada indexes of real domestic product.

Tables VII and VIII on pages 79 and 80 indicate the trends in indexes of real production in Ontario construction.

Electric Power, Gas and Water Utilities

This category is examined as a separate group throughout this study, despite its inclusion in the more aggregative category "transportation, communication and other utilities" from 1961 onward. Canada indexes of real domestic product similarly view this category as a distinct goods-producing unit and include it in the special grouping "index of industrial production."[25] The remaining components of the

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[25]The index of industrial production includes mining, manufacturing and electric power, gas and water utilities.

larger category consist of the service-producing transportation, storage and communication industries, according to the 1960 S.I.C.

Despite the "goods" orientation of the special group, indexes of real production for electric power, gas and water utilities are calculated according to the service industry approach, in which Canadian productivity is modified by the wage ratio to yield a distinct estimate of Ontario productivity and output.

Data sources for the estimation of real production indexes include Indexes of Real Domestic Product by Industry and various employment data publications.[26] Gross domestic product in constant base year dollars has been derived from the former publication and divided by estimated total employment in the particular industry under consideration to arrive at real output per employee in Canada. Each value has then been multiplied by the "productivity adjustment factor" and again by Ontario employment in the industry to obtain a real output value for Ontario. These have then been set up in index form.

A number of data adjustments have been required because of the absence of a complete series on total industry employment[27] from 1947

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[26]Dominion Bureau of Statistics, Estimates of Employees by Province and Industry, 1961-1968 (Ottawa: Queen's Printer, 1969); and Dominion Bureau of Statistics, Review of Employment and Average Weekly Wages and Salaries, 1957-67 (Ottawa: Queen's Printer, 1969) and selected annual issues. Additional data have been provided by the Labour Division, Statistics Canada.

[27]Total employment, estimated from a survey of large establishments and a sample survey of small establishments, is available only from 1961 onward in Estimates of Employees by Province and Industry.

onward. The major series available on large establishment employment is itself discontinuous to the extent that the original series, based upon the 1948 S.I.C. and measuring employment in establishments with fifteen employees or more, does not extend through the 1960's. Instead it is replaced by the 1960 S.I.C. series which measures employment in establishments of twenty employees or more. The latter series is conceptually comparable with the estimate of total employees (including estimated small firm employment) from 1961 to 1970.

In order to arrive at estimates of total employees from 1947 to 1961 (according to the 1949 basis), it has been necessary to assume a reasonable degree of stability in the ratio of large establishment employees to total employees. This has been confirmed in an examination of the series from 1961 to 1970, for which both large establishment employment and total employment are available. Changes over time have tended to be both moderate and smooth.

It has been assumed that this continuity has been maintained over the period 1947 to 1961. Accordingly, the ratios of large establishment (fifteen employees and over) employment to total employment from 1951 and 1961 census data have been calculated; where differences have existed, the intervening years (as well as 1947 and 1948) have been derived by interpolation. Dividing large establishment data for 1947 to 1961 by the corresponding annual ratios has yielded estimates of total employment.

This approach has been applied to both Canada and Ontario to arrive at two compatible employment series which will reflect the changing ratio of Canada labour input to Ontario labour input over time. By applying the Canada employment series to Canada real domestic product for electric power, gas and water utilities, it has been possible to determine Canadian output per employee in this industry group. The series has then been adjusted for the productivity gap and multiplied by Ontario employment to estimate Ontario output. Both the 1949 and 1961 based series on total output appear in index form in the aggregate tables.

Transportation, Storage and Communication

The calculation of real production indexes for transportation, storage and communications follows the procedure described in the immediately preceding section. To conform with Canada R.D.P. measures, the Dominion Post Office has been transferred to this group, despite its inclusion in the community, recreation, business and personal service division in the 1948 standard industrial classification.

The indexes from 1947 to 1961 appear in Table VII on page 79; the remaining period from 1961 to 1970, based on 1961 equals 100, is represented in Table VIII on page 80.

Trade

The trade industry is made up of retail and wholesale trade.
In this study the two have been aggregated because total employee
data are available only on a combined basis. Both the 1948 and 1960
standard industrial classifications for trade are considered sufficient-
ly compatible to permit direct linking of the respective R.D.P. series
for Canada.

The same methodology has been applied in deriving Ontario
indexes of real production for this industry as for the two preceding
industry groups. The two series, based on 1949 equals 100 and on 1961
equals 100, are represented individually in the aggregate tables
on page 79 and 80.

Finance, Insurance and Real Estate

Once again the derivation of Ontario indexes has been based upon
the service industry approach which differentiates Ontario productivity
from Canada productivity according to the corresponding ratio of average
weekly wages and salaries.

The establishment of a separate index for real estate, carried
out by Cameron in his 1964 study, has not been possible under the new
format for data presentation. Whereas Cameron was able to derive
real estate employment in large establishments (agencies) from existing
data, more recent data--both for large establishment employment and total
employment--do not isolate the real estate component. Cameron's approach
was to relate Canada real domestic product for real estate (which was based
on labour input) to personal income and to assume a similar relationship

for Ontario, thereby arriving at an estimate of value added for Ontario
real estate.

In essence this approach yielded Ontario real production in real
estate by applying the Ontario-to-Canada ratio of personal income to
Canada real domestic product in real estate. According to the produc-
tivity-adjusted employment approach used for other service industries,
the derived Ontario index is similarly related to the ratio of (a) the
product of Ontario employment and average weekly wages and salaries
to (b) the corresponding Canadian product. To the extent that the
latter ratio compares labour wage bills, it bears a close relationship
to the ratio comparing personal income, since labour income represents
by far the major portion of personal income. The difference between
the two approaches thus rests with the changing ratio of Ontario non-
labour personal income to that of Canada--which is a relatively minor
component and consequently of lesser importance.

Community, Business and Personal Service

The derivation of Ontario output measures for this industry
group has been made difficult by the absence of comprehensive data
covering the full period 1947 to 1970. A special procedure has been
followed to compensate for this deficiency.

While the "service" industries group (Division 11) of the 1948
S.I.C. includes government service, the latter has been transferred
to a separate category on public administration and defence in calcula-

tions of Canada real domestic product,[28] leaving the remaining services comparable with the 1960 S.I.C. Division 10 (community, business and personal service). Included in these are education, health, welfare and religious services, as well as motion picture and recreational services, services to management, personal services (e.g., laundries, hotels, barber shops) and miscellaneous services (e.g., labour organizations, trade associations, photography).

Appropriate Canada real domestic product indexes are available; until recently, however, employment data have been inadequate. Since 1961, total employee estimates have encompassed this group; prior to that time, the large establishment survey included only a small portion of the group; namely business, personal, recreational and miscellaneous services. The important education, health, welfare and religious services were omitted. This created problems when attempting to adequately reflect total employment in the total service group.

This data problem for the period prior to 1961 has been overcome by referring to 1951 and 1961 census data on the service sector, in order to isolate the education, health, welfare and religious employment from the remaining services. Employment in the latter business, personal and recreational group is assumed to move in accordance with the index of employment available from the large establishment survey from 1947 onward. It is further assumed that employment in education, health,

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[28]Dominion Bureau of Statistics, Indexes of Real Domestic Product by Industry (1961 Base), pp. 213-215.

welfare and religious services is not generally responsive to short term economic conditions, but tends to grow at a steadily increasing rate. This is borne out by the steadily rising expenditures on these activities made by the various levels of government. It is also supported by the rising level of service provided. In 1951 each employee in this group of services in Canada "supported" a population of 44.8; by 1961 this had fallen to 30.6 persons, reflecting the rising prominence of this industry group.

The estimation of employment in this group has been based upon the interpolation of the ratio of the industry's employment to total population between census years. The series has then been added to the estimates for the remaining services--after deducting estimated Dominion Post Office employment--to complete the industry employment estimate between 1947 and 1961. Because the data on average weekly wages and salaries cover only a relatively small proportion of the total industry, the productivity adjustment has been omitted. This decision has been reinforced by the extent to which labour input has served as the unit of measurement for Canada real domestic product in this industry group.

Public Administration and Defence

This group refers to the administration of the different levels of government as well as defence services. In Canada's indexes of real domestic product, this category represented over seven per cent of total gross domestic product in the base year 1961.

As in the case of the service industries group, the continuity
of this series is somewhat limited. This stems from the changes intro-
duced in converting from the 1948 S.I.C. to the 1960 classification.
For example, estimates of depreciation on all government-owned assets
have been included in this group for the first time as of 1961. While
the examination of the two periods 1947-1961 and 1961 onward as
separate entities removes these problems, there remains the difficulty
of obtaining appropriate employment data for the former period.
Unlike the latter period, for which total civilian employee statistics
are available, there is no satisfactory series which provides first
hand information on changes over time.

The problem has been handled in a manner similar to that
applied to service employment. Since R.D.P. measures include the
Armed Services, it has been necessary to view total employment as
consisting of civilian and non-civilian employment. Non-civilian
employment has been provided by the Department of National Defence
(covering the entire 1947 to 1970 period). Employment in public
administration, which is not readily available on a provincial basis,
has been estimated by examining the ratio of government employment
to total population for 1951 and 1961 and interpolating for interven-
ing years. This approach once again is based upon the assumption
of reasonably continuous growth trends in employment over time.

The addition of military employment to these employment
estimates (as well as to the survey statistics for 1961-1970) pro-
duces the final series for use in deriving Ontario real production

indexes in public administration and defence. Because of the basic labour input orientation of R.D.P. measures in this group, no productivity adjustment has been carried out.

VI. THE AGGREGATE INDEXES

The annual indexes of real production for all industry groups discussed are incorporated in the two tables appearing on pages 79 and 80. Table VII covers the period from 1947 to 1961 and is generally based upon the 1948 standard industrial classification, with all indexes based upon 1949 equals 100. Table VIII provides the same measurement of real production, but is based upon the 1960 standard industrial classification and is indexed with reference to 1961 as the base year. Data cover the period 1961 to 1970.

Method of Aggregation

Each table provides four aggregate measures of real production: goods; services; goods and services less agriculture; and total goods and services.

The method of aggregation corresponds to that employed in arriving at aggregate indexes in the mining and manufacturing groups. Each individual component is allocated a base year weight. Each weight represents the relative prominence of the industry with respect to total Ontario gross domestic product in the base year.

Individual values of gross domestic product have in effect already been calculated in arriving at each set of industry indexes.

TABLE VII

INDEXES OF REAL PRODUCTION IN ONTARIO
BY INDUSTRY GROUP, 1947-1961

INDEXES: 1949 = 100

Industry Group	1949 Weight	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Agriculture	7.229	90.6	95.7	100.0	99.3	103.1	105.5	105.4	105.6	107.4	108.8	115.4	128.0	121.7	122.8	134.1
Forestry	1.054	130.3	124.1	100.0	113.4	131.8	123.9	110.7	109.2	119.0	120.2	124.0	106.2	116.7	118.8	108.5
Fishing and trapping	0.152	89.2	88.2	100.0	101.1	97.8	91.4	95.7	88.2	93.5	89.2	83.9	79.6	58.1	61.3	62.4
Mining	2.103	88.5	95.9	100.0	104.2	115.5	117.0	118.0	126.2	133.7	151.1	191.6	228.5	277.5	264.4	241.0
Manufacturing	36.491	91.3	96.4	100.0	109.0	118.2	120.7	130.3	123.4	138.4	151.3	152.6	146.4	159.6	157.2	164.7
Construction	5.915	78.3	87.8	100.0	109.1	108.4	113.4	128.5	136.0	147.0	158.0	181.4	199.6	172.3	168.5	168.9
Electric power and gas utilities	2.025	84.2	91.5	100.0	115.5	136.3	147.9	157.2	170.5	193.2	206.9	220.0	241.7	274.5	294.4	320.0
Total goods sector[1]	56.142	90.3	95.7	100.0	108.0	116.0	119.2	127.6	124.8	138.3	149.6	155.8	157.2	165.9	164.5	171.0
Transportation, storage and communication	6.795	96.9	98.3	100.0	105.4	114.3	120.1	122.6	119.4	136.5	152.8	153.0	147.0	157.7	162.3	172.0
Trade	13.581	95.9	95.6	100.0	109.3	112.9	120.7	128.3	131.2	146.8	161.3	161.5	164.7	175.6	177.3	182.5
Finance insurance and real estate	9.705	87.9	93.6	100.0	106.3	116.7	121.8	125.8	132.4	139.1	143.9	154.5	157.3	164.7	171.7	178.7
Service	9.242	93.4	96.7	100.0	104.5	109.4	114.1	122.0	120.0	122.5	129.2	134.8	139.9	147.1	152.3	156.3
Public administration and defence	4.535	95.3	95.0	100.0	105.6	116.1	131.1	138.2	144.6	148.9	151.2	156.1	163.7	166.1	167.7	170.1
Total service sector	43.858	93.7	95.7	100.0	106.6	113.6	120.5	126.6	128.7	138.6	148.3	152.4	155.0	163.4	167.5	173.2
Total goods and services less agriculture	92.771	91.9	95.7	100.0	108.0	115.8	120.9	128.9	128.1	140.8	152.2	157.4	158.4	168.2	169.1	174.9
Total Goods and Services	100.000	91.8	95.7	100.0	107.4	114.9	119.8	127.2	126.5	138.4	149.0	154.3	156.2	164.8	165.8	172.0

[1]Includes miscellaneous goods industries not stated elsewhere; their growth is assumed to correspond to their growth in all of Canada.

TABLE VIII

INDEXES OF REAL PRODUCTION IN ONTARIO
BY INDUSTRY GROUP, 1961-1970

INDEXES: 1961 = 100

Industry Group	1961 Weight	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Agriculture	3.513	100.0	104.4	104.7	108.7	109.3	117.0	115.4	118.3	117.6	121.6
Forestry	0.523	100.0	105.1	108.3	115.3	114.8	121.6	122.9	119.6	125.8	120.1
Fishing and trapping	0.043	100.0	86.9	100.0	91.8	85.2	91.8	82.0	88.5	103.3	78.7
Mining	3.512	100.0	93.7	90.4	95.0	96.9	89.1	103.9	113.7	99.5	118.1
Manufacturing	31.072	100.0	110.1	119.8	132.1	145.4	156.7	162.8	174.7	182.9	180.8
Construction	4.730	100.0	108.3	112.4	118.4	126.5	145.8	145.5	155.4	158.8	162.6
Electric power, gas and water utilities	3.376	100.0	102.0	108.3	115.2	119.5	128.5	138.3	147.9	166.6	184.7
Total goods sector	46.769	100.0	107.6	114.7	124.7	134.9	145.1	150.8	160.5	167.4	169.3
Transportation, storage and communication	7.675	100.0	104.3	111.6	122.4	130.1	137.4	145.5	152.4	163.8	174.9
Trade	12.857	100.0	105.3	110.2	117.5	126.3	135.8	142.4	147.6	156.5	159.8
Finance insurance and real estate	13.344	100.0	104.1	108.1	111.3	115.8	119.9	125.8	130.3	137.1	140.1
Community business and personal service	12.751	100.0	106.9	112.2	120.3	129.0	140.1	149.0	159.8	170.6	179.5
Public administration and defence	6.604	100.0	103.1	104.3	108.0	110.5	118.2	120.5	127.1	128.1	129.6
Total service sector	53.231	100.0	105.0	109.6	116.1	122.9	130.9	137.5	144.3	152.5	158.0
Total goods and services less agriculture	96.487	100.0	106.3	112.3	120.6	129.2	138.3	144.8	153.1	161.0	164.8
Total Goods and Services	100.000	100.0	106.2	112.0	120.2	128.5	137.5	143.7	151.9	159.5	163.3

In the case of agriculture, forestry and mining, where physical units, gross output or actual indexes alone formed the basis for the derivation of indexes, Ontario's share of census value added in Canada has been applied to Canada gross domestic product in the base year for the appropriate industry.

The base year weights appear in the first numerical columns in Tables VII and VIII. As can be seen, manufacturing is over-whelmingly the principal industry group in Ontario, accounting for roughly one third of total provincial output in both base years. Other prominent groups are trade (wholesale and retail); finance, insurance and real estate, and the service industries. These three groups combined have accounted for roughly another one third, leaving all remaining industries combined as the final one third.

Although there are certain discontinuities between the 1949 and 1961 based data, most industry groups are directly comparable. Consequently the changes in weights between 1949 and 1961 reflect the shifts which have taken place between industries. For example, agriculture has receded in prominence since 1949 while almost all service-producing industries have become more prominent. Manufacturing, which yielded part of its share of total product nevertheless remains by far the leading industry in the province.

Trends in Real Production

Based upon the estimates of real production, the trend rate of growth of Ontario's output was 4.8 per cent annually between 1947 and 1961, and over 5.8 per cent between 1961 and 1970. As might be expected, the changing pattern of growth over time corresponds reasonably closely to Canadian experience.[29] This can be expected in light of Ontario's prominence in the nation.

According to the derivation of real production, gross domestic product in Ontario in 1961 was valued at 14.25 billion dollars, representing 40.7 per cent of Canada gross domestic product, which was valued at 35.97 billion dollars.

The 5.8 per cent trend rate of growth in the 1961-1970 period has included 6.4 per cent and 5.4 per cent annual gains in the output of goods and services respectively. The total non-agricultural economy rose 6.1 per cent.

Table VIII, which covers the period to 1970, indicates that manufacturing and electric power have been the major strengths in the goods sector during the 1960's, with greater than average annual gains of 7.2 per cent and 6.7 per cent respectively. In the services sector, the most rapid increases appear to have taken place in the transportation group and in community, business and personal service.

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[29]This is confirmed by the Canada indexes of real domestic product, which indicate similar trends over time. It should be noted, however, that the Canada and Ontario indexes are not strictly comparable, since several indexes for Ontario have been derived without direct reference to the Canadian indexes.

The trends in Ontario real production can be seen in Figures 1 and 2, on pages 84 and 85. These indicate the changes taking place in output in the two periods covered by the indexes and reveal the extent of the upsurge in output which has taken place in the past decade. These and other characteristics of Ontario's economic growth will form the basis for the determination of potential output over the period to 1977. The additional required element--population and labour force--is derived in Chapter V.
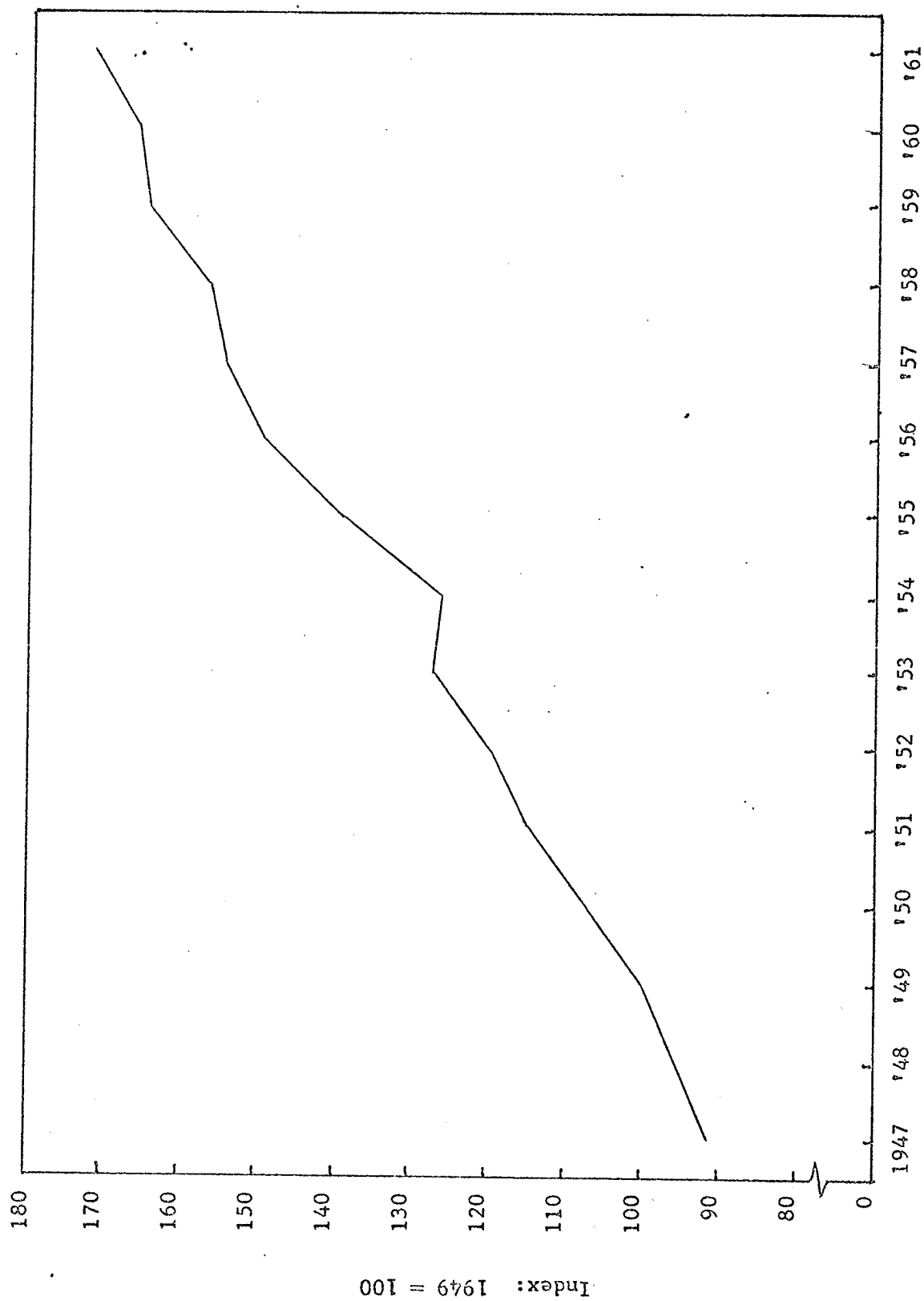
FIGURE 1

INDEX OF TOTAL REAL PRODUCTION IN ONTARIO (INDEX: 1949 = 100)
1947-1961

Index: 1949 = 100

180 170 160 150 140 130 120 110 100 90 80 0

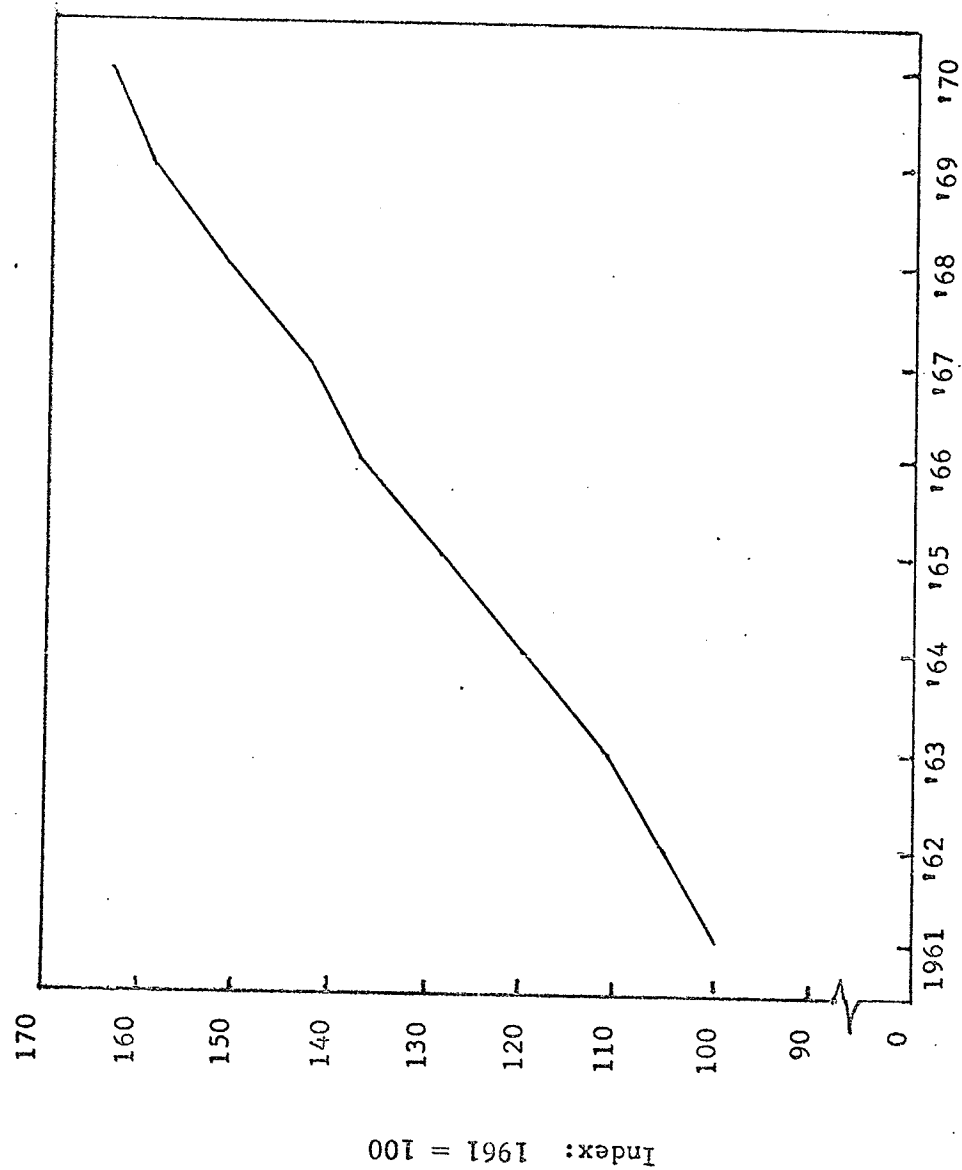1947 '48 '49 '50 '51 '52 '53 '54 '55 '56 '57 '58 '59 '60 '61

FIGURE 2

INDEX OF TOTAL REAL PRODUCTION IN ONTARIO
(INDEX: 1961 = 100)
1961-1970

CHAPTER V

ONTARIO POPULATION AND LABOUR FORCE

The existence of an aggregate measure of total output--such
as has been developed in Chapter IV--is not alone sufficient to derive
adequate estimates of potential output for an economy. Movements in
total output over time actually represent the combined effect of
changes in two very important and separate elements: output per
employed person and the total number of employed persons.

The former is commonly used as a means of representing produc-
tivity. The latter represents the end product of interacting forces,
namely demographic and economic. Employment, while obviously a
function of economic conditions, does require an appropriate popula-
tion and labour force base from which to draw. This chapter concerns
itself with past trends and forecasts for that population and labour
force base.

I. POPULATION

The size, structure and rate of growth of population are
among the basic factors in a nation's economic performance. Many
factors ultimately influence the rate of growth in an economy--for
example, the nature of industrial organization, resources, levels of
productivity--but it is basic population considerations that spawn
many of the other parameters of growth. The size and age distribution

of the population influence the potential size of the labour force,
which in turn influences the labour input in the economy. Aside
from its impact upon demand, population growth relates to the growth
of the economy over time by influencing the size of the group of
"employable" persons--the labour force "source" population of working
age.[1] The application of participation rates yields the size of the
labour force itself.

Perspective on Ontario Population

As an industrial nation, Canada is relatively sparsely populated,
with just over 21 million people in 1971. Ontario, the most populous
province in Canada, has a population of 7.7 million, approximately
36 per cent of the national total. This compares with 203 million in
the United States, 56 million in the United Kingdom, 102 million in
Japan and 50 million in France, to mention some of the major industrial
nations of the world.

In recent decades, population growth in Canada and Ontario has
exceeded growth in most of these nations. In the United States,
for example, average annual growth was 1.7 per cent in the 1950's
and 1.3 per cent between 1960 and 1970. In Canada, the corresponding
growth rates were 2.7 per cent and 1.8 per cent. Ontario surpassed

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[1]According to the Labour Force Survey, Canada's major household
sample survey, Canadian source population is defined as total popula-
tion aged 14 years and over, excluding inmates of institutions, members
of the Armed Services, Indians living on reserves, and residents of
the Yukon and Northwest Territories.

both with average annual growth rates of 3.1 per cent and 2.2 per cent respectively.

Examination of the trend of Canadian and Ontario population growth reveals there have been several distinct phases of growth over the past century. Figure 3, which indicates population growth by five year periods, reflects average annual growth in Ontario of between 1.5 per cent and 1.8 per cent during the early years of Confederation.[2] Between 1881 and 1891, this rate of growth eased to 0.9 per cent annually. From this point onward, however, there was a pronounced falling off in the annual rate of growth, with average 0.3 per cent increases occurring through to the end of the 19th Century. During the early years of the 20th Century the rate of population increase gained strength, with the return to annual increases between 1.5 per cent and 2.0 per cent continuing to the end of the 1920's. Population increases tended to flatten out once again during the depression years of the 1930's, both in Ontario and elsewhere in Canada. From 1941 onward, population growth accelerated dramatically, rising an average 1.5 per cent annually through to 1946, 2.3 per cent to 1951, and a very sharp 3.2 per cent annually to 1956. Some moderation was evident in succeeding years, with average growth tapering to 2.9 per cent to 1961 and an average of 2.2 per cent annually through to 1971.

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[2]Figure 3 is presented in semi-logarithmic form, where equal vertical distances represent equal percentage increases. More steeply rising curves represent higher rates of increase.
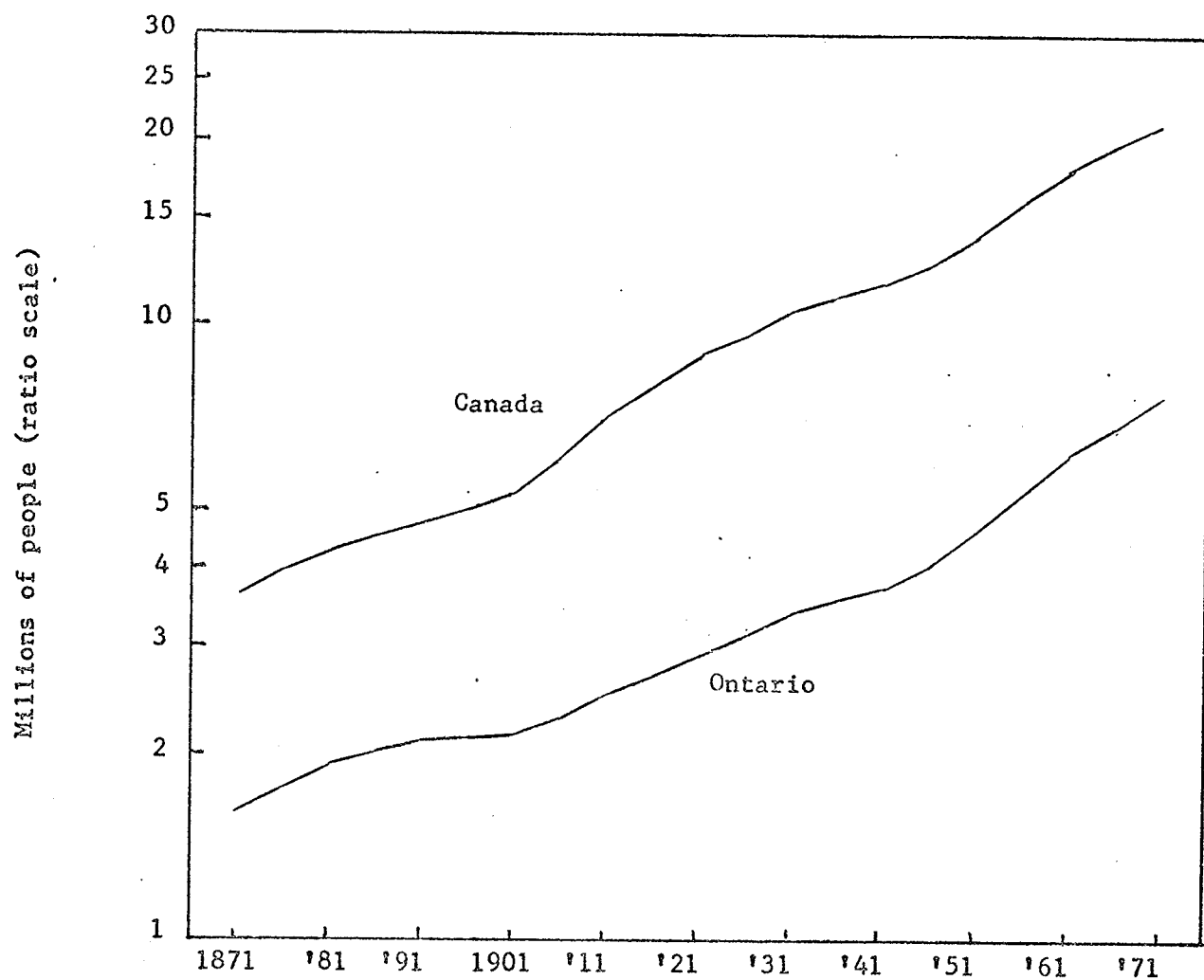
FIGURE 3

POPULATION GROWTH IN ONTARIO AND CANADA, 1871-1971
(BASED ON DATA FROM DEPARTMENT
OF TREASURY AND ECONOMICS)

In terms of its prominence in Canada, Ontario's population
has passed through several distinct phases during the past century,
as can be seen in Figure 4. In 1871, it represented just over 42
per cent of Canada's population, which at that time consisted of
scarcely more than the original founding provinces. After 1881 the
percentage dropped fairly sharply, falling to 32 per cent of the Canadian
total by 1931, as the development of the Canadian West during the
first decades of the 20th Century led to rapid growth outside of
Ontario. Since the 1940's, however, Ontario's share has risen steadily,
corresponding to the emergence of Toronto as a major centre of industry
and finance. In 1971 Ontario's population represented over 35 per cent
of the Canadian total.

Elements of Population Growth

Analysis of the characteristics of population growth both his-
torically and for forecasting purposes requires an examination of
the basic elements of population growth. This "component method"[3]
examines natural increases in population and net migration. The
natural increase refers to the net effect of deaths and births in a

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[3]This method is employed in the most comprehensive of popula-
tion projections. See Frank T. Denton, Yoshiko Kasahara and Sylvia
Ostry, Population and Labour Force Projections to 1970, Staff Study
No. 1, Economic Council of Canada (Ottawa: Queen's Printer, 1964);
also Wolfgang M. Illing, Population, Household and Labour Force
Growth to 1980, Staff Study No. 19, Economic Council of Canada
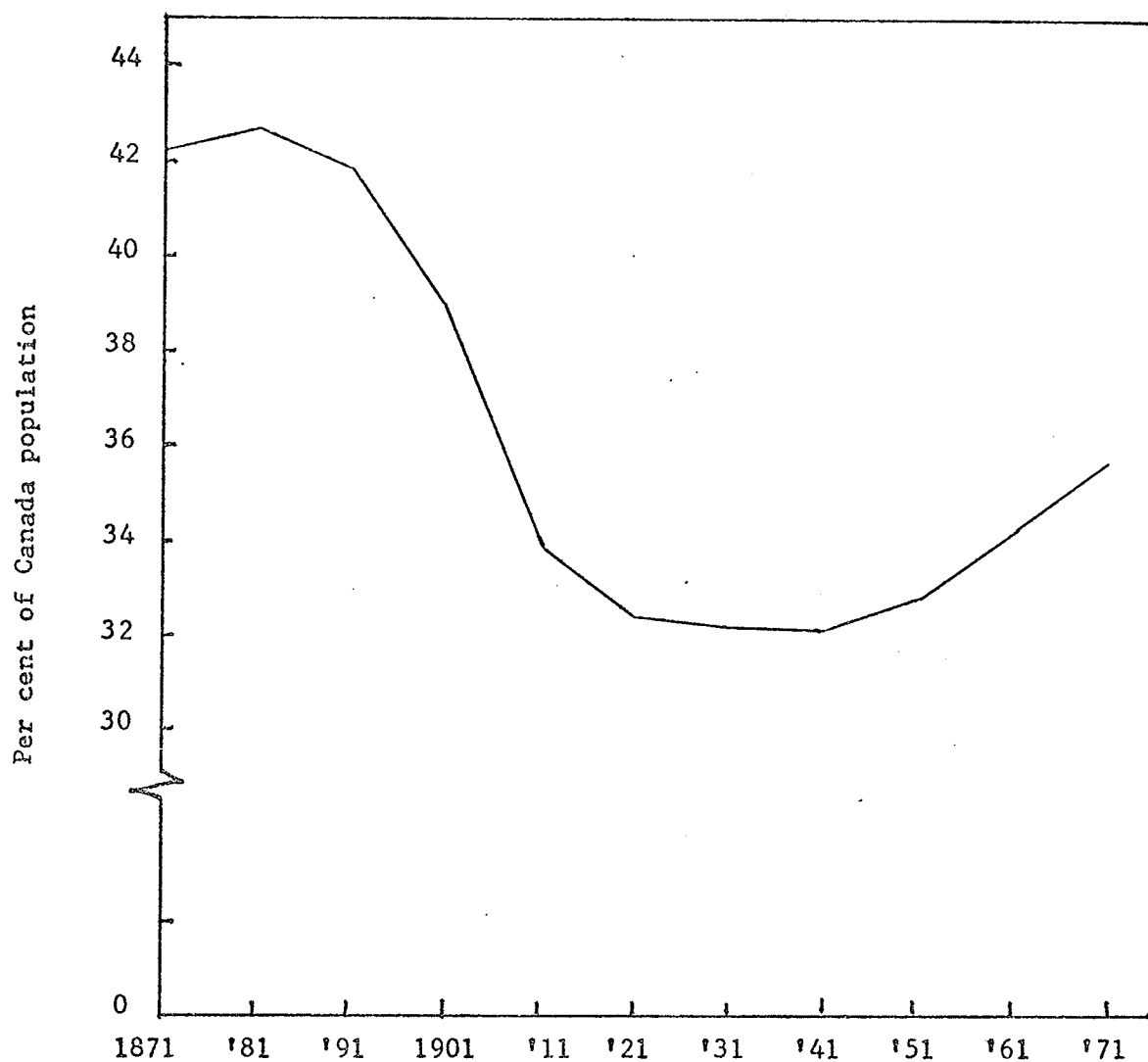(Ottawa: Queen's Printer, 1967).

FIGURE 4

POPULATION OF ONTARIO AS A PERCENTAGE
OF POPULATION OF CANADA, 1871-1971
(BASED ON DATA FROM DEPARTMENT
OF TREASURY AND ECONOMICS)

given population. Net migration represents the net addition to (or subtraction from) the population through the inflow (or outflow) of migrants from (or to) other countries and other provinces.

While natural increase has played a significant part in the growth of population in both Canada and Ontario, migration has been a prominent factor, especially in the late 1950's and late 1960's.

Mortality. The crude death rate--expressed in deaths per thousand population--in both Ontario and Canada, as in other industrialized nations, is perhaps the most stable of the three basic factors in population growth. Primarily because of continuing improvements in preventative and remedial medicine and in general living standards, there has been a fairly steady decline in the death rate over time. Ontario, with one of the lowest crude death rates of all Canadian provinces, has seen this rate decline from over 13 deaths per thousand population during the early 1900's to 7.5 by 1969. In numerical terms, Ontario's total deaths rose from 34,000 in 1911 to just under 56,000 in 1969. Thus, while population increased almost 200 per cent, the number of deaths rose only 62 per cent.

The crude death rate provides an overview of broad trends; but it is not sufficiently detailed for analytical purposes. Shifts in the relative prominence of various age groups combined with changing age-specific death rates (or deaths per 1000 population in a particular age group) reveal more precisely the characteristics which have

affected the crude death rate.

While medical science and improved hygiene have been instru-
mental in reducing death rates for all age groups in general,[4] nowhere
have they played as prominent a role as in the earliest years of life.
Historically, the death rate has been quite high during child birth
and in early infancy, due to the vulnerability of the newborn in their
new environment. Mortality rates among infants aged zero to one year[5]
have always been relatively high, exceeding all age groups up to the
age group 60-64 for males and 65-69 for females. During the 20th
Century there have been remarkable reductions in infant mortality,
more so than in any other age group. For the age group zero to four
years, the death rate fell from 28.3 in 1921 to 4.0 in 1969.[6] The
corresponding declines by sex were 31.8 to 4.4 for males and 24.7 to
3.5 for females.

Even so, infant mortality rates remain relatively high compared
with all age groups below age 45. In 1969, the death rates for all
other age groups up to age 40 were less than 1.7, while the age group

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[4]Any exceptions, of course, are likely to come at the oldest
age groups where death eventually overtakes those survivors of lower
age groups. As long as the size of this age group is rising, however,
reduction in the death rates of all age groups is possible.

[5]Expressed as number of deaths per thousand live births.

[6]Dominion Bureau of Statistics, Vital Statistics, 1969
(Ottawa: Information Canada, 1972), pp. 92-94; Department of Treasury
and Economics, Population Statistics for Ontario, 1969, Toronto, 1969,
Table 33.

40-44 recorded a rate of 2.6. Beyond age group 45-49, with its rate

of 4.5 deaths per thousand, there is a steady acceleration, culminating

in rates in excess of 100 for age groups 80 years and over.

Fertility. The relative stability of Ontario's crude death

rate over time contrasts with the fluctuations in the crude birth rate

(births per thousand population). While the death rate has moved

steadily downward, the crude birth rate has fluctuated between approx-

imately 17 and 27 births per thousand population. The rate passed

through a trough in the late 1930's after it peaked during the early

1920's. The gradual recovery through the 1940's culminated in a peak

in 1957 and was followed thereafter by a precipitous decline in the

1960's. In the late 1960's the crude birth rate approached record

low levels.

While the crude birth rate offers an interesting comparison

with crude death rates, thus giving some insight into the rate of

natural increase in population, a more appropriate analysis of births

should relate to the female population exclusively; in particular,

age groups between 15 and 44 years (generally regarded as the main

child bearing ages). As Figure 5 indicates, births relative to the

population of women of child bearing age have been far from stable,

showing marked declines during the two distinct periods noted earlier.

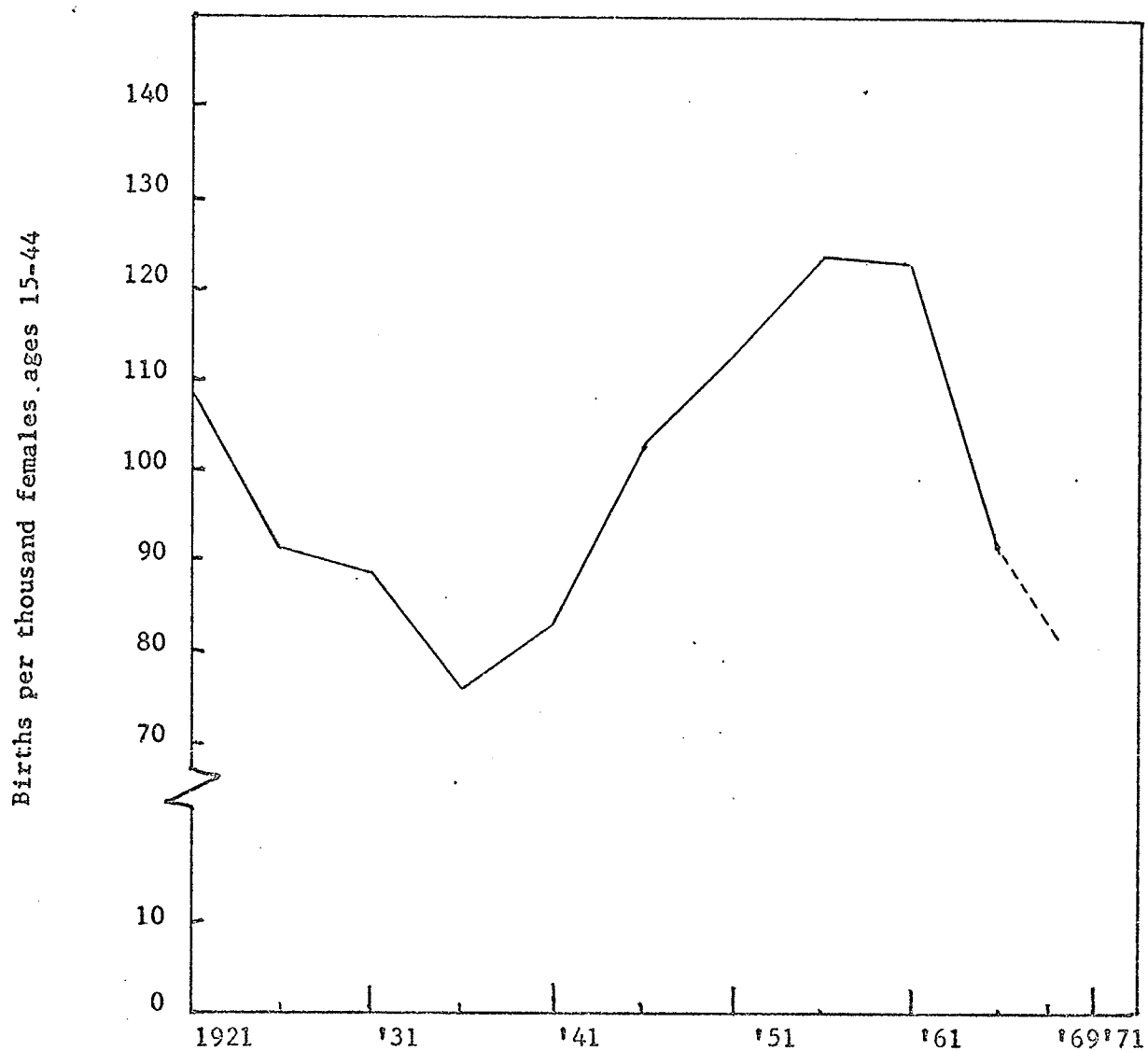Within the broad range of ages are distinct age sub-groupings

FIGURE 5

BIRTHS PER THOUSAND FEMALES AGED 15-44
IN ONTARIO, 1921-1966 AND 1969
(BASED ON DATA FROM DEPARTMENT
OF TREASURY AND ECONOMICS)

with their own characteristic rates. The following statistics illustrate the relative prominence of specific age groups and the changes in age-specific birth rates which have taken place between selected years:[7]

Age Group	Births per 1,000 Women in Age Group		
	1921	1959	1969
15-19	35.4	71.7	49.5
20-24	150.3	239.5	152.5
25-29	173.4	214.7	148.4
30-34	143.0	133.0	82.3
35-39	98.2	73.0	38.3
40-44	38.8	20.8	10.7
15-44	109.3	126.8	82.1

As can be seen, birth rates for the prominent age groups up to 29 years increased to 1959, falling back somewhat by 1969. At the older ages, there has been a smoother declining trend with diminishing rates throughout most of the 48 year span.

There are numerous factors which influence the rates of births among different age groups and for the total female population of child bearing age. Economic factors may be prominent. During the depression years of the 1930's the rates declined sharply because

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[7]Ibid., Table 24.

of the reduced ability to afford children. Important social factors
include attitudes towards age at marriage, desired family size and
appropriate age for child bearing. Trends toward more extensive
schooling or the pursuit of careers may further postpone child bearing.
The advent of oral contraceptives represents a technological factor
which has facilitated postponement as well.

The decline of birth rates during the 1960's can actually be
viewed as a response to certain distinct factors accompanying the long
period of economic growth: rising female participation in the labour
force; new social attitudes favouring smaller families; and the advent
of more convenient and reliable contraception.

Net Migration. Total net migration into Ontario has played
an important role in the province's population growth. Throughout
the post World War II period, approximately 40 per cent of Ontario's
population increase has been due to net migration. The overall
prominence of migration, however, has been matched by its volatility.
In 1967, when it added 111,000 to the population, net migration repre-
sented 59 per cent of the population gain; in 1962, a year of relatively
high unemployment, the net migration of 11,000 accounted for a slim
10 per cent of the population increase.

The ability of Ontario to attract migrants is in part repre-
sentative of Canada's positive features and in part a reflection of
Ontario's prominent role in the nation. As a young, resource-rich
and industrialized nation with vast potential for increasing population

and output, Canada has been able to attract migrants from all areas of the world. This inflow has often varied according to economic conditions in Canada, particularly as they relate to conditions in the home countries of prospective migrants.[8] In addition, specific non-economic factors have been prominent, such as in 1957, when a large influx of Hungarian migrants followed the political upheaval in that country. In recent years, emigrants from the United States have come to Canada because they wish to avoid the military draft or because they oppose certain United States policies.

Historically, over one half of all immigrants to Canada have named Ontario as their province of destination.

Ontario has usually experienced net gains in terms of inter-provincial movements as well. This phenomenon has been largely economic in nature, reflecting Ontario's favourable position with respect to regional disparities. The existence of employment opportunities has attracted young adults from other provinces, as have higher wages, the concentration of industry and commerce and the attractiveness of the major urban centres.

Ontario Population Projections

The projection of population by the component method requires comprehensive analysis of current and historical data. In analyzing

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[8]To a certain degree it has been influenced by the access accorded prospective migrants by official inmigration policy. Canadian policy, while it has become more stringent in recent years, is still regarded as fairly liberal.

the trends of the past and evaluating likely assumptions regarding

the future, comparisons have been made with the assumptions of existing

projections produced by the Province of Ontario. The decision has been

taken to use existing projections of annual population made by the

Ministry of Treasury, Economics and Intergovernmental Affairs (formerly

the Department of Treasury and Economics).[9] Since the projections

employ official 1969 intercensal population estimates as the base,

some adjustments have been made to incorporate more recent official

population counts.[10] The adjustments consist of the establishment of

indexes of projected population by age group which have been related

to the originally projected 1971 population by age group. The sub-

stitution of the actual 1971 count for each age group as the new base

then permits the recalculation of projected population according to

the assumptions adopted from 1972 onward.[11]

Assumptions. It has been assumed that age-specific death rates

will continue their marginal improvement at the same rates as observed

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[9]Department of Treasury and Economics, Ontario Short-Term
Population Projections, 1970-1981, Toronto, September, 1970.

[10]The latest data available are the early releases of the
1971 Census of Canada on provincial population by age groups. See
Statistics Canada, Statistics Canada Daily, April 26, 1972, pp. 2-4.

[11]This approach is adequate to represent the application of
the original assumptions to the new data, particularly since the
original projections are not substantially different from the actual
recorded population counts. Comprehensi e population projections
must await more complete 1971 Census of Canada population data.

over recent years. While these trends are expected to continue, the trend in age-specific fertility rates is expected to stabilize at the rates recorded for 1969, the last year for which detailed information is available.[12] These constant rates over the period to 1977 reflect the state of equilibrium which appears to have been reached by 1969.

The net migration assumption anticipates a sustained net influx of 60,000 persons between 1971 and 1972, settling down to a constant net inflow of 50,000 persons annually to the end of 1977. Migration is represented as a smooth trend because of the impracticality of estimating likely movements around this trend. This is regarded as a medium assumption representing the trend of the past few decades. It corresponds to the general conception of Ontario's net migration indicated in other population projections.[13]

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[12]As is customary when projecting variables which fluctuate over time, alternative assumptions have been made to represent prospective population growth under different situations. In this study only the "most probable" assumption is incorporated into the single set of projections. The "most probable" trend of fertility rates corresponds to the "medium" assumption made in projections of Canadian population. See Census Division, Dominion Bureau of Statistics, The Population Projections for Canada, 1969-84 (Analytical and Technical Memorandum No. 4. Ottawa: Queen's Printer, April, 1970), pp. 11-24.

[13]Department of Treasury and Economics, Preliminary Population Projections for Ontario, 1971-1991, Toronto, December, 1968, pp. 5-6.

Projection Results. The application of the preceding methodology and assumptions to the existing 1971 population base has yielded annual projections to 1977 as indicated in Table IX. Ontario's population is expected to rise from 7.7 million in 1971 to more than 8.5 million in 1977, a gain of 10.8 per cent over the period or an average 1.7 per cent annually. All age groups with the exception of 5-9 years and 10-14 years are expected to increase, the largest gains taking place in the 25-34 age group, which should rise 26.1 per cent to 1977. The young age groups which are expected to decline are reversing the positive growth recorded between 1966 and 1971. The youngest group --age 0 to 4 years--had declined between the two recorded census counts in 1966 and 1971, but should recover on the basis of recent and anticipated births.

According to these projections, the population aged 15 to 64 years, which most closely approximates working ages, will advance more rapidly than the population as a whole. The annual gain in 1972 is expected to reach 2.7 per cent, gradually diminishing to an increase of 2.5 per cent to 1974 and to 2.2 per cent by 1977.

TABLE IX

ACTUAL AND PROJECTED POPULATION IN ONTARIO
BY AGE GROUPS, 1966 AND 1971-1977

Age Group	Census 1966	1971	1972	1973	1974	1975	1976	1977	Percentage Change 1971-77 Per Cent
				Thousands of Persons					
0-4	745.7	637.3	645.7	661.0	681.0	703.6	725.7	747.8	17.3
5-9	770.1	783.5	760.3	729.9	701.9	678.8	673.0	680.7	13.1
10-14	688.3	787.7	797.2	805.1	807.3	804.3	787.4	763.9	3.0
15-19	599.2	713.4	736.8	759.4	780.9	800.0	815.5	824.3	15.5
20-24	485.1	674.1	695.0	712.3	729.5	748.2	769.3	792.1	17.5
25-34	881.0	1,045.5	1,088.8	1,133.4	1,180.3	1,227.2	1,273.4	1,317.9	26.1
35-44	942.0	942.7	944.8	947.4	952.2	960.2	971.7	987.8	4.8
45-54	744.4	850.9	873.8	895.5	915.4	932.0	944.0	952.0	11.9
55-64	537.5	623.6	639.7	654.6	669.6	685.8	703.8	723.5	16.0
65-69	199.2	227.8	233.5	239.2	245.3	252.0	259.5	267.7	17.5
70+	358.5	416.6	426.6	436.6	446.4	456.9	467.8	478.9	15.0
Total	6,960.9	7,703.1	7,842.2	7,974.4	8,109.8	8,249.0	8,391.1	8,536.7	10.8

II. LABOUR FORCE

The growth of labour force in Ontario, as in Canada, has been a major factor promoting rising output and employment. Few other countries have experienced as prominent a rise in labour force in recent decades.[14] Since 1946, when it numbered 1,702,000, the Ontario labour force has risen 91 per cent to a level of 3,249,000 in 1971. A continuation of the strong growth in labour force--it increased an average 3.0 per cent annually during the 1960's--would go far towards encouraging rapid economic growth in the 1970's; a significant falling off would signal the possible danger of economic stagnation.

Elements of Labour Force Growth

The size of the labour force in any economy is influenced by a number of factors. The first consideration, of course, is the actual population within the age groups from which the labour force is drawn. The total labour force is considered to be drawn from the population aged 14 years and over, according to Canada's Labour Force Survey. In this survey, labour force "source" population is defined as the total population aged 14 years and over, excluding inmates of

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[14]Using these past trends as an important element in future growth, projections of labour force to 1985 indicate that Canadian labour force growth will be almost twice that of the United States, over three times that of France and 11 times that of Britain. See Illing, op. cit., p. 79.

institutions, members of the Armed Services and Indians living on reserves.[15]

The relationship between this source population and the actual labour force is determined by individual participation rates by age group and by sex; that is, by the percentage of a particular source population group (according to age group and sex) that is actively engaged in work or seeking work.

These participation rates are themselves the result of social and economic factors. In recent years, for example, women have generally participated in the labour force to an increasing degree. This has been fostered by changing social attitudes toward working mothers and toward career women in general. The ability of women to participate has been fostered by technological advances which have freed housewives and mothers of much of their time-consuming duties, giving them the opportunity of pursuing independent careers.

In addition, economic conditions may affect labour force participation. During economic expansions, when opportunities for employment abound, many women enter the labour force to take up easily-obtainable employment. When conditions grow more slack, many of those who were marginal--that is, who only sought to take advantage of opportunities for extra money when they were plentiful--

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[15]Residents of the Yukon and Northwest Territories are also omitted from Canadian labour force source population.

may choose to leave the labour force rather than remain in it in an unemployed status.

On a broader front, the need for more education has reduced labour force participation at the younger age groups over recent decades. Similarly, the introduction of pension plans encouraging retirement at age 65 (or younger) has affected labour force participation at this age level and beyond.

Aside from these specific groups, labour force participation has tended to be quite stable, making the size of this part of the labour force largely a function of the size of the source population.

Estimating Methodology

The basic techniques used in projecting labour force follow the steps indicated above.[16] That is, based upon historical data, the total population is subdivided according to age group and sex for the age groups from 14 years onward. From each group are deducted the corresponding data for inmates of institution, members of the Armed Services and Indians living on reserves. Projections of these same components provide the necessary statistics for the derivation of the future size of the source population.

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[16]These techniques are applied in Denton, Kasahara and Ostry, op. cit., pp. 23-29; Illing, op. cit., pp. 72-76; Department of Treasury and Economics, Ontario Labour Force Projections, 1968-1991, Toronto, October, 1968, pp. 2-5; and Ministry of Treasury, Economics and Intergovernmental Affairs, Labour Force, Employment and Unemployment, Ontario, 1972, Toronto, April, 1972, pp. 9-12.

The next step is to analyse past trends in labour force

participation by age group and sex. Factors which have affected

these rates in the past can be evaluated and their future roles

forecasted. In addition, any new elements which may influence

future participation can be evaluated and incorporated in the pro-

jected participation rates.

Ontario Labour Force Projections

The projection of Ontario labour force in this study follows

the same standard approach adhered to in other labour force pro-

jections.[17] Because provincial data are not as extensive as data at

the national level, it has been necessary to base the analysis upon

trends observed in Ontario only over the past decade, supplemented

with more detailed national information.

Labour Force Source Population. The estimate of source

population is based largely upon the population projection in Table IX

on page 102.[18] From the initial statistics for each sex and relevant

age group have been deducted members of the Armed Services, inmates of

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[17]Cf. ante, footnote 15, p.

[18]In the absence of 1971 Census of Canada population data by
sex, the age groups of Table IX have been apportioned by sex accord-
ing to the distribution given in Department of Treasury and Economics,
Ontario Short-Term Population Projections, 1970-1981. In addition,
estimates of population aged 14 have been added to the 15 years and
over categories to bring the population classifications more closely
in line with labour force definitions of source population.

institutions and Indians living on reserves. Data for 1970 were
compared with official statistics on source population to ensure
compatibility.[19]

Annual information on the strength of the Armed Services in
Ontario was obtained from the Department of National Defence, along
with the typical age and sex distribution. This standard age and
sex distribution was applied to the military population in Ontario
for each year. According to estimates of the Department of National
Defence, the gradual decline in personnel which started in 1962 is
expected to end in 1972, remaining stable throughout the remaining
forecast period. This has been incorporated in the projected non-
civilian population in Ontario.

The remaining difference between the original population and
the final source population was allocated between Indians on reserves
and inmates of institutions for each sex and age group according to
1966 data. It was assumed that the growth of each group (by age and
sex) would follow that of the corresponding group in the general
population.

The adjustments made to the original 1970 population of working
age lowered the total male group aged 14 and over by less than three
per cent and the corresponding female group by less than 2.5 per cent.

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[19]Ministry of Treasury, Economics and Intergovernmental
Affairs, Labour Force, Employment and Unemployment, Ontario, 1972;
p. 20. Estimated source population was specially tabulated by
the Labour Division, Statistics Canada.

As a consequence the projected trends in the final source population did not differ noticeably from the growth of the corresponding population aged 14 and over. This similarity was strengthened by the assumptions of equivalent growth for Indians living on reserves and inmates of institutions, leaving the stability of the Armed Services as the only factor affecting the annual growth rate. Thus the assumption of stable military strength led to an overall increase of 15.3 per cent in male source population between 1971 and 1977, as compared with 15.1 per cent for the original male population aged 14 and over. Because of the minimal female participation in the Armed Services, both female growth rates were equal, at 15.4 per cent, for the period 1971 to 1977.

Based upon the derived estimates of labour force source population, it is projected that the overall potential work force will rise from 5,497,000 in 1971 to 6,340,000 in 1977, an increase of 15.3 per cent. The following indicates the percentage increases expected from 1971 to 1977 by age group and sex:

Age Group	Males	Females
14-19	14.1	14.3
20-24	18.5	16.8
25-44	16.1	16.2
45-64	13.6	13.8
65$^+$	14.7	16.8
Total	15.3	15.4

Participation Rates. The extent to which the source population

actually engages in work, or actively seeks work, is reflected in

Ontario's overall participation rate. Since the early 1950's, partici-

pation rates have moved up slowly from 55.2 per cent in 1953 to 58.3

per cent in 1971.[20] Canada's corresponding advance has been from 53.1

per cent in 1953 to 56.1 per cent in 1971.

An examination of Ontario labour force participation rates

by sex indicates a basic difference in the direction of male and female

rates. Since 1961, male participation in the labour force has declined

slightly, from 84.3 per cent in 1961 to 78.5 per cent in 1970. During

the same period, female participation rose from 32.6 per cent to 38.1

per cent. These trends, which are characteristic of Canada as a whole,

are expected to continue during the 1970's.

As the statistics indicate, males participate in the labour

force to a much more substantial degree than females, reflecting the

established role of the male as the principal income earner. This

role creates a significant degree of stability in the age groups 25-44

years and 45-64 years, where participation exceeds 90 per cent. The

major shifts in participation, in fact, take place at the younger and

older age groups, where education and possible retirement respectively

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[20]Statistics Canada, The Labour Force, January, 1972
(Ottawa: Information Canada, 1972), p. 44.

[21]Ministry of Treasury, Economics and Intergovernmental
Affairs, op. cit.

exert a strong influence on decisions to participate in the labour force. Changes in participation rates by age group and by sex from 1961 to 1970 are indicated below:

Age Group	Males		Females	
	1961	1970	1961	1970
14-19	43.6	39.4	36.9	31.4
20-24	94.6	83.2	51.0	59.4
25-44	98.8	97.6	34.4	43.5
45-64	94.2	92.9	33.3	40.8
65^+	33.6	25.2	7.4	5.2
Total	84.3	78.5	32.6	38.1

Comparatively lower participation rates for females have allowed for much greater flexibility in terms of changes over time. Attitudes relating to "female emancipation" have led to greater willingness to participate in the labour force, as have the modern conveniences available to working mothers and the increasing numbers of child care centres. As the above statistics indicate, the main thrust of female participation has taken place in the groups between 20 and 64 years of age. The 14-19 year age group and the 65 years and over group have generally maintained a slightly downward trend throughout the 1960's,

for substantially the same reasons as indicated for males.[22]

Based upon these observed trends and preliminary 1971 data,
it has been assumed that the decreased participation for males and
increases for most female age groups will continue over the years
to 1977. A minor exception is the adjustment and levelling off in
the rate for females aged 14-19 years, following the strong upsurge
indicated for 1971. Anticipated 1977 participation rates are compared
with preliminary 1971 rates[23] below:

Age Group	Males		Females	
	1971	1977	1971	1977
14-19	38.8	36.9	38.0	34.0
20-24	83.1	81.9	61.0	67.0
25-44	97.5	96.7	45.2	51.2
45-64	91.9	90.8	40.8	44.0
65+	22.0	19.0	5.7	5.7
Total	77.5	76.3	39.9	42.9

Projection Results. The application of these rates to the
labour force source population produces projections of labour force
by sex and age group from 1971 to 1977. These indicate the expected

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[22]Preliminary 1971 data suggests there has been a fairly sharp
upward movement in the participation rate for females aged 14-19 years.
This erratic development corresponds to the high unemployment in that
age group and is consistent with the recent falling off in the growth of
enrolment in institutions of higher learning.

[23]Ministry of Treasury, Economics and Intergovernmental Affairs,
op. cit., p. 19.

rate of growth in total labour force as well as in individual age groups.

While the adopted procedure determines the pattern of growth over the forecast period, there remains one additional problem which must be dealt with before these projections can be used in conjunction with past data as part of a continuing series. The projection of labour force, which uses 1970 as the data base (since it was the latest year for which detailed statistics were available), yields an estimate for 1971 which can be compared with official figures for Ontario labour force in 1971. Such a comparison indicated that the 1971 projection fell 1.1 per cent short of the official figure of 3,249,000, with males under-represented by 1.8 per cent and females by 0.1 per cent.

In part, the discrepancy stems from the use of trends to 1970 as the basis for projecting beyond that year. In addition, part of the difference results from this study's use of newly released 1971 census data in combination with participation rates for 1971, which have been derived on the basis of now-obsolete intercensal population estimates.

To permit the use of these projections for time series analysis, continuity has been maintained by expanding the 1971 projections by age group so as to achieve the official total count for each sex, while at the same time retaining the original projected distribution of age groups within each sex. Subsequent annual projections have all been expanded according to the degre of enlargement undertaken for 1971; in this way the growth patterns of all age groups have been

maintained. The end result of this adjustment has been to provide for the growth of official labour force from 1970 to 1971 and at the same time link the projections to the actual data.

The final adjusted estimates of Ontario labour force appear in Table X. Growth of 17.1 per cent is anticipated over the period 1971 to 1977, rising from 3,249,000 to 3,806,000. The major thrust will come from increasing participation of females in the labour force: while the male labour force should rise 13.5 per cent from 1971 to 1977, the female labour force is expected to rise 24.2 per cent. This is based upon projected increases of 31.7 per cent for ages 25-44 years; 28.3 per cent for ages 20-24 years; and 22.7 per cent for the 45-64 year age group. The remaining female age groups are expected to remain stable.

The more modest increases in the size of the male labour force should be buoyed by a 16.8 per cent rise in the 20-24 year age group and a 15.2 per cent increase in the largest group aged 25-44 years. A slightly lower than average gain of 12.3 per cent is expected in the 45-64 year age group.

While the 2.7 per cent average annual increase expected in total labour force is lower than the increase which occurred in most of the years of the 1960's, it is nevertheless a positive factor compared with expected labour force increases in other countries.

TABLE X

ESTIMATED LABOUR FORCE IN ONTARIO
1971-1977

Age Group	1971	1972	1973	1974	1975	1976	1977
			Thousands	of Persons			
Males							
14-19	173	177	180	183	186	187	188
20-24	274	282	289	296	303	311	320
25-44	957	979	1,000	1,023	1,049	1,075	1,102
45-64	675	691	707	721	735	747	758
65+	59	59	59	58	58	58	58
Total Males	2,138	2,188	2,235	2,281	2,331	2,378	2,426
Females							
14-19	159	156	151	155	159	161	163
20-24	191	200	208	216	225	235	245
25-44	438	458	479	502	526	550	577
45-64	304	317	329	341	352	363	373
65+	19	20	20	21	21	22	22
Total Females	1,111	1,151	1,187	1,235	1,283	1,331	1,380
Total Labour Force	3,249	3,339	3,422	3,516	3,614	3,709	3,806

In the United States, for example, the labour force is expected to

advance 1.7 per cent annually throughout the 1970's.[24] Annual increases

of the magnitude expected ensure that there will be a substantial pool

of labour resources for the expansion of output in Ontario.

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[24]"The Ingredients of Growth," The Morgan Guaranty Survey
(New York: Morgan Guaranty Trust Company, November, 1969), p. 6.

CHAPTER VI

THE ESTIMATION OF POTENTIAL OUTPUT

IN ONTARIO

The two preceding chapters have examined in some detail two specific--and vital--aspects of Ontario's economic profile. It remains now to establish the criteria for the evaluation of the observed performance of the economy. Such a task requires some concept of optimum attainable output, otherwise known as potential output.

A completely thorough evaluation of performance requires that all important "ingredients" of growth be identified, isolated and measured. By relating the various inputs to final output, the role of each factor input can be measured to determine the extent to which it contributes to growth. Time series analysis makes it possible to detect changes from one period to another, which may reflect such things as the impact of changing levels of output (i.e., the business cycle) or the impact of more enduring and longer-run structural changes in the economy.

The development of the concept of potential output has seen the continuing achievement of rising levels of sophistication. As each undertaking adds (hopefully) to the analytical and empirical foundation for future research, the opportunities for the expanded investigation of potential output increase.

Within the past decade, perhaps one of the most influential contributions has been that of Edward F. Denison, who pioneered in the isolation and measurement of factors leading to medium and long run growth.[1] His initial study on growth in the United States was followed by Why Growth Rates Differ, a study comparing the growth performance of the United States with eight European Countries between 1950 and 1962. This approach has since been adopted in other studies,[2] particularly the Walters study which has attempted to evaluate Canadian performance in comparison with those of the countries examined by Denison.

This approach is cross-sectional in nature and examines the contributions of basic factor inputs. Labour inputs are examined as a whole and disaggregated on a "per employed worker" basis according to the contributions of hours worked, age-sex distribution and education; capital and land inputs per employed worker are disaggregated according to the contributions of housing and non-residential structures and equipment.

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[1] Edward F. Denison, The Sources of Economic Growth and the Alternatives Before Us, New York, Committee for Economic Development (Supplementary Paper No. 13), 1962; also Edward F. Denison, assisted by Jean-Pierre Poullier, Why Growth Rates Differ: Postwar Experience in Nine Western Countries (Washington: The Brookings Institution, 1967).

[2] N. H. Lithwick, Economic Growth in Canada: A Quantitative Analysis (Canadian Studies in Economics, No. 19), Toronto, University of Toronto Press, 1967. Also: Dorothy Walter, Canadian Income Levels and Growth: An International Perspective Staff Study No. 23, Economic Council of Canada (Ottawa: Queen's Printer, 1968).

In the Walters study, it was found that 2.7 percentage points of Canada's 3.8 per cent annual growth in net national product between 1950 and 1962 was provided by the factor inputs (with labour contributing 1.4 points and capital and land 1.3 percentage points). The contribution of productivity was 1.1 percentage points, 0.6 of which was directly identifiable (the remainder including advances in knowledge). This study thus revealed that the greatest contributions to growth in Canada came from the growth of the factor inputs rather than their productivity. While the United States performance showed a similar balance, in Northwest Europe and the United Kingdom productivity represented over one half of the gain. Viewed in terms of net national income "per person employed," productivity accounted for 1.1 percentage points of Canada's average annual gain of 1.8 per cent, while it accounted for 1.4 of the 2.2 per cent gain in the United States, 3.1 of the 3.8 per cent gain in Northwest Europe and 1.2 of the 1.6 per cent gain in the United Kingdom.[3]

Constraints of Limited Data

One of the obvious aspects of such undertakings is the availability of adequate data. While certain adjustments are undeniably required, the existence of a reasonably sound data base at the national level affords the opportunity of carrying out such comprehensive research.

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[3]Ibid, p. 7.

As has already been indicated, the availability of data at the sub-national level is quite limited. Consequently it is not possible to take advantage of the methodology applied to such elaborate and comprehensive studies. In fact, the best that can be hoped for is that a simple approach may be applicable. This is borne out by the fact that indexes of provincial output have had to be constructed in order to carry out any research at all.

The Method Adopted

Because of the limitations of data availability, potential output is being examined in a more rudimentary fashion. The procedure adopted corresponds to a significant degree with the Drabble study,[4] which was referred to in Chapter I.[5] In this early work, Drabble examined gross domestic product (in constant dollars) for three basic areas of the economy: agriculture; public administration and community services; and the commercial non-agricultural economy. By virtue of its prevalence, the commercial non-agricultural economy was looked at in more detail, incorporating the effects of changing hours as well as employees. Changes in hours worked primarily reflect the impact of business conditions, although they are affected by miscellaneous adjustments (such as the number of possible weekdays in the year, holidays and adjustments due to strikes or illness).

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[4]B. J. Drabble, Potential Output 1946 to 1970.

[5]Cf. ante, p. 2.

The division of areas to be examined resulted from the differ-
ences in the characteristics of the three groups. In Canadian agricul-
ture, productivity advanced sharply over the 1946 to 1963 period
examined by Drabble. At the same time employment declined, presenting
a trend distinctly different from the remainder of the economy.
The public sector was examined separately because of the rapid rise
in employment, the indicated low absolute levels of productivity and
because of the problems inherent in those productivity measures.
The remainder of the economy was treated as a single unit.

The first step involved the calculation of total potential
employment in the economy. The procedure began with the assembly of
labour force source population data and actual participation rates.
Because of the inclusion of the Armed Services in output measures,
their numbers were included in the actual labour force and reflected
in the participation rates. Total participation rates were adjusted
by means of a five year moving average, which attempted to establish
a more stable pattern of change, one which evened out the influence
of "random" changes which could possibly be responses to particular
unusual and unique fluctuations in business activity (such as changing
participation by teenagers and older workers).

The adjusted participation rates yielded adjusted total labour
force estimates in place of the actual labour force (including the
Armed Services). The deduction of military personnel left adjusted
civilian labour force. A major assumption was then introduced in the

calculation of potential unemployment. Based upon the research of Denton and Ostry,[6] which revealed a basic capability of the Canadian economy to achieve a three per cent unemployment rate with prices reasonably stable and no serious imbalances in the economy, Drabble took three per cent of the adjusted civilian labour force to represent potential numbers of unemployed. The remaining 97 per cent of the adjusted labour force thus represented potential employment in the economy.

The projection of potential into the future required an estimate of labour force source population for each year (to 1970) and projected participation rates. Both were obtained from other independent studies. Forecasts of military personnel were based upon Department of National Defence information.

Consideration of potential output in the agricultural sector included the smoothing of erratic output values and the application of straight line logarithmic trends to determine potential past and future output. Employment data were smoothed and projected at a moderately declining rate consistent with observed experience. From these were obtained measures of output per employed person, both actual

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[6]Frank T. Denton and Sylvia Ostry, *An Analysis of Post-War Employment*, Staff Study No. 3, Economic Council of Canada (Ottawa: Queen's Printer, 1964).

and potential. Because of declining employment (due in part to the rising influence of capital), such output per employed person showed a strong upward trend.

Public administration and community services were examined separately in arriving at estimated future output, assumptions being adopted which were deemed appropriate to each. Based upon the assumption of reasonably stable levels of output per employed person, total potential employment was derived as a residual.

The determination of total potential employment in the remaining commercial non-agricultural sector followed directly, since it was a residual of the potential total employment less potential employment in the two groups discussed above. By establishing trends for average weekly hours, a measure of potential average hours worked by paid employees was obtained for the commercial non-agricultural economy. All that remained was the estimation of potential man-hour productivity, which was carried out on the basis of observed trends. Accordingly, total potential output was derived for the terminal year and for intervening years.

The Study in Perspective

The Drabble approach is admittedly simplistic when compared with other more elaborate approaches to the measurement of potential G.N.P. The "production function" method is perhaps the most elaborate,

usually requiring an econometric model with at least the two major inputs, labour and capital.[7] Okun's "truncated production function" method is yet another method of estimation,[8] in this case relating labour force utilization and productivity to total output over the short run. In his work Okun directly linked changes in unemployment with changes in real G.N.P. Denison's approach, referred to as the "linked-peaks" method, is actually considered one of the most simplistic, although it has involved elaborate examination of varied data. The simplicity rests with the approach of linking peaks of activity which represent full employment and connecting them with a logarithmic straight line, representing the "gap" below this line as an output loss. One prominent difficulty with this method is that it can only be used some time after a peak is established, eliminating the capability of determining current or future potential G.N.P.[9]

A basic element in the Drabble approach, which is patterned after the work of the Council of Economic Advisors, assumes that

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[7]Michael E. Levy, _Fiscal Policy, Cycles and Growth_, Studies in Business Economics No. 81 (New York: The Conference Board, 1963), p. 64.

[8]_Ibid_, pp. 65-68.

[9]_Ibid_, pp. 70-71.

potential output grows at a constant rate for many years. Base years
which reach "potential" have to be established according to the usual
criteria for full-resource utilization--which usually means unemploy-
ment of a rate considered equivalent to full employment.

In the Canadian setting, the Drabble study was the first major
undertaking to measure Canada's potential output, serving as a primary
source upon which the Economic Council of Canada relied for years.
In this regard, the simplicity was more than compensated for by the
attention it drew to comparisons of growth and evaluation standards.

While the approach is simple, it is not inherently deficient
in analyzing actual and potential output. Unlike Denison's approach,
inputs are not separately examined and evaluated; however, they are
implicitly incorporated in the study. Thus the contributions of
different factors are simply contained within the usual labour unit
of measurement. A relevant cautionary note on the dangers of misinter-
pretation appears in a Statistics Canada productivity study:

> The measures of productivity presented in this report . . .
> relate output to a single input only, labour time. It must
> be emphasized, however, that changes in output per unit of
> labour input cannot be attributed directly and solely to
> labour. These measures reflect not only changes in the skills
> and effort of the labour force, but also the contribution of
> other productive resources with which labour works as well
> as the effectiveness with which all are combined and organ-
> ized for production. In other words, changes in technology,
> capital investment, capacity utilization, work flow, mana-
> gerial skills and labour-management relations each have a
> bearing on movements in what is termed "labour productivity."[10]

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[10]Statistics Canada, Productivity Trends in Industry: Petroleum
Refineries, 1959-1969 (Ottawa, Information Canada, 1971), p. 3.

Failure to appreciate the value of this study may also stem from misplaced attacks upon the methodology rather than the assumptions, some of which have been externally determined. For example, in light of recent experience, the assumption of reasonable price stability under "full" employment appears to some to be misguided. The concept of potential implies that basic stability can be maintained not for just one year but for many years. Potential G.N.P. is defined as:

> a measure of the optimum or best practice which it is believed the economy is capable of sustaining on the average, year after year, without running into serious instability of employment, output or prices.[11]

But the basic level of unemployment defined as a reasonable full capacity level can be changed. While it entails revisions to the established levels of potential, it does not in any serious way invalidate the basic usefulness of the approach.

The Ontario Approach

Estimates of potential output in Ontario make use of the real production indexes and population and labour force projections carried out earlier. In examining the data series, the two separately-based indexes (1949 equals 100 and 1961 equals 100) have been linked together by major industry group. It is recognized that certain distortions

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[11]James W. Knowles, "The Potential Economic Growth in the United States," Study Paper No. 20, in Study of Employment, Growth and Price Levels, Congress of the United States, Joint Economic Committee (Washington: U. S. Government Printing Office, January 30, 1960), p. 6.

may arise because of some discontinuities between the 1948 and 1960 standard industrial classifications. However, at an aggregate level these distortions are minimal.

The Drabble methodology has been employed in estimating potential. Instead of three divisions, however, this study has divided the investigation into agricultural output and non-agricultural output. Public administration and community services have not been isolated because of problems of continuity between classifications and because of the absence of concrete employment data for the entire period under study.

As a first step, potential employment has been derived for the total economy, following the procedure outlined by Drabble. Estimates of labour force source population have been taken from the work done in Chapter V. Similarly, participation rate forecasts for the period to 1977 have been incorporated in the five-year moving averages used to determine "adjusted" labour force participation. These take into consideration a projected stable number of military personnel in Ontario, which has been furnished by the Department of National Defence.

Perhaps the most crucial assumption has been that of a rate of unemployment consistent with the concept of "full" employment. The approach adopted has been to accept the statements of the Province of Ontario wherein a rate of three per cent has been put forward as the

attainable full employment goal. In light of Ontario's consistently lower rate in comparison with Canadian unemployment, this appears to be totally acceptable.

In accordance with the adoption of the three per cent unemployment figure and other demographic assumptions, Ontario's potential civilian employment will advance annually at a rate ranging between 2.4 per cent and 2.8 per cent over the period 1972 to 1977. Total potential civilian employment accordingly will be 3,689,000 by 1977, while the inclusion of the Armed Services will raise it to an estimated 3,713,000, as can be seen on page 134.

The Measurement of Potential

Since Drabble's growth rate extrapolation method assumes a constant rate of growth in potential output over a reasonably long period of years, the derivation of potential in this study has followed suit, basing estimated potential upon trends and characteristics noted over the full span of years between 1947 and 1970. A supplemental investigation has also been carried out to compare the trends observed over the more recent 1961-1970 period.

The principal source of Ontario output data has been the indexes established in Chapter IV. In order to provide a continuous series, the 1949-based data have been linked to the 1961 based data according to 1961 weights, thus yielding one continuous common based series from 1947 to 1970. As is inevitable with such an adjustment, there have been very minor changes in the growth of the aggregate series, since industries of differing growth characteristics have been

allocated different weights. These have been accepted as inevitable
and a reflection of a minor problem which results when long data
series are used.

Examination of the trends in real production in Ontario between
1947 and 1961 has disclosed a generally lower trend rate of growth in
aggregate output compared to the period 1961 to 1970. Several valid
reasons exist for this difference.

Perhaps the most obvious is the presence of peaks and troughs
throughout the 1947 to 1961 period in comparison with strong and
sustained economic growth during the 1960's--which made it the longest
period of sustained economic expansion in Ontario's history (see
Figure 6 on page 135). From a statistical point of view there is
yet another even more important explanation. The trend rate of growth
in the 1947-1961 period is biased downward by the use of the low-perform-
ance year 1961 as the terminal point, while this same year 1961,
when serving as the starting year, biases the trend rate of growth
upward if not matched by a corresponding trough year at the end of
the series. Consequently much more credibility is to be attached to
an examination of long run trends between 1947 and 1970, since this
period encompasses the recession of 1954, the slow growth of the late
1950's and all of the rapid expansion periods. For this reason the
calculated potential for 1961-1970, while of interest, may not be
sufficiently representative of circumstances likely to prevail on
average over the 1970's.

Linear regression of the logarithms of the major variables affecting output has been carried out over the long run (1947-1970) period to establish trends which could be equated with "potential". In agriculture--with notoriously low growth characteristics--potential output has been derived directly as the straight line logarithmic trend of actual output. The resulting low "potential" rate of growth of 2.4 per cent in fact represents the middle ground between the 2.7 per cent and 2.1 per cent trend rates for 1947-1961 and 1961-1970 respectively.

Ontario's actual real production in agriculture as a percentage of trend, or potential, is indicated below:

1947	99.3	1955	95.5	1963	101.3
48	102.2	56	94.3	64	102.5
49	104.0	57	97.4	65	100.4
50	100.6	58	105.3	66	104.7
51	101.8	59	97.5	67	100.6
52	101.5	60	95.8	68	100.5
53	98.8	61	102.0	69	97.3
54	96.4	62	103.7	70	98.0

The adoption of a smooth 3.5 per cent declining trend in agricultural employment is consistent with the actual reduction from a level of 300,000 in 1947 to a level of 132,000 in 1970. Actual employment as a percentage of trend, or potential, for Ontario agriculture is as follows:

1947	104.1	1955	108.9	1963	105.5
48	104.3	56	102.3	64	101.7
49	106.2	57	95.6	65	99.4
50	98.1	58	90.8	66	95.5
51	95.2	59	94.1	67	104.0
52	94.5	60	98.7	68	104.8
53	94.5	61	92.5	69	103.3
54	112.6	62	93.5	70	103.9

Based upon these adopted trends, derived output per person in agriculture advances approximately six per cent yearly.

Having established both potential total employment (including the Armed Services) and potential agricultural employment, a simple subtraction has yielded potential employment in the non-agricultural sector of the economy.

In keeping with the procedure adopted by Drabble, this largest sector has been subject to more detailed examination.[12] Data on indexes of commercial non-agricultural employment and man-hours in Canada have been obtained from Statistics Canada in order to derive annual hours of work; this assumes that (a) the commercial non-agricultural sector is more or less equivalent to the total non-agricultural sector for the purpose intended, and (b) the trend in hours worked in Canada can be applied to Ontario.

The derivation of logarithmic trends in average annual hours from 1947 to 1970 has yielded a potential annual decrease of 0.5 per cent,

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[12]Drabble examined commercial non-agricultural industries; however, it is assumed here that the basic methodology applies equally to the total non-agricultural economy of Ontario.

corresponding to the observed decline in annual hours from over 2,200 in 1947 to 1,915 in 1970. This has been combined with the growth of potential employment in the non-agricultural sector to arrive at the potential input of man-hours. In combination with the observed 2.5 per cent trend value for productivity (or output per man-hour) over the corresponding period, they have yielded an average annual rate of growth of 5.2 per cent in potential non-agricultural output.

The combination of total agricultural and non-agricultural potential output has revealed a growth rate of potential output of 5.1 per cent annually. The similarity of potential output growth in the non-agricultural sector and the total economy points out the prominence of non-agricultural industries in Ontario. In fact, agriculture has scarcely exerted any noticeable impact on the total economy at all.

The derived data on actual and potential employment and output in the total economy appear on page 134.

For comparative purposes, a similar derivation of potential output has been carried out for the period 1961 to 1970. Using the same methodology, it has been indicated that output per man-hour in the non-agricultural sector has advanced over three per cent annually between 1961 and 1970, contributing substantially to the derived 5.8 per cent potential rate of growth in output for the whole economy based upon the trend of the 1960's.

The question of selecting the potential measure for the years ahead has been looked into from the point of view of the appropriateness of particular past trends. While some believe the gains of the 1960's can be repeated, there is little real evidence to support it. Population

and labour force growth characteristics are definitely moderating;
this is further reinforced by the recent 1971 census population count
which indicated that intercensal estimates were indeed too high
between 1966 and 1971.

Since these variables combined with participation rates are
basic assumptions in the selection of appropriate standards for
potential, it would appear the immediately past trend is inappropriate.
Failure to meet such a "potential" would be almost assured, particular-
ly as the trend in hours worked continues to decline. This would leave
the burden of achievement upon productivity. Increases in female
labour force participation which are expected tend to lead to lower
average gains in productivity--due essentially to the nature of the
jobs taken. A recent _Fortune_ article expressed this succinctly:[13]

> Women in general, and teenagers in particular, are less productive
> than the average member of the labour force. The teenagers lack
> experience and training, and many older women are less productive
> because they tend to enter lines of work--mostly clerical jobs--
> in which the level of productivity is quite low.

Since the shift to employment in service industries is continuing, the
problem of maintaining adequate productivity is sufficiently real to
raise doubt as to the ability of the Ontario economy to approach the
high trend rates in output recorded earlier.

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[13]Sanford Rose, "The News About Productivity is Better Than You
Think," _Fortune_, February, 1972, p. 182.

On this basis, the potential output objective derived from trends between 1947 and 1970 has been adopted. As indicated in Figure 6, this "target" over the past two decades or more has been achieved during three specific periods: the early 1950's; the period following the recession of 1954; and the mid 1960's. All periods have followed upon years of fairly substantial idle capacity. The first period was largely in response to the war-related and war-generated investment activities following upon the Korean War of 1951. The second period responded to the pronounced resource development in Canada and was manifested in substantial manufacturing activity. The last period was largely a product of demand "overflow" created by the diversion of U.S. resources to the Vietnam war effort.

This potential output objective is accepted in full recognition of the newly revised Canadian objective of 5.5 per cent annual growth. The defence of the 5.1 per cent objective for Ontario is based upon several factors:

(a) the entire system of evaluation of Ontario output rests with the use of the derived indexes of real production which are not totally comparable with indexes of real domestic product for Canada and which are not necessarily compatible with all revised National Accounts data. In fact, prior to the adoption of new statistical data, Canadian potential growth was itself estimated at five per cent for the corresponding period.

TABLE XI

ACTUAL AND POTENTIAL EMPLOYMENT AND
OUTPUT IN ONTARIO,
1947-1977

| | Employment | | | | Output | | |
|------|-----------------|--------------------|--------------|----------------|--------------------|--------------|
| | (A) Actual Thousands | (B) Potential | (A) as % of (B) | (C) Actual 1961 $ Billion | (D) Potential | (C) as % of (D) |
| 1947 | 1,740 | 1,717 | 101.3 | 7.56 | 7.59 | 99.6 |
| 1948 | 1,755 | 1,733 | 101.3 | 7.88 | 7.88 | 100.0 |
| 1949 | 1,786 | 1,767 | 101.1 | 8.23 | 8.27 | 99.6 |
| 1950 | 1,796 | 1,794 | 100.1 | 8.86 | 8.63 | 102.7 |
| 1951 | 1,858 | 1,828 | 101.6 | 9.49 | 9.04 | 105.0 |
| 1952 | 1,895 | 1,883 | 100.6 | 9.90 | 9.58 | 103.3 |
| 1953 | 1,938 | 1,933 | 100.3 | 10.52 | 10.10 | 104.2 |
| 1954 | 1,978 | 1,990 | 99.4 | 10.46 | 10.68 | 98.0 |
| 1955 | 2,028 | 2,049 | 99.0 | 11.47 | 11.29 | 101.6 |
| 1956 | 2,130 | 2,098 | 101.5 | 12.37 | 11.86 | 104.3 |
| 1957 | 2,196 | 2,176 | 100.9 | 12.80 | 12.62 | 101.4 |
| 1958 | 2,177 | 2,243 | 97.1 | 12.93 | 13.34 | 96.9 |
| 1959 | 2,234 | 2,287 | 97.7 | 13.67 | 13.93 | 98.1 |
| 1960 | 2,284 | 2,322 | 98.4 | 13.75 | 14.48 | 94.9 |
| 1961 | 2,305 | 2,360 | 97.7 | 14.25 | 15.07 | 94.5 |
| 1962 | 2,355 | 2,406 | 97.9 | 15.14 | 15.72 | 96.3 |
| 1963 | 2,419 | 2,445 | 98.9 | 15.96 | 16.35 | 97.6 |
| 1964 | 2,509 | 2,507 | 100.1 | 17.12 | 17.16 | 99.8 |
| 1965 | 2,581 | 2,582 | 100.0 | 18.31 | 18.07 | 101.3 |
| 1966 | 2,682 | 2,671 | 100.4 | 19.60 | 19.14 | 102.4 |
| 1967 | 2,774 | 2,773 | 100.0 | 20.48 | 20.31 | 100.8 |
| 1968 | 2,860 | 2,871 | 99.6 | 21.64 | 21.51 | 100.6 |
| 1969 | 2,965 | 2,969 | 99.9 | 22.72 | 22.74 | 99.9 |
| 1970 | 3,022 | 3,060 | 98.8 | 23.87 | 23.96 | 99.6 |
| 1971 | | 3,179 | | | 25.43 | |
| 1972 | | 3,264 | | | 26.67 | |
| 1973 | | 3,342 | | | 27.90 | |
| 1974 | | 3,434 | | | 29.28 | |
| 1975 | | 3,529 | | | 30.73 | |
| 1976 | | 3,622 | | | 32.21 | |
| 1977 | | 3,713 | | | 33.72 | |
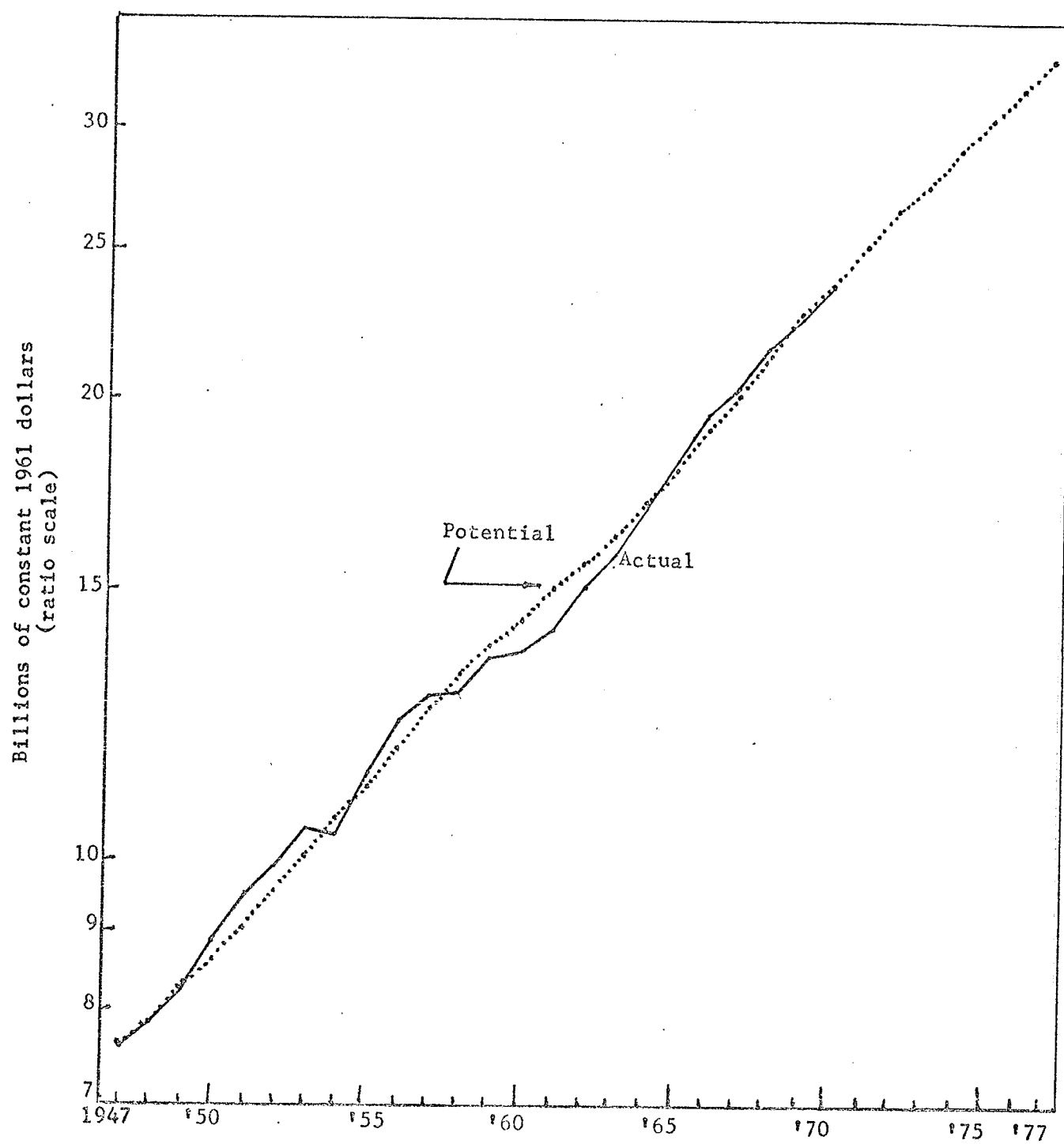
FIGURE 6

ACTUAL AND POTENTIAL VALUE OF PRODUCTION
IN ONTARIO IN BILLIONS OF CONSTANT
1961 DOLLARS, 1947-1977

(b) from Figure 6 it can be seen that the 5.1 per cent trend line is a fair representation of the general trend over the full period 1947 to 1970.

(c) quite clearly there have been periods of actual growth which have exceeded the 5.1 per cent "potential" growth rate; subsequent calculations accepting the inflated assumptions of population and labour force growth of that period will inevitably overstate the role of employment and impose unattainable expectations upon productivity.

(d) potential is viewed here not simply as past trends adjusted for "full" employment but as a function of realistic assumptions about the basic population and labour force variables. Canadian potential appears to accept somewhat greater scope for expansion in labour force and population, while the Ontario estimates simply accept the realistic expectation (already borne out by 1971 census data) of moderating growth in these areas. The approach for Ontario thus is not simply one of accepting a given past trend but of adopting a framework which best fits the likely broad economic and social environment of the 1970's. Expressed another way, it is quite conceivable that the potential of one period is not necessarily the potential of another.

Accordingly, the expectation of 5.1 per cent potential output growth combined with a growth of potential employment of approximately 2.6 per cent leads to anticipated potential increases in productivity of 2.4 per cent, the long run average of the past 23 years.

Potential output, which was not achieved in 1970, will be valued at over 33.7 billion (constant 1961) dollars in 1977. In order to move toward achieving this value by 1977, average annual growth in real output in Ontario will have to be over 5.3 per cent. With employment expected to rise 2.6 per cent, productivity will have to advance at least 2.6 per cent annually as well.

In light of early evidence of a further 1971 shortfall from potential of the Ontario economy, the requirement to achieve the potential output value of 1977 by that time at the latest would require annual gains of no less than 5.8 per cent in real production, which imposes a heavy responsibility on the part of productivity. With such an objective in mind, however, the provincial government may be able to pursue appropriate policies aimed at encouraging growth where it will be most effective.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Summary of Results

This investigation of the fundamental problem of an inadequate
framework for the analysis of provincial economic activity has attempted
to focus upon the nature of the problem and to attempt to fashion an
approach to its solution. In the process, a set of provincial produc-
tion indexes has been constructed in two basic segments, covering the
periods 1947-1961 and 1961-1970. With the exception of the pioneering
work of Cameron, upon which the derivation of production indexes has
been based, this set of indexes represents the only known set of
provincial indexes of the volume of production by major industry group.

In first examining the problems which have resulted in the
failure of Statistics Canada to provide provincial data bases equivalent
to the sophisticated national accounts, a variety of statistical and
conceptual problems have been uncovered which have made such extensions
difficult. These are essentially a consequence of the "open" nature
of provincial economies wherein mobility is substantially more pro-
nounced than at the national level. Consequently free access and
movement imposes strict constraints on the ability to observe and
record transactions of an economic nature, whether in terms of the
flow of goods and services or the division of production among the
various establishments of a multi-establishment enterprise which spans
more than one province.

The resolution of this problem has been attempted largely by relating known provincial measures of census value added to national indexes of gross domestic product at factor cost in constant base year dollars; in addition, real production indexes for service-producing industries have been estimated in conjunction with available employment data, which still form part of the basis of estimation of national indexes of production.

One benefit of the derivation of the indexes has been a clearer perspective on Ontario's historical economic pattern. As anticipated, Ontario accounts for approximately forty per cent of Canada's total output, while its population represents thirty-five per cent of the national total. This prominence has yielded the not-unexpected observation that Ontario plays a vital role in the national economy and because of it strongly influences the shape of national growth patterns. The prevalence in Ontario of manufacturing--which has been one of the most productive industries and among the leading contributors to growth--has been significant in the strong five per cent trend rate of growth in the non-agricultural economy between 1947 and 1970.

The extension of the picture of actual production to potential has required that population and labour force performance and potentials be examined to determine the prospective employment base in the economy. The analysis has revealed that continued sound advances may be expected, though not of the substantial magnitudes recorded over the past decade.

The derivation of potential output--despite the proliferation
of new and more sophisticated techniques--has had to rely upon relatively
simplistic linear growth rate extrapolation, principally because of the
weaker provincial data base, especially on non-labour factors of pro-
duction. According to the trends derived on the basis of the more
representative long run period, Ontario possesses the capability of
easily achieving a 5.1 per cent annual growth in its real production,
given that the demographic variables follow assumed trends.

The observation of past performance has revealed that Ontario
succeeded in achieving its potential output in three periods since
World War II, most recently in the latter half of the 1960's. However
the current departure from the potential rate of growth means that
substantial advances--which could imply further inflationary dangers--
would be required if potential is to achieved within a few years.

Implications for Policy

The major advantage of any attempt to determine economic
potential is that it focuses upon the relative performance of an
economy and provides some indication of what more can reasonably be
expected under the conditions assumed by the analysis and the measure-
ment technique. Given that optimum output is desirable, attempts to
bridge the gap between actual and potential output have to be related
to a given time span in order to assure that additional strains are
not produced in attempting to achieve too much too soon.

The existence of the basis for comparison of actual and potential output permits the determination of necessary advances in productivity to achieve potential output. By concentrating its efforts, government may be able to effect advances in productivity which might otherwise be insufficient to bring total output up to its potential. Typical tools are tax incentives, including those encouraging investment in machinery and equipment; the promotion of upgraded education and work skills; and the provision of various forms of government assistance which aid industry expansion and development.

Where productivity improvements were being actively encouraged, the existence of a data base on provincial industry performance would serve well the purpose of channelling efforts where they would have the most beneficial effect. From this industry data base, greater awareness of the more productive areas of activity would promote a better allocation of resources and growth policies.

Furthermore, recognition of low productivity activities could lead government to channel its own tax and fiscal policies in particular directions, for the sake of either avoiding costly and low return investments or actively promoting specific improvements in industry output and productivity.

Caveats and Future Development

As originally indicated, any effort at establishing the basis
for measuring actual or potential output on a sub-national level must
adopt "second-best" solutions, given the current state of affairs.
This must be borne in mind when considering the applicability of
this--or any other--derivation of actual and potential output for
a province.

The problems inherent in deriving estimated output stem in
part from the absence of provincial price data, which are critical
to any sound analysis of current real production. Fortunately, the
prominence of Ontario has made the adoption of select national price
measures less of a risk than would be the case for most other provinces.
There is also a need for greater sophistication in the allocation of
national production among provinces. This would best be promoted
by having consistent and compatible provincial accounts which are
interlocked with the national accounts.

Considerable scope for the expansion of the measurement of
potential output would be provided if details of all factors of
production were available provincially. The current admittedly
oversimplified representation of all factor inputs in terms of labour
conceals much of the vital information needed to effect precisely-
directed government policy. With such disaggregation, policies
directed toward expanding manpower resources, increasing capital
investment or promoting technological advances could be applied much
more effectively.

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