

**ECONOMIC PROJECTIONS IN CANADA
TO 1970**

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INTRODUCTION

Within the past two years two important projections of the Canadian economy have been published: one by the Economic Council of Canada,¹ the other by T. M. Brown for the Royal Commission on Health Services.² But these are simply the latest of a series that began a decade ago: O. J. Firestone's projection for the Department of Trade and Commerce³ was presented in 1956, the Final Report of the Royal Commission on Canada's Economic Prospects⁴ was published in 1957 and the study carried out by R. E. Caves and R. H. Holton⁵ became available in 1959. Similar work for other economies has, of course, been going forward in many countries, especially in the United States and Europe and at the United Nations.

Economic projection is not an exact science. Even though the projections are based to a great extent on the trends observed in the past, much ingenuity and flair is necessary to assess the relative influence of economic, sociological and political forces that may render inaccurate any straight-line extrapolation of such trends. The general

1. Economic Council of Canada, First Annual Review: Economic Goals for Canada to 1970 (Ottawa: Queen's Printer, Dec., 1964).

2. Royal Commission on Health Services, Canadian Economic Growth by T. M. Brown (Ottawa: Queen's Printer, 1964).

3. O. J. Firestone, "Growth and Future of the Canadian Market" (Ottawa: Department of Trade and Commerce, 1956). (Mimeographed).

4. Royal Commission on Canada's Economic Prospects, Final Report (Ottawa: Queen's Printer, 1957).

5. Richard E. Caves and Richard H. Holton, The Canadian Economy: Prospect and Retrospect (Cambridge, Mass.: Harvard University Press, 1959).

assumption that the future will greatly resemble the immediate past is more appropriate to a short-term forecast than to a long-term projection.

Assumptions, then, are all important in economic projections, as are all the techniques of projection themselves. And it is both in their assumptions and in their techniques that economists vary. Not only do we have the "four patterns" model preferred by Gerhard Colm⁶ and Firestone but Brown has shown us that it is possible to develop in a single study four projections of the Canadian economy: two relatively simple models based essentially on supply and two econometric models (one free, the other controlled) capable of analysing aggregate demand as well as supply.

The thesis will present and assess the techniques used by professional economists in making long-term projections in Canada. Differences in results will be noted and assessed with the object of determining whether improved techniques can be developed to analyse policy implications more accurately.

Planning, and thus intelligent assessment of the future, is as essential to society as it is to the individual. The thesis will attempt to demonstrate what techniques of projection are most likely to help develop policies best suited to meet Canada's future economic requirements.

1. Plan of the Study

Chapters I to IV deal with the past, with the assumptions, techniques and results of four recent economic projections in Canada: the Final Report of the Royal Commission on Canada's Economic Prospects (1957); The Canadian Economy: Prospect and Retrospect, (1959),

6. Gerhard Colm, The American Economy in 1960 (Washington, NPA, 1952).

(prepared for the Canadian Pacific Railway), by R. E. Caves and R. H. Holton; Canadian Economic Growth, (1964), (prepared for the Royal Commission on Health Services), by T. M. Brown; and First Annual Review, Economic Goals for Canada to 1970. (December 1964), by the Economic Council of Canada.

Reference is made whenever necessary to the staff studies authorized both by the Royal Commission on Canada's Economic Prospects and by the Economic Council of Canada. The names of these two official bodies, because of the great frequency of their occurrence, are abbreviated in headings, footnotes, and in the bibliography to RCCEP and ECC respectively. The Royal Commission on Health Services is abbreviated to RCHS. All the abbreviations used are summarized in Appendix "A".

Throughout the study "Royal Commission" refers to the Royal Commission on Canada's Economic Prospects and not to the Royal Commission on Health Services since the only work of the latter commission referred to is Canadian Economic Growth by T. M. Brown. Invariably, unless the contrary is specifically stated, 1957 constant dollars are used. It is important to bear this in mind when referring to the original sources for Caves and Holton use 1949, 1952 and 1955 dollars, the Royal Commission 1955 dollars, and the Economic Council 1963 dollars. All these have been converted to constant 1957 dollars (those now used by DBS) by multiplication by the following factors:

Dollars	Conversion factor to 1957 dollars	Conversion factor back from 1957 dollars
1949	1.3231	0.7558
1952	1.2155	0.905
1955	1.06952	0.935
1963	0.90662	1.103

Happily, T. M. Brown uses 1957 dollars throughout his four projections.

The Royal Commission's projection extends from 1955 to 1980; Caves and Holton's from 1955 to 1970; Brown's from 1961 to 1991; and the Economic Council's from 1963 to 1970. Though our study is restricted to the period up to 1970, occasionally we refer to the fact that the projections of both the Royal Commission and Brown extend beyond this date.

Chapter II details the techniques used in each projection, while Chapter III assesses the differences in techniques. The results of each projection as well as the latest DBS figures are compared in Chapter IV. Strictly speaking then, there should be no indication of results in Chapters II and III, though some are included whenever this helps the exposition of the techniques or the differences between them. In describing techniques it is usually necessary to state the assumptions on which the projections are based and often these assumptions are quantitative. It would often be awkward, then, to ignore results entirely in Chapters II and III. However, it must be stressed that the systematic and comprehensive comparison of the results is to be found only in Chapter IV.

2. The Future

In Chapter V an attempt is made to set out the framework of the method of making a complete projection of an economy, with special reference to Canada's. This effort is primarily based on Chapter III - "Nature and Methodology of Aggregate Projections" - and Chapter IV - "Projections by Sectors" - of the 1955 United Nations publication, Analyses and Projections of Economic Development;

I. An Introduction to the Technique of Programming

The reference in the title to programming, to formal government planning, follows naturally from the fact that such planning is based on

projections, as well as, of course, on the targets set by the government. An example of this procedure is Jan Tinbergen's suggested list of activities to be carried out in succession:

I. The Macro-Stage

1. Instruction of planning bureau by government on aims and means of policy
2. Collection of statistics and forecasts on data
3. Macro-forecast
4. Confrontation with aims
5. Macro-plan.⁷

Tinbergen is concerned with describing a complete planning procedure and continues his list with suggested activities under the headings of II. The Sector (and/or Regional) Stage; III. The Project Stage; IV. Final Stage. In Canada, though some co-ordination of economic policies is effected through the federal budget, the government has not committed itself to an economic plan for Canada. The country reached activity 4 of Tinbergen's stage I - confrontation with aims - in December, 1964, with the Economic Council's First Annual Review, but has not yet gone beyond this point.

Still, as Tinbergen has written, "the process from an unplanned to a planned policy ... has been a very gradual one".⁸ Indeed, it might be claimed, on the basis of the following description by Tinbergen of the characteristics of a planned policy, that the Canadian government already does engage in planning:

- (1) Estimation of future developments as a basis for policy decisions instead of relying on the past evidence available at the moment of decision.
- (2) The explicit formulation of more general aims of policy, in the ideal case for the economy as a whole, instead of incidental action.
- (3) Coordinated action instead of random action by individual

7. Jan. Tinbergen, Central Planning (New Haven: Yale University Press, 1964), p. 88.

8. Ibid., p. 43.

ministries or services.⁹

But as lately as 1963 O. J. Firestone indicated his agreement with the view that it was a serious matter that the Canadian budget failed "to present clearly the potential impact of the budget upon the economy as a whole".¹⁰ And he added:

Such economic analysis, if included in the budget presented by the Minister of Finance, would be particularly helpful if set against economic objectives or targets expressed in quantitative terms covering a period of several years, say four to seven years so that the effect of economic policies pursued can be assessed against the economic progress made over a period of time. Economic planning and economic policy formulation for the immediate term is a much more complex task than dealing with economic problems at hand and taking short term measures of an expediency type.¹¹

It would seem useful, then, in making a projection to use a form or technique that leads on to the more formal planning or programming described by Tinbergen. This is what has been attempted in Chapter V.

Since, however, some Canadians apparently fear that government economic planning tends to be undemocratic, reference should be made to the view of W. Arthur Lewis that the government "should plan not by direction but by manipulating the market,"¹² that is, by inducement. "Economic planning should carefully preserve a maximum role for the working of the forces in the market."¹³

9. Ibid., pp. 42-3.

10. O. J. Firestone, Problems of Economic Growth (Ottawa: University of Ottawa Press, 1965), p. 89, quoting Professor Clarence L. Barber.

11. Ibid., p. 90.

12. W. Arthur Lewis, The Principles of Economic Planning (London: George Allen and Unwin, Ltd., 1949), p. 20. This little book of 128 pages is a model of common sense, like all books Lewis writes. For example: "the efficiency of planning is to be judged not by the excellence of the system of rationing and price controls, but by the speed with which shortages are eliminated and price controls and rationing rendered unnecessary." (p. 21).

13. Gunnar Myrdal, "The Trend Towards Economic Planning", Manchester School of Economic and Social Studies, XIX, p. 37.

Though many Canadians may still be wary of the word "planning", dissatisfaction with its opposite, with drift, is widely expressed. On December 9th, 1965, the federal and provincial finance ministers and treasurers met in Ottawa to assess the economic problems facing the nation. Premier Duff Roblin of Manitoba is reported to have called the meeting "useful because there is a pressing necessity to achieve some machinery to co-ordinate policies." The case for economic planning in Canada could not have been better put, although possibly unwittingly. A plan is nothing but the co-ordination of economic policies.

But this is not a thesis on planning. All that is argued here is that an economic projection should be in the form best adopted to planning so that government and public may see the implications of a government decision to change or not to change its economic policies. And to the extent that these government decisions are influenced and thus co-ordinated by the projection and by its confrontation with political aims or targets then the government is engaged in planning.



CHAPTER I

BASIC ASSUMPTIONS OF PAST CANADIAN ECONOMIC PROJECTIONS

RCCEP.--The first two assumptions of the Royal Commission on Canada's Economic Prospects, namely that there will be no general war and no major depression similar to that of the 1930's between base year 1955 and terminal year 1980,¹ may be accepted with little question. As the Commissioners point out, there would be little point predicting Canada's economic future in a dead world. And it is reasonable to assume that governments have learnt how to mitigate the ups and downs of business recessions.

The Commissioners themselves point out that their third assumption of "no change either in the general price level or in price relationships"² is "completely unrealistic". It may be asked whether it was necessary to make this assumption. Constant dollars series are used in economic projections so that the extent of real changes, as distinct from value changes, may be assessed. But the use of such a technique does not preclude a projection, in separate tables, of expected future price levels. Though the Commissioners insist that they "know of no method by which long-range price changes can be forecast with the slightest degree of confidence", the least that can be said is that it is more likely that the general price level will be 40 per cent higher in 1980 than in 1955 than that 1980 current dollar prices will be equal to those of a quarter century earlier. It would seem that Hood and Scott,

1. RCCEP, Final Report, pp. 3-4.

2. Ibid., p. 4.

who "assumed that the eroding force of inflation will be restrained", were being more realistic than the Commissioners themselves.³

From the point of view of those preparing or comparing future projections it was awkward of the Commissioners to select 1955 as the base year for projections in terms of constant dollars, for at that time DBS was still using 1949 as the base year and now uses 1957 constant dollars for GNP estimates.

The fourth general assumption was that there would "be no major changes in the economic policies of the Canadian or other governments."⁴ The Commissioners agreed that this assumption was also unrealistic but considered that their task would become unmanageable if they "were to try to allow for every contingent change of policy." In effect, the realism of this assumption depends on the Commissioners' own projections: if they predict steady growth of the economy with no major areas of weakness or change, either internally or externally, then the Commissioners were right to assume there would "be no major changes in the economic policies ...". As a matter of fact, though, the Commissioners' projections of Canada's economic development do lend them to "put forward fairly specific suggestions" for changes in policy. To the extent that these suggestions are adopted, the unfavourable developments will not come about or will be mitigated. This would not imply that the projection was "wrong" but rather that it was put to good use.

Caves and Holton.—The authors began their study in the summer of

3. RCCEP, Output, Labour and Capital in the Canadian Economy, Study by William C. Hood and Anthony Scott (Ottawa: Queen's Printer, Feb., 1957), p. 2.

4. RCCEP, Final Report, p. 4.

1955 for the Canadian Pacific Railway Company⁵ and published their results in 1959. Accordingly they had access to the submissions to the Royal Commission. Caves and Holton's statistical estimates were made entirely independently, however, for their manuscripts had reached the final stages of revision before the Royal Commission began to publish its findings and studies in 1957.

Caves and Holton generally use 1955 as their base year but occasionally use earlier years when they find it convenient to do so. 1970 is their final year. During the term of their projection they, like the Royal Commission, predict that no major war will occur. Such an assumption may be a form of forecast for, as Caves and Holton point out, they are "really forecasting the absence of war without justifying the forecast", but in such matters which lie outside the discipline of an economist their "only alternative is an impossibly ponderous and at least partially amateurish study."⁶

Caves and Holton state that the assumption concerning the level of employment in the future requires the most careful study because of the great effect the level of employment has on economic growth and national output. This said, they then assume a high level of employment in most but not all of the period to 1970 with only minor recessions causing but brief departures from high employment levels. They conclude that "Canadian industries are not expected on the average to maintain for the coming years a rate of growth quite as rapid as that experienced since the end of the war."⁷

5. Caves and Holton, p.ix.

6. Ibid., p. 6.

7. Ibid., p. 7.

Since Caves and Holton put no figure on their "high level of employment", it may be assumed that an employment rate of 96 per cent would be close to what they had in mind, for this rate though high, was lower than the 1946-53 average of 97.2% or even the 1946-57 average of 96.7% and reflected a rate of growth of Canadian industries not quite as rapid as that experienced since the end of the war to 1955.

Caves and Holton base their high employment assumption on the high-level employment commitments of the Canadian and United States governments. The authors see confirmation of this in the increased spending of the Conservative government during the 1957 recession. They note the openness of the Canadian economy - the lesser efficacy of monetary and fiscal measures to avoid extended periods of unemployment because of the large size of Canada's export sector - but then find reassurance in the continued ability of the United States and the United Kingdom to maintain high-level employment themselves.

Finally, Caves and Holton note that the relatively rapid rate of growth of the Canadian economy from 1945 to 1955 gives it a buoyancy not shared by other developed nations. As the authors point out, Canadian GNP in 1949 rose by "4 per cent in the face of 1 per cent drop in United States output."⁸

Again like the Royal Commission, Caves and Holton assume few significant changes in government policy up to 1970. Major projects, like the St. Lawrence Seaway, certainly do affect economic growth but none such was being discussed in 1955 and, as the authors note, the span of their projection - fifteen years - from conception to achievement is not long for a major project.⁹

8. Ibid., p. 10.

9. Ibid., p. 12.

Caves and Holton examine the possibilities of major changes in trade, either in the direction of increasing or decreasing restrictions, and conclude that even the changes that occur as a result of the European Economic Community and the European Free Trade Area will have little effect on Canada. In any event, as they foresee it, there will be a gradual freeing of trade.

Caves and Holton differ from the Royal Commission in not attempting to assume away a rise in the price level. Yet this makes no difference to the two projections for Caves and Holton foresee only moderate price rises (1 to 2 per cent a year) which "will not affect the rate of development except insofar as it will help maintain a high level of employment."¹⁰ Redistributive effects would be of little importance to long-run growth and, in any case, would be small.

Finally, Caves and Holton assume "that the institutions and attitude of the Canadians will continue to encourage development as they have in the past."¹¹

RGHS.—Brown makes the routine assumption that "during the 30 years of the projection (from 1961 to 1991) we shall experience no major war or catastrophe."¹² Further, in his projections 1 and 2 he assumes "near full employment from 1966 on"¹³ - defined as 96 per cent of the labour force employed. However, he drops this assumption in his two econometric projections.

Projections 1 and 2 (PR-1 and 2) are notable for Brown's

10. Ibid., p. 18.

11. Ibid., p. 21.

12. RGHS, Brown, p. 110.

13. Ibid., p. 100.

assumptions concerning the allocation of output: 21 per cent for national savings, 75 per cent for national consumption, and 4 per cent for defence consumption. He recognizes that "our natural desired rate of saving might still be 24 per cent or more"¹⁴ but that in our more mature economy adequate investment opportunities might be lacking. Brown assumes that government policy will show an awareness of this and will be fashioned to reduce desired national saving to 21 per cent. He notes that government promotion of expanded health services will greatly help to attain this objective.

Brown considers the alternative of the government adopting a high growth policy, that is, with investments, both public and private, at a level high enough to absorb savings equal to 25 per cent of GNP. He is probably right in concluding that Canadian governments as we have known them in the past are more likely to adopt policies of curing unemployment by discouraging oversaving than by boosting investment to the full employment level.

In PR-2 Brown makes another major assumption concerning government policy, namely that both it and natural economic forces "will cause the capital inflow to diminish in relative terms though it may still continue to rise in absolute terms."¹⁵

This, too, seems a sensible assumption. The problem was not recognized by Caves and Holton ten years earlier - and still is not recognized by some economists today. It is as natural for the earlier projections to assume no change in government policies with regard to foreign investment as it is for later studies to assume the contrary.

14. Ibid.

15. Ibid., p. 128.

In his controlled econometric projections, Brown continues to make important assumptions concerning government policy. High-level employment remains the first assumed aim of government. To this he now adds "a high growth path of standard of living."¹⁶ Further, he assumes two subsidiary aims of government policy: to gradually eliminate the balance of payments deficits on current account and to reduce the government deficit.

Even if the government does not have well thought out policies in these areas, the least that can be said is that any government would possibly count Brown's assumptions among its aims.

Brown, like the others, makes no attempt to predict what the future will bring in the way of relative price changes. However, as an addendum to his first projection he projects GNP to 1991 in current dollars on the assumption that the recent growth rate per annum for the price level of 1.94 per cent will continue into the future. This will cause the price level to rise by 21.2 per cent every ten years.¹⁷ There is no reason to question Brown's assumption except to wonder, having regard to his other assumption of continuous high-level employment, whether he might not be a trifle conservative. Unless more determined anti-inflationary government policies are assumed in the future than have occurred in the past - and Brown makes no mention of this - then it would seem safer to assume that high-level employment will increase prices each year by somewhat more than two per cent rather than by slightly less.

The projections of levels of economic activity and rates of growth for Canada contained in the Report of the Royal Commission on Canada's

16. Ibid., p. 175.

17. Ibid., pp. 115-6.

Economic Prospects and in Caves and Holton's book represent assessments of what appeared to be the most probable course of events as seen through the eyes of the authors. Brown, too, was concerned with the probable but, as his working out of four projections suggests, he did so under a variety of assumptions, especially government policy assumptions. The unemployment rate had risen and government policies could no longer be assumed to be invariant.

ECC.—The Economic Council of Canada's First Annual Review denies even having prepared an economic forecast in measuring the country's economic potential to 1970: "It is a calculation of the possible - in a sense, a target to be aimed at - not a projection of the probable."¹⁸

The Economic Council states that a 97 per cent rate of employment would be "a realistic objective to be aimed at over the balance of the 1960's."¹⁹

Staff Study No. 1 assumes "no catastrophic events" and "more or less full employment"²⁰ during the period. The first is the normal "no major war" type of basic assumption while the second is based on the tacit and more fundamental assumption that the Council's major recommendations for maintaining the economy's developing thrust to full employment will be adopted by the community. As a matter of fact, the Council's whole First Annual Review is explicitly based on the assumption that the

18. ECC, First Annual Review, p. 31.

19. Ibid., p. 37.

20. ECC, Population and Labour Force Projections to 1970. Staff Study No. 1 by Frank T. Denton, Yoshiko Kasahara and Sylvia Ostry (Ottawa: Queen's Printer, 1965), p. 1.

government can and will adopt the policies required for the economy to attain its potential growth path.

Staff Study No. 2 makes the point that potential output is essentially a supply concept and is a calculation derived from factor inputs. Its calculation involved the implicit assumption "that the appropriate level and pattern of aggregate demand can be generated."²¹ In Brown's projections, of course, with his equal emphasis on demand and supply, this assumption is explicit, as noted above.

The assumptions made in all of the projections, then, are basically similar, with the difference only that the earlier projections, those of the Royal Commission and Caves and Holton, assume no change in government policy, while the later projections, those of Brown and the Economic Council, assume whatever changes in government policy that may be necessary to ensure a return to the "full" employment of the earlier period.

21. ECC, Potential Output, 1946 to 1970. Staff Study No. 2 by R. J. Drabble (Ottawa: Queen's Printer, Dec., 1964), p. 4.



CHAPTER II

TECHNIQUES USED IN MAKING PAST ECONOMIC PROJECTIONS IN CANADA

1. General - RCCEP

The Royal Commission on Canada's Economic Prospects with the 34 studies published under its auspices is certainly the most exhaustive, and expensive, projection of the Canadian economy.¹ Exhaustive research is made into many facets of the economy in the search for trends, for guides to the future.

Yet, though the Royal Commission authorized a total of 16 industrial sector studies² no complete sectoral projection was made as a check or refinement of Hood and Scott's overall projection. The industrial studies certainly round out the picture but since future output and employment in the business sector³ is not completely estimated directly (the output and employment in the trade, finance, services, transportation, storage and communication industries are essentially residual forecasts), the Royal Commission's study cannot be said to use the double-barrelled method described in detail in Chapter V: that of an overall projection, then sectoral projections, and finally reconciliation of the two. Rather, Hood and Scott build up their overall projections in consultation with those making the partial sectoral

1. Caves and Holton refer rather wistfully to the Royal Commission having one hundred times their resources.

2. Namely: energy, agriculture, fisheries, forest industries, mining and mineral processing, manufacturing, primary iron and steel, automotive, agricultural machinery, industrial machinery, electrical, electronics, primary textiles, construction, chemical and service.

3. The other two sectors of the complete economy being agriculture and government.

projections. These industrial studies supply the detail, Hood and Scott offer the consolidation.⁴

An indication of the Royal Commission's single-barrelled method is to be found below at page 31, where it is noted that Hood and Scott derive employment in the business sector residually by subtracting employment in the agricultural and government sectors from the previously derived total employment. If complete sectoral projections had been made the business sector employment figure thus derived would have been checked against the business sector employment figure derived by adding up each subsector's or industry's figure. Hood and Scott could not do this because no such summation had been made.

Fullerton and Hampson's study⁵ also effects a partial consolidation by bringing together into a single volume the results of the studies of the various secondary manufacturing industries. And the total employment they project for secondary manufacturing is derived by summation of the individual industries. Still, this total only represents (in 1970) about 20 per cent of total employment and is thus not an independent check; too much of the remaining 80 per cent is still derived residually.

Hood and Scott include Appendix A to their Chapter 7 to explain the difficulties in the way of using the "formal checks" of an input-output model. The following passage from this appendix shows that while the Royal Commission also did not use the method of overall projection -

4. For instance, this sentence on p. 211 of RCCEP, Hood and Scott: "An even finer breakdown of GDP for the manufacturing sector of the economy may be found in the Commission study Canadian Secondary Manufacturing Industry".

5. RCCEP, Canadian Secondary Manufacturing Industry by D. H. Fullerton and H. A. Hampson (Ottawa: Queen's Printer, 1957).

sectoral projections - reconciliation, effective co-ordination was attained by Hood and Scott and the sectoral projections:

We built up the forecast of total GNE by forecasting the output of three sectors of the economy using the labour force that we thought would be available, under certain assumptions as to productivity. We then compared the forecasts of individual components of expenditure with this total and with the record of the distribution of expenditure in the light of our general expectations of the structure of expenditure. We also compared the forecasts of output and employment in individual industries with the total forecast and with the industrial distributions in the record again in the light of our general expectations. After considerable discussion we agreed substantially on the forecasts that have been presented in this book.⁶

Hood and Scott make clear in their Chapter 7 that they would have preferred to use the method of overall projection - sectoral projections - reconciliation:

In principle, forecasts of aggregates of output and expenditure should be considered as tentative until examined in the light of forecasts of their components, just as forecasts of each component should be regarded as tentative until examined in the light of forecasts of other components and of the aggregate. In principle both the aggregate and the components should be subject to adjustment at the time of reconciliation. As a matter of practical necessity however, we had to limit our adjustments, following the examination of tentative results, to the forecasts of components.⁷

The overall projection of GNP, made by Hood and Scott, uses the employment approach, favoured by all those so far making projections of Canada's economy, and which is described both in the appropriate sections in this chapter as well as summarized in Chapter V (pages 179-180).

Especially noteworthy is the Royal Commission's use of straight-line projections throughout.⁸

6. RCCEP, Hood and Scott, pp. 496-7.

7. Ibid., pp. 307-8.

8. It should be mentioned, however, that after 1970, the Royal Commission projects a slowing of the rate of increase of agricultural productivity (from 3 per cent p.a.p.a to 2½ per cent), because of a slackening in the rate of mechanization. RCCEP, Final Report, p. 324.

1. General - Caves and Holton

"A careful and conscientious forecast", write Caves and Holton, "cannot grow from any simple projection of past trends."⁹ This does not mean that knowledge of past trends is not essential for forecasting.

As the only non-Canadians among the authors of the four studies of the Canadian economy, it is fitting that Caves and Holton should devote the most space to Canadian economic history: 230 pages out of 645 are given over to "Retrospect", to a detailed analysis of the engines of growth of the sectors, regions and time periods of the Canadian economy.

It is, then, from a fairly adequate base of broad knowledge of why Canada grew in the past that Caves and Holton approach the task of projecting the future.

In their lengthy, detailed and useful retrospective view of the Canadian economy, Caves and Holton discuss the staple theory of Canadian economic growth - "the role of world demand for resource - based Canadian products and discoveries of resources and resource technology"¹⁰ - and note how resource development has supported the filling in process which has led, and continues to lead, to the diversification of the economy.

They hold to the view that much of Canada's staples will remain highly competitive on world markets and that, therefore, any assessment of the direction of Canada's growth must take account of the continual competition for factors of production between Canada's primary resource industries and those secondary industries whose growth is encouraged by the primary industries themselves.

Caves and Holton's work is replete with crosschecks, of

9. Caves and Holton, p. 30.

10. Ibid., p. 22.

reconciliations - not to ensure a merely surface consistency but rather to ensure that nothing was left out of consideration in one or other of the independent projections.

Two or three projections, each derived by different approaches, permit more confidence being placed in the option finally selected. Also, with the wisdom granted by seven or eight additional years of hindsight, it is now possible to see which projection is more likely to be borne out in 1970 and it is, therefore, now easier to assess the arguments adduced by Caves and Holton in 1957 or 1958 when they were, in effect, explaining why they chose one of their own projections in preference to another.¹¹ Forecasters working in 1966 will be the wiser for being able to see the detailed reasoning which led Caves and Holton not only to make one projection but two or three, and then to prefer one to the other.

Caves and Holton devote two chapters to projecting Canada's population and to the labour force and GNP of 1970. This result is based on the first, and simplest method: present productivity plus forecast growth of productivity per man-hour to 1970 times the work force in that year (adjusted for decrease in man-hours of work) yield the 1970 output.

The next eleven chapters contain obviously more complicated and much more detailed projections of Canada's 1970 output. Four chapters assess final demand: one chapter each to personal consumption expenditures, investment, government expenditures, and foreign trade. The addition of these four categories of final demand results in the second projection of GNP in 1970.

The following chapter, entitled "The Interindustry Table", is

11. See especially their arguments on p. 421 concerning the two labour force projections.

the connecting link between the previous four and the next five dealing with the various industries, namely, agriculture, minerals, and forestry and fisheries (the primary industries), manufacturing, and service. A final chapter deals with the regional distribution of economic activity. The authors use their chapter on the interindustry table to forecast the level of output that must be forthcoming in 1970 to satisfy the demand they have just finished determining.

The third method of projecting output is carried out in the five chapters on the industrial sectors and consists of projecting the output of the individual industries to 1970. Here the emphasis is on the supply factors as contrasted with the interindustry tables' stress on demand.

Essentially, what Caves and Holton have done, as is explained in Chapter V, is to

- a) make an overall projection of the rate of growth of GNP using the employment approach (method 4, pages 179-180);
- b) make a sectoral projection (page 193);
- c) as part of the sectoral projection, end with an input-output model (page 204).

1. General - RCHS

In PR 1 and 2 Brown's method is the overall employment approach described in Chapter V (pages 179-180) with the lead variable, population, being projected independently.

PR-3F and PR-3G are based on an econometric model which attempts to explain the behaviour of an aggregated economic system, or of any subsector of such a system in terms of the basic cause-effect relationships which underly the behaviour of the system. The model attempts to encompass and describe the complete economy treated as a unit "organism", with many interrelated "organs" and subsystems. In the process of description, one direct causal relationship is developed (usually) to explain each endogenous variable in the economy. The relation is expressed as an equation, in which the endogenous

variable being explained is put equal to a function of the other variables in the system which act on it directly as causes.

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 An econometric model of the system then consists of the set of all of the basic relations, expressed as equations, within the system, and which, taken together, round out as complete a quantitative description as possible of the organism considered as a whole or as unity. Successful quantitative description in this manner requires careful background study of economic institutions, and of the anatomy and the behaviouristic characteristics of the total economic organism. Such a model gives us in concept an aggregative "general equilibrium". This "general equilibrium" is found by the simultaneous solution of the system of equations, for the endogenous variables, in terms of the exogenous and lagged variables. The equilibrium or solution is dynamic, moving through time under the influence of the moving exogenous forces, and of the successive changes in the lagged endogenous variables.¹²

1. General - ECC

The Economic Council's projection, too, is based on the overall employment approach. But since the Council is projecting the potential growth of GNP (that is, the highest feasible), the productivity of labour is based not entirely on past trends but more especially on what it must be in future to ensure that the potential GNP growth rate is obtained. Naturally, the projected rate of increase of labour productivity per man-hour is itself deemed feasible of attainment.

Unlike Caves and Holton who do carry out a formal sectoral projection and thus consider demand as well as supply, the Economic Council, with its stress on the "potentialities" of growth of the economy,¹³ is concerned essentially with measuring "the supply factors and capabilities of the economy and assumes that the favourable and appropriate demand conditions necessary"¹⁴ for actually achieving the

12. RCHS, Brown, pp. 140-1.

13. cf. ECC, First Annual Review, p. 31: "The Act establishing the Economic Council of Canada calls upon the Council to examine the 'potentialities' for growth of the economy".

14. Ibid. UNIVERSITY OF OTTAWA SCHOOL OF GRADUATE STUDIES

reasonably full and efficient use of the nation's economic resources can be generated. The Council emphasizes:

Such a measure of the country's economic potential is not an economic forecast. It is a calculation of the possible - in a sense, a target to be aimed at - not a projection of the probable.¹⁵

2. Population - RCCEP

After reviewing the history of the rate of natural increase in Canada and of immigration to and emigration from Canada as well as describing the present age structure, Hood and Scott detail their method of forecasting population growth.

They start by forecasting mortality rates by five-year classes of males and females grouped separately. Their forecasts are based on their observation of "a tolerably constant relative rate of observation of decline"¹⁶ of mortality rates since the depression. Hood and Scott simply project these constant rates of decline by five-year age groups of males and females. However, although mortality rates are thus projected to decline at a constant rate, the rates are assumed to be constant within quinquennia.

Fertility rates (number of live births per thousand women) were also assumed to be constant within each quinquennium, although not from one quinquennium to the next. "In each year of a given quinquennium, the number of live births was taken to be the sum of the products of the number of women (expressed in thousands) in each fertile age group at the beginning of that quinquennium and the estimated fertility rate pertaining to that age group".¹⁷ Before settling on precise fertility rate projections, Hood and Scott examine the marriage rate, the average age

15. Ibid.

16. RCCEP, Hood and Scott, p. 163.

17. Ibid.

of marriage, and family size. The conclusion they derive from their "forecast of age-specific rates is that the crude birth rate will vary between 24.2 and 25.6 over the period of the forecast."¹⁸

In forecasting net immigration to Canada, Hood and Scott were overwhelmingly influenced by the experience of the years 1946-55 when net immigration was at historically high levels. They assume no change in government policies at home and abroad and consider it plausible that "our net loss or exchange of people with the United States will be cut."¹⁹ These considerations lead them to predict net immigration to Canada of 75,000 a year, with high and low limits 25,000 on each side of their favoured figure.

These forecasts of mortality and birth rates and of net immigration when applied to the present population result in Hood and Scott's population forecasts - four in all, based respectively on 0, 50,000, 75,000, and 100,000 yearly net immigration.

The authors conclude their section on population by forecasting the regional growth of population. They admit to crudity of method:

Lacking knowledge of interprovincial migration and refined methods of forecasting, it was felt there would be little point in undertaking detailed forecasts of the natural increase of each region. Rather, a general feeling for the ranking of the provinces by rate of population growth was expressed in the selection of figures for the percentage distribution of the total population in each target year.²⁰

Hood and Scott in effect assumed the pronounced interregional growth pattern of past decades would continue into the future: the rich

18. Ibid., p. 167.

19. Ibid., p. 173.

20. Ibid., p. 179.

would get richer; that is, British Columbia's population would increase at the fastest rate, followed by Ontario's, which province would, however, continue to receive the bulk of immigrants.

2. Population - Caves and Holton

While admitting that population forecasts have often been dismally out in the past, Caves and Holton add that there is no alternative to the construction of specific population estimates else it would be impossible to establish any future national income aggregate or the future consumer demand for any commodity.²¹

Caves and Holton base their population projection on careful analysis of trends in the country's birth rates, mortality rates, and immigration rates. They conclude that the birth rate will remain in the 25 to 28 per thousand range rather than decline towards the depression rate of 20 to 21 per thousand. Yet because the marriage rate has been falling steadily from 10.9 in 1946 to 6.7 in 1955, and because the industrialization of Canada is likely to continue, they expect a decline in the birth rate. Here, for the first but far from the last time, Caves and Holton refer to the United States' experience as a forecast of what the future holds for Canada: "the discrepancy between the birth rate in Canada and that of the United States has been declining from about six to eight births per thousand in the 1920's to about three or four per thousand in the years since World War II."²²

Caves and Holton use a high, a low, and a medium birth rate for each age group to compute three alternative population projections. Less enamoured of linear projection than the Royal Commission, their "best"

21. Caves and Holton, p. 258.

22. Ibid., p. 264.

projection between the high and the low birth rate assumptions "presumes that the 1951 rates will continue until 1960 and that thereafter the rate of decline will be the same as in the low birth rate assumption."²³

Caves and Holton note that linear projection of the 1926-56 death rate reductions to 1970 would be unrealistic for this would imply some of the age groups would have zero death rates by 1970. Caves and Holton therefore assume ~~a~~ change in death rates for the older groups and a falling rate of decline in death rates "for each of the age groups for males under 50 and for females under 55."²⁴

Turning to immigration, Caves and Holton are able quickly to reject the "displacement theory" because of their detailed examination of it in the first part of their study. In their view migration, in normal times, takes place when incomes are rising in both the countries of departure and of arrival - provided only that the incomes are higher and are rising faster in the country of arrival. If Canadians, then, emigrate to the United States it is not because they have been "displaced" by new arrivals in Canada but rather because they are attracted by the still higher incomes south of the border.²⁵

Caves and Holton note that net immigration to Canada has been declining since the high post-war war induced immigration: 120,000 in 1951, 100,000 in 1955. Such a rate of decline would forecast net immigration approaching zero in 1970. But Caves and Holton reject such a

23. Ibid., p. 268.

24. Ibid.

25. John H. Dales, "The Cost of Protectionism with High International Mobility of Factors" CJEPS, XXX, No. 4, (November 1964), pp. 513-25.

forecast on the grounds of "the world's growing need for the minerals and other raw materials which Canada appears to have at her disposal."²⁶

Such needs indicate rising incomes in Canada and a larger labour force to work the resources - a double draw for immigrants. Accordingly, Caves and Holton forecast as their medium rate of net immigration a linear decline from the 100,000 of 1955 to 40,000 in 1970, with high and low forecasts being 10,000 on either side of the terminal figure.

In order to forecast the total impact of immigration on the Canadian population, Caves and Holton assume that the 1951-52 age-sex distribution of immigrants will continue into the future, that they will have the same birth and death rates as Canadians, and that the age-sex distribution of emigrants is the same as that of the immigrants.

Caves and Holton describe their actual calculating procedure as follows:

First, consider those Canadians who were living in 1951 (the year of the most recent census). Of every age and sex group, a certain fraction will survive to comprise the age groups 20 and over in 1970. The number of these survivors can be calculated using our assumed rates of change in death rates. Each year, each age group is assumed to be decreased through mortalities and increased through immigration. Applying this procedure for all age groups gives the base population for the next year's calculation, adjusting for the fact that everyone becomes one year older. The age distribution of the female population which comes out of these calculations lets us compute the number of births each year, using the assumed specific birth rates.²⁷

2. Population - RCHS

A. Stukel, who carried out the population projections, 1961-1991, in T. M. Brown's book, pays tribute to Miss Yoshiko Kasahara in a footnote for being "particularly helpful in discussing some methodological points

26. Caves and Holton, p. 274.

27. Ibid., p. 275.

of the projection."²⁸ It should not be expected, therefore, that Stukel's techniques will be fundamentally different from Miss Kasahara's which are described on pages 23-24. However, Stukel, like a good statistician, gives the actual formulae he uses in making his projections.

He makes five population projections to 1991 at five-year intervals based on alternative rates of net immigration of zero, 10,000, 25,000, 50,000 and 100,000, leaving it up to the Royal Commission on Health Services to select 50,000 as a preferred figure.

The assumptions underlying Stukel's mortality rates' projections are similar to Miss Kasahara's. Not so for his fertility rates' projections. Like her, he projects a slight increase in the fertility rate of the 15-19 age group on the assumption that the trends towards lower age at marriage and concentration of births in the younger age groups would continue. But, unlike Miss Kasahara's projections, this increase does not make up for a continued decline in the fertility of the other age groups.²⁹

Stukel notes that up to 1957, male immigrants predominated in all ages up to 50 but that since 1957 female immigrants predominate in all ages over 14. Like Miss Kasahara, Stukel notes the slight predominance of males over females for the period 1950-1961 (2.3 percentage points), but, unlike her, assumes that this imbalance will continue into the future.

2. Population - ECC

It is hard to summarize the six and a half pages Miss Yoshiko Kasahara³⁰ devotes to an excellent explanation of her method of population

28. RGHS, Brown, p. 269.

29. RGHS, Brown, "Table 6, Fertility Rates Per 1000 Women", p. 289.

30. ECC. Staff Study No. 1, pp. 1-7.

projection. Perhaps, then, it would be best to quote her own summary directly:

The method used is a "component method" involving separate projections of the basic components of population change, i.e., fertility, mortality, immigration and emigration. Starting with the estimates of Canada's population by age and sex as of June 1, 1963, calculation of the expected survivors of this population subject to the assumed mortality conditions was carried out for each of the years over the period 1963-70. Additions to this population due to births after June 1, 1963, were estimated separately on the basis of assumed age-specific fertility and mortality rates applicable to each birth cohort over the period involved. Losses due to emigration from this base population and the birth cohorts to be associated with it were then accounted for. Gains to be attributed to surviving immigrants and their children born since their entry into Canada were also calculated separately. The projected population by age and sex for any given year is thus the sum of the survivors of the segments of the population expected to be residing in Canada on June 1 of that year after an allowance was made for the accumulated emigration over the period preceding that date.³¹

In deriving survival ratios by age and sex for each of the years between 1963 and 1970, Miss Kasahara considers the following factors concerning mortality:

- 1) the past trends;
- 2) major causes of death;
- 3) probable advances in medical research;
- 4) past trends and current levels of mortality in countries similar to Canada;
- 5) the levels of mortality in Canada and elsewhere which are below the Canadian average;
- 6) possible effects of technological developments upon mortality.³²

Where appropriate, Miss Kasahara considers the above factors in relation to age-sex differentials.

31. *Ibid.*, p. 1.

32. *Ibid.*, p. 2.

With regard to fertility, she projects that the 1963 fertility rate would be lower at every age group than the level reached in 1962, thus continuing the decline of recent years. However, she then projects a constant fertility rate to 1970 because of the countervailing force of "a probable rise in the marriage rates over the coming few years and an expected increase in the proportion of women under 25 years of age in the total forthcoming marriages."³³

With regard to immigration, Miss Kasahara, admitting that any projection is here more a matter of judgement than anything else, assumes a net immigration of 40,000 in 1964 and thereafter to 1970 net immigration of 50,000 a year. On the basis of the average sex ratio for the past decade, she assumes that in 1963-64 there will be a slight excess of males over females among immigrants but that for the period 1966-70 the sex distribution will be equal. She derives the figures for 1965 by interpolation. She assumes the equality of the sex distribution 1966-70 on the basis of the relative increase in the arrival of family groups and of the arrival of wives, brides and other female dependants of the men who in migrating earlier caused the male immigrant predominance of the earlier period.³⁴

3. Civilian Labour Force and Labour Participation Rates - RCCEP

Hood and Scott outline the broad procedure they followed in these terms:

to derive from forecasts of the population, by age and by sex, a forecast of the civilian non-institutional population, and to derive a forecast of the labour force by age and by sex from this in turn by applying predicted labour force membership (participation) rates specific to each sex and each age class.³⁵

33. Ibid., p. 4.

34. Ibid., p. 6.

35. RCCEP, Hood and Scott, p. 181.

To estimate the total population 14 years and over, by sex, the authors graphed the cumulative percentage age distribution of the total population for males and females, fit free-hand curves and then read from the curves the percentage of the total population under the age of 14. Next they converted the population figures from five-year age groups by sex to the standard labour force age categories: 14-19, 20-24, 25-44, 45-64 and 65 and over. Their last stages were to deduct the total in the armed forces by age group (assumed to be all male and to maintain a constant size of 120,000), Indians on reservations by sex and age group (assumed that those over the age of 14 would maintain a constant size of 70,000), and the institutional population by sex and age group (assumed that the male institutional population would remain constant at 0.9 per cent of the total male population while females would remain constant at 0.7 per cent of the total female population).

Hood and Scott now come to the crux of the problem: the projection of participation rates. They examine the observable trends in each sex-age group, basing themselves, however, on data which only go "back to late 1945 when the labour force sample survey was begun".³⁶ While accepting the necessity of making guesses in some cases they do predict with confidence that the trends to earlier retirement, longer schooling and greater labour force participation by women will continue. Their general conclusion is that after a decline in the first quinquennium, "the labour force rises at a slightly more rapid rate than the population."³⁷

Hood and Scott conclude their chapter with a forecast of the regional distribution of the labour force - something they do with little

36. *Ibid.*, p. 182.

37. *Ibid.*, p. 186.

confidence for two main reasons: the difficulty of forecasting regional population increases, and the non-availability of current data on the regional, occupational and industrial division of labour. Also, the authors have only modest confidence in their ability to forecast the location of industry. Hence they describe their estimates of the regional distribution of the labour force as being "thoughtful guesses". Still, they are related "to forecasts of regional economic prospects generally".³⁸

3. Civilian Labour Force and Labour Participation Rates - Caves and Holton

Caves and Holton, defining the civilian labour force as do Hood and Scott, base their forecast of it in 1970 on an application of their forecast labour participation rates by age groups to the projected 1970 labour force population.

They note the trend to increasing participation in the labour force by women and to decreasing participation by both males and females in the 14-19 year-old group and by males in the 65 and over age group.

To derive the 1970 participation rates, Caves and Holton combine "the information on postwar trends in Canadian participation rates with the prospects implied by Canada - United States difference".³⁹ Even though they claim the adjustments they have made to past trends are "quite modest",⁴⁰ it is apparent in our Chapter IV, they have indeed "been bolder than Hood and Scott in assuming ... that Canadian labour-force participation will come nearer to resembling the pattern in the United

38. Ibid.

39. Caves and Holton, p. 285.

40. Ibid., p. 286.

States".⁴¹

3. Civilian Labour Force and Labour Participation Rates - RCHS

Brown's discussion⁴² of the factors affecting participation rates reveals no difference between him and Denton and Ostry (see below) with regard either to the factors considered, the assessment of their relative influence, or to method used in projecting first the participation rates and then, from them, the civilian labour force. Like Denton and Ostry, Brown projects a gentle increase in the over-all participation rate with the upward trend for women continuing to overwhelm the downward trend for men.

3. Civilian Labour Force and Labour Participation Rates - ECC

Denton and Mrs. Sylvia Ostry also excluded the same four groups from the basic population and thus achieve a definition of the civilian labour force identical to the others as well as to the historical series of the DBS Labour Force Survey. "For each of these groups, separate projections were made by age and sex, and subtracted from the totals to obtain what may be termed the 'labour force population'".⁴³ However, Denton and Ostry adjusted their civilian labour force to an annual average basis as follows:

As estimate of the June 1, 1963 labour force population was made for each age-sex group by interpolating between the published May and June figures. The difference between this estimate and the published 1963 annual average was then calculated. This difference was added to the June 1 labour force population projection for each year.⁴⁴

41. Ibid., p. 281.

42. RCHS, Brown, pp. 80-2.

43. ECC, Staff Study No. 1, p. 23.

44. Ibid., p. 29.

To ensure comparability with the other projections the EGC labour force figures have been converted back to the DBS monthly average basis, as explained in Chapter IV, Table IV, The Civilian Labour Force.

In making their participation rate projections, Denton and Ostry paid particular attention "to those groups in which there have been marked changes in participation; namely, younger and older men and married women."⁴⁵ Having estimated the participation rates in 1970, as described below, they estimated the rates for the years between 1963, when the actual rates were known, and 1970, by straight line interpolation.

Starting with the male 14-19 age group, Denton and Ostry note that from 1956 to 1973 the participation rate fell by no less than 9 percentage points. They estimate it will fall by no more than an additional 2 percentage points by 1970 for several reasons: (1) the Canadian rate is already lower than the United States' rate; (2) some levelling off would seem to be inevitable under almost any circumstances; (3) continual high level employment will draw more teenagers who might otherwise have continued at school into the labour market; (4) the shift towards the older end of the age groups will continue.

Participation rates for men aged 20-24 are expected to continue the moderate rate of decline established during the 1950's as the trend towards more higher education continues. The authors note that in this age group the Canadian rate is still some 6 percentage points higher than the United States.

Little or no change in participation rates is predicted for men aged 25 to 64 but levelling off in the rate of decline is predicted for men over 65 in view of the sharp decreases in the past two decades, high employment and the fact that "the rate is now substantially lower in

⁴⁵ Ibid., p. 23.

Canada than in the United States".⁴⁶ Again is seen the use of intercountry comparisons.

For the two younger women's groups (14-19 and 20-24) Denton and Ostry predict slight upward increases in participation rates, mostly the result of the age-shift within each group towards the older end. In the case of the 14-19 age group this age effect is expected to be sufficiently powerful to reverse the trend towards a slight reduction in this group's participation rate.

The rapid influx of married women into the labour force is expected to continue and affect markedly all four female age groups between 25 and 64, with the highest increase of 8.5 percentage points predicted for the 45-54 age group. In each case Denton and Ostry refer to the United States' experience and point out that even the rapid rate of increase they predict will not bring the Canadian rate by 1970 up to the United States' 1963 level.

Women 65 and over are expected to continue their slight trend to increased participation.

With participation rates thus obtained, the labour force population in each age-sex group was multiplied by the appropriate participation rate to obtain the labour force projections.

4. Employment and Employment Ratio - RCCEP

Having determined the future size of the labour force by multiplying the projected labour force population by the projected labour participation rates, Hood and Scott now have recourse to their full employment assumption to predict that the employed labour force will be

46. Ibid., p. 27.

97% of the labour force in all the years ahead.⁴⁷ Their next step is "to estimate the division of the employed labour force among three main sectors of the economy, namely, the sector in which the work of government and community service is carried on, the sector in which agriculture is pursued and, finally, the so-called business sector in which all other employment is found".⁴⁸

Hood and Scott first forecast employment in the government and community services sector - broken down into five subsectors: health; university education; other education, including religion; miscellaneous community services; and municipal, federal and provincial governments. In each category their method was one of detailed examination of the historical record followed by a projection of trends, modified where necessary. In the field of health, for example, they note that "the ratio of employment ... to the total population has risen since 1931 from about .6% to approximately 1.25% in 1955."⁴⁹ They expect a continuation of this rising ratio, but at a slower rate. Their forecast of employment in universities - as in schools - is based, naturally enough, on the number of students in attendance. But in both cases they take account of the pressure of exploding enrolment by forecasting a rise in the ratio of students to teachers.

The forecast of agricultural employment accepts that the downward trend of farm employment will continue but not at the rapid rate of decline of the last few years. Drummond and MacKenzie predict "that the impact of mechanization in the future will be less forceful than in recent

47. RCCEP, Hood and Scott, p. 195.

48. Ibid., p. 193.

49. Ibid., p. 196.

years",⁵⁰ the rate of mechanization since the war being considered impossible to sustain. Looking further to the future, Drummond and MacKenzie predict that the increasing population will sustain a large increase in livestock production which requires more labour per farm than crop production.

For these reasons their prediction is that the agricultural labour force in 1965 will have fallen 10 per cent to 733,000 from the 1955 level of 817,000 while during the next 15 years the further decline will be one of only 18,000 or 2.52 per cent to 715,000.⁵¹ The 1970 figure would then be 727,000. Continued mechanization by then will be largely offset by increasing livestock production.

Hood and Scott accept these conclusions pointing out "that the ratio of agricultural employment to total civilian persons with jobs which has decreased almost continuously since 1926 will decrease further from its present level of 15.3 to approximately 7.5% in 1980".⁵² That is, to 9.4% by 1970.⁵³

Having thus forecast employment in the two main sectors of government and community service, and agriculture, Hood and Scott now simply subtract these two sets of figures from those of total employment to derive their figures of employment in the business sector residually.

50. RCCEP, Progress and Prospect of Canadian Agriculture. Study prepared by W. M. Drummond and Wm. MacKenzie (Ottawa: Queen's Printer, 1957), p. 100.

51. Ibid., p. 101.

52. RCCEP, Hood and Scott, p. 201.

53. Calculated by dividing 727,000 by the 1970 total civilian employment figure derived in column (b) of Table VI in Chapter IV below.

Fullerton and Hampson derive their projected employment figures in secondary manufacturing by applying estimates of output, productivity and hours of work to the 1953 employment figures. To obtain their forecast employment figures, they "deflate the expected increase in output to allow for the projected annual increase in productivity over the period".⁵⁴ The reciprocal of their estimates of productivity increases is used as the employment deflator.

As pointed out at the beginning of this Chapter, Fullerton and Hampson's study (as well as their studies covering other sectors) does not provide an independent check of Hood and Scott's figures because some part of total employment must still be derived residually.

4. Employment and Employment Ratio - Caves and Holton

Caves and Holton project the work force requirements of Canada in 1970 by a detailed industry by industry assessment of the output requirements of the terminal year coupled with an assessment of the productivity increase expected within each particular industry. For example, having determined that the world would require 85 per cent more Canadian nickel in 1970 than in 1955, that is 325,000 tons rather than 175,000 tons,⁵⁵ they then determine the 1970 work force requirements as follows:

If we assume that a return to a normal ratio of workers actually mining to all other other mine employees would raise the output to 16 tons per man-year and then apply the historic 3.75 per cent annual increase in productivity per worker in mining, the 1970 output of nickel-copper metal content from nickel-copper mines would be 28,8 tons per man-year. (This assumes a continued shortening of the work week at the 1926-1954 rate.) Nickel production of 325,000 tons in 1970 would then require 21,200 men, the same number as in 1954. That is to say that the expected increase in industry output would equal the expected productivity

54. RCCEP, Fullerton and Hampson, p. 185.

55. Caves and Holton, p. 502.

increase of the present work force.⁵⁶

As explained in Table IV of Chapter IV below, Caves and Holton set Canada's labour force requirement in 1970 at 7,431,000 while in their chapter on the interindustry table they summarize the work force requirements of each separate industry. The result shows a work force requirement of 7,855,400 in 1970.⁵⁷ At first sight this would seem to imply an employment ratio of 105.7 per cent - full employment with a vengeance. But this is not to be: the authors have forecast only a high level of employment, but a little lower than in the period 1945-55 - and this is assumed to mean an employment ratio of 96 per cent, as pointed out on page 4.

Caves and Holton note that if the figure for the labour force (derived from the population and participation rate projections) is 7,431,000 while the figure for the all-industries work force (based on each industry's output and productivity trends) is indeed 7,855,400 then their GNP estimate must be too high - for the smaller labour force simply will not be able to produce the output forecast. The authors are convinced, however, that such is not the case and they offer two reasons for what they consider the upward bias in the work force requirements. The first can be accepted with little question: many of those in the agricultural work force - possibly as many as 200,000 or 300,000 - work part-time in other industries, especially forestry and construction, and are therefore subject to a measure of double counting. Caves and Holton think the second upward bias may be due to their error in making overly low estimates of productivity growth by industry for they made no effort

56. Ibid., p. 530.

57. Ibid., p. 420.

to reconcile the individual estimates with the aggregate productivity growth rate which they forecast for the non-agricultural sector.

It would seem, though, that Caves and Helton should have had more confidence in their forecasts of productivity increases by individual industries than in the overall aggregate, unless, of course, they wish to fall back on the statistical possibility of over and under individual estimates cancelling each other out.

It will become evident in chapter IV below that Caves and Helton would indeed have done better to have placed more confidence in their individual industries forecast of a work force requirement of 7,855,400 in 1970. This forecast was not too high because of a too low estimation of productivity increases but rather the forecast of a 1970 labour force of 7,230,000 was too low because of an under-estimation of the participation rates.

4. Employment and Employment Ratio - RCHS

Brown surveys the history of unemployment in Canada and the United States since the late 1920's and concludes that the two countries have had a continuous unemployment problem since 1929. Labour-absorbing innovations have been lacking in Canada since that date although the war and post-war booms "may have covered over this basic problem until 1957".⁵⁸ Brown also contends that this trend in unemployment has been accentuated by lack of efforts to be competitive in world markets and by the fact that "aggregate demand falls short of potential supply because investment does not measure up to full employment saving".⁵⁹

Despite these pessimistic considerations, Brown concludes that

58. RCHS, Brown, p. 83.

59. Ibid., p. 84.

the Canadian government and people will not tolerate a rate of unemployment higher than 4 per cent as a long-term average and that the rate will be brought down to this level between 1961 and 1966. This is the rate Brown uses in his projections 1 and 2.

In his third projection (PR-3F) Brown simulates the growing Canadian economy, running free; that is, with the government taking no action to correct conditions indicating unhealthy functioning of the economy in the sensitive areas of the rate of unemployment, the current account balance on international trade, and the government surplus or deficit. Brown's procedure "was to insert the observed exogenous data for 1962 and the lagged data from 1961 applicable to 1962 into the model, and solve it for the 1962 endogenous variables".⁶⁰ To arrive at a simultaneous solution he uses the method of continuous substitution to eliminate variables until finally he reaches an equation in only one variable, total employment. He then uses total employment "to compute each of the other endogenous variables in a 'back-solution' using the equations of the substitution-elimination process".⁶¹ The solution for each subsequent year is obtained in a similar manner, the solution for one year providing the lagged values of the endogenous variables for the next.

As Table V of Chapter IV below reveals, Brown's procedure in PR-3F projected 12.55 per cent of the labour force as being unemployed in 1970. Of course Brown, like anyone else, takes it for granted that the government would act before things had deteriorated to this extent but, as he says, PR-3F has the advantage of showing the trends inherent

60. Ibid., pp. 164-5.

61. Ibid., p. 165.

in the pre-1962 data: it reveals the problem areas in the economy, where government action will be required rather than letting the economy run free.

Brown finds the answer to the highly "unclassical" behaviour of the free-running economy "mainly in the insulation of the labour market from the unemployed, so that real wage rates do not fall, but instead advance" for, because of his built-in equations, "real wages are influenced only by productivity, and this productivity grows ... because of technical progress as long as there is sufficient total demand".⁶²

The final determinant, then, is total or aggregate demand. It is important to note this for, apart from emphasizing the consequences of allowing free rein to unfavourable trends, the general equilibrium which the econometric method requires forces equal consideration being given to demand and supply.

In his model, Brown assumes steady, per annum, exogenous rates of growth of population of $2\frac{1}{4}$ per cent and of exports of 3 per cent. The real wage rate, an endogenous variable, advances at $3\frac{1}{2}$ per cent because average labour productivity advances at a rate of 5 per cent. Meanwhile, man-hours employed falls by $1\frac{1}{2}$ per cent per annum. This causes the civilian wage bill to grow at an approximate rate of $2\frac{1}{2}$ per cent per annum even though hours of work per worker decline at a rate of $3\frac{1}{3}$ per cent per annum. Thus employment advances at a rate of 2 per cent.

The heavy and increasing unemployment stems from the fact that the civilian labour force grows at an even faster rate.

The results of his free projection with the econometric model fitted to the Canadian data of 1926 to 1961, Brown summarizes as a

62. *Ibid.*, p. 167.

picture of a seemingly profitable and prosperous steady growth, but with growing unemployment - which would have been worse but for the rapid decline in hours of work. Intermixed with this problem of technological unemployment is a weakness in aggregate demand which weakens the rise in the standard of living, which Brown defines as national consumption per capita. "In fact the model has presented a stylized version of something like the economic picture we have seen in North America in the 1957 to 1961 period indicating how it might look when projected into the future".⁶³

In his fourth projection (PR-3C) Brown again uses his econometric model but with the central government using all the policy instruments it commands to overcome the obvious defects of the free-running economy. The primary goal of the government is high employment. The government develops its policy year by year by studying the situation that has developed in the economy in the previous years, especially in policy foci such as the proportion unemployed. Thus the latter is one of the equilibrating mechanisms of the model - but it is not an automatic mechanism. The government must act by, for instance, changing tax rates and transfer payments or by changing its expenditures.

Brown next first estimates which of such policy variables the government should change and then by how much. This he does by a mental cut and try approach, along with rough multipliers as the projection proceeds. He makes no bones about the fact that "a more scientific approach would have been to establish exact multipliers for each year, given the lagged and exogenous data appropriate to that year".⁶⁴ But

63. Ibid., p. 171.

64. Ibid., p. 175.

time and resources did not allow this and the discrepancies are not closed very early in the projection as they otherwise would have been. Indeed, by 1970, 11.48 per cent of the labour force is still unemployed.

It must be stressed that Brown is not truly projecting an unemployment rate of 11.48 per cent in 1970. What he is saying is that under the assumptions he makes concerning the economy as revealed by the equations he uses and that if the government adopted the policy measures he recommends as revealed by the yearly exogenous changes in policy variables, then 1970 would be as he projects.

For a projection in which he himself had faith, Brown would have needed more time - time to prepare PR-3C (revised).

4. Employment and Employment Ratio - ECC

In their second staff study Denton and Ostry analyse the background of post-war unemployment and conclude that the fullest possible employment Canada can attain under present conditions is 97 per cent employment of its labour force, with the 3 per cent unemployed made up as follows:

1. Minimum frictional and structural unemployment	1.6%	
2. Minimum seasonal unemployment	1.0%	
3. Minimum "slack" (because of demand-deficiency)	0.4%	
Minimum Unemployment	3.0%	65
or Potential labour force utilization	97.0%	

The Economic Council of Canada accepts "that a 97 per cent rate of employment, of the labour force would constitute a realistic objective to be aimed at over the balance of the 1960's ..."⁶⁶ As Table V in Chapter IV below reveals, other studies on which the Economic Council's

65. ECC, An Analysis of Post-War Unemployment. Staff Study No. 3 by Frank T. Denton and Sylvia Ostry (Ottawa: Queen's Printer, Dec. 1964), p. 18.

66. ECC, First Annual Review, p. 38.

Review is based accept that the 97 per cent rate of employment is attained by 1965 and is maintained thereafter. It is true that B. J. Drabble refers only to a return to potential employment (97 per cent) by 1970⁶⁷ but the fact is that the figures on page 54 of his study show that this potential employment is projected to occur by 1965.

In his study of output, employment and productivity to 1970, Drabble divides the economy into three sectors: farm, public administration and community services, and commercial nonagricultural. He does so because from 1946 to 1956 - the only period which provides "reasonably good observation points of economic performance at near-potential levels of output"⁶⁸ - farm productivity increased at a very high and obviously unsustainable rate, as unsustainable, he believes, as the rapid shift of the work force off the land. He deals in a similar manner with the public sector because, though as its employment grows in relative importance its impact on over-all measures of productivity increases, "the changes over time in productivity show no clear trend and are essentially meaningless".⁶⁹ Also, there are conceptual problems in the measurement of output in this sector.

The employment in the remaining sector, commercial nonagricultural - by far the largest - was then derived by deducting the estimates of agricultural and public service employment previously calculated (as described below) from total employment, which is, of course, 97 per cent of the labour force.

The potential employment in agriculture in 1970 is projected by

67. ECC, Staff Study No. 2, p. 47.

68. Ibid., p. 6.

69. Ibid., p. 7.

John Dawson to be 540,000.⁷⁰ He arrives at this estimate by first assessing the change in demand for Canadian agricultural products between 1963 and 1970. He concludes that demand will increase at an approximate annual average rate of 2.5 per cent.⁷¹ He then reviews the past record of changes in the use of productive resources (including labour) in agriculture as well as agricultural organization. Dawson's final section deals with his projections of developments in Canadian agriculture to 1970. He notes that "one of the major factors affecting the rate of decline in the number of farms and the agricultural labour force is the relationship of agricultural to nonagricultural incomes"⁷² - and the latter are expected to increase when the economy is on its potential growth path. In addition, in such circumstances alternative job opportunities are available. These and other factors, coupled with the earlier considerations, lead Dawson to the conclusion that the agricultural labour force will decline at a rate of not much more than 2 per cent annually to its 1970 figure of 550,000, with the number employed averaging 540,000.

Drabble accepts this figure and then turns to a consideration of public service employment. In this category he includes the armed forces which are excluded from everyone else's projections of the civilian labour force. To ensure comparability, therefore, the projected strength of the armed forces (110,000 between 1966 and 1970) has been deducted from Drabble's figures.

As will be detailed in Chapter V below, one method of deriving

70. ECC, Changes in Agriculture to 1970. Staff Study No. 11 by John Dawson (Ottawa: Queen's Printer, Dec. 1964), p. 24.

71. Ibid., p. 7.

72. Ibid., p. 21.

projections of GNP is by relating projections of increases in productivity to increases in future employment (with deductions as necessary for reductions in the hours of work per man per year). Drabble's method of deriving future employment in public administration and community services is precisely the opposite.

He starts by projecting to 1970 estimates of output in the public sector - not as simple extrapolations but with adjustments "made in the light of independent studies of the demand for public services at potential".⁷³ These independent studies are to be found in the First Annual Review, which bases its estimates "primarily upon the existing complex of policies, the probable increases associated with population change, and upon continuing trends toward approved standards".⁷⁴ The Review projects a slight decline in the ratio of government expenditure to GNP by 1970.

Based on this and on a consideration of separate projections of productivity in each of the two major component groups of public administration and community services, Drabble arrives at his projection of employment in the public sector, "obtained residually from these projections of output and output per person employed".⁷⁵

Potential employment in the commercial nonagricultural sector was then simply obtained as a residual by deducting from total potential employment (97 per cent of the civilian labour force) the above estimates of employment at potential in agriculture and in the public sector.

5. Labour Productivity - RCCEP

Hood and Scott base their predictions concerning the rates of

⁷³ ECC, Staff Study No. 2, p. 21.

⁷⁴ ECC, First Annual Review, p. 115.

⁷⁵ ECC, Staff Study No. 2, p. 24.

decline in hours of work on the historical record. They are impressed by the fact that since the war "average hours worked per man per year have declined at about the same rate in agriculture as they have in business".⁷⁶ They predict that this state of affairs will continue and that in the business sector "hours will continue to decline at the same rate of decrease that has been experienced since 1926".⁷⁷

Hood and Scott tabulate the historical record of the rate of increase of agricultural productivity per man-hour in Canada and the United States. Again they are impressed by the high post-war rates of increase (no less than 11.23 per cent per annum between 1949 and 1953), due in large measure to mechanization of the farms. However, they also note the exceptional increases that result from years of bumper crops. Thus they are not dismayed to note that agricultural productivity sank to a low 0.51 per cent per annum in the most recent past, between 1953 and 1955: an ebb is a natural consequence of bumper years inflating productivity. Their conclusion is that agricultural productivity per man-hour will experience a decline in its post-war rate of increase. They "forecast, therefore, that it will rise at 3% p.a.p.a. from 1955 to 1970".⁷⁸

Turning to productivity per man-hour in the private business sector, Hood and Scott examine the historical record of its growth in Canada from 1926 and in the United States from 1910. The authors tend to the view that figures spanning the depression and the Second World War should be discounted while greater weight should be accorded the more recent post-war figures. The future is more likely to resemble the recent past and, moreover, the earlier data are less trustworthy. Finally, the

76. RCCEP, Hood and Scott, p. 201.

77. Ibid., p. 202.

78. Ibid., p. 213.

authors are fortified by "a faith in the cumulative growth of knowledge and applied science".⁷⁹ Their prediction, then, is that productivity per man-hour in the business sector "will rise at a compounded average annual rate of between 2.50% and 3.25%".⁸⁰

At first sight the record of productivity in the government and community services sector reveals a surprising constancy over the past thirty years - GDP per man-year since 1926 has hovered within \$400 plus or minus of \$2,820 (1949 dollars). Hood and Scott point out that part of the reason for this is that the rising productivity one would normally expect has in some measure been offset by a reduction in hours worked. However, the basic reason for constant productivity is concerned with the way productivity is measured in this sector: "for a large component of the output of this sector, namely that of the civil services of governments, output has been measured by payrolls and real output by payrolls deflated by an index of wage rates; real output per man measured in this way necessarily will be almost constant".⁸¹ The authors predict a continuation of this stability.

It will be noted that in the government and community services sector, Hood and Scott are dealing with productivity per man-year and not with the productivity per man-hour they project for the business and agricultural sectors. Therefore, when it comes time for them to project output in the government and community services sector they simply multiply projected employment by the (constant) output per man year; in

79. *Ibid.*, pp. 217-18.

80. *Ibid.*, p. 218.

81. *Ibid.*, p. 220.

the other two sectors they multiply projected employment by the index of projected man-hours of work per year and by the index of projected output per man-hour. Obviously, if they wished to derive it, multiplication of these two indices alone would give them the index of projected increases in labour productivity per man-year.

Before starting their forecast of the output of secondary manufacturing industry, Fullerton and Hampson devote seven chapters and two appendices to the historical record and to past trends in growth, exports, scale, specialization, labour costs, other competitive factors, and productivity. Only one-eighth of the book is concerned with the outlook.

The basic method they use to forecast output is to apply "estimates of output, productivity and hours of work to the 1953 employment figures".⁸² The authors at once stress that "current productivity data are not very trustworthy in aggregate, and less so on an individual industry basis". War and depression have distorted past trends, and 1926-29, which alone is comparable to the past decade and to the assumed future full employment, is replete with statistical deficiencies. Therefore Fullerton and Hampson base their productivity assumptions on three sources, in descending order of importance as follows:

- (a) The performance of each industry since the war with particular importance attached to its record since 1949;
- (b) Guesses about future productivity in the studies and submissions;
- (c) The long term trends, 1926-1955.⁸³

Fullerton and Hampson accept the reductions in the work week

82. RCCEP, Fullerton and Hampson, p. 185.

83. Ibid., p. 186.

forecast by Hood and Scott.

Fullerton and Hampson's summation of secondary manufacturing individual industry annual increases in productivity per man-hour results in a figure of 3.2 per cent - higher than Hood and Scott's average figure of 2.875 per cent for the private non-agricultural economy. Yet there is no inconsistency, for "higher than average productivity in the extractive and manufacturing sectors offsets the lower rates characteristic of transportation, construction and the service industries".⁸⁴ Also, as the authors point out, they forecast the greatest expansion in the high productivity industries.

5. Labour Productivity - Caves and Holton

Unlike the Royal Commission, Caves and Holton do not project the percentage increases in labour productivity per man-hour separately from the projected percentage decreases in man-hours of work per year. Caves and Holton project labour productivity per man-year directly although they do consider decreases in man-hours of work per year as one of the factors or influences on labour productivity per man-year; for example, "In 1946 and 1947 the decline (in nonagricultural productivity) apparently was due to reduced hours because production per man-hour in nonagricultural employment seems to have increased in both of those years".⁸⁵

It must be borne in mind, therefore, that the Royal Commission is talking of labour productivity per man-hour while Caves and Holton are talking of labour productivity per man-year. One can be converted into the other by simply adjusting for the projected decreases in man-hours

84. Ibid., p. 187.

85. Caves and Holton, p. 291.

of work per year.

Caves and Holton examine the record of productivity increases in Canada back to 1926 separately for agricultural and non-agricultural employment. They note that there is "great variability over time of productivity growth in particular (industrial) sectors"⁸⁶ and hold that because of this there is little to be gained by disaggregating national productivity figures, though this leaves them "without a causal explanation of the national productivity growth rate".

Faced with their conclusion that "productivity forecasting then must remain pretty much an exercise in blind extrapolation",⁸⁷ Caves and Holton return to their favourite method of looking at the United States experience as a check of their interpretation of the Canadian rate of growth of productivity. And the United States experience is that the rate of technological advance is constant.

Considering Canadian agricultural productivity in detail they conclude that the factors tending to increase it in the future slightly outweigh the negative influences. They therefore settle on a figure of 1.5 per cent per annum as the growth rate of agricultural productivity per man-year, a figure which is a slight over-estimate of the long-term trend, "a fact", they are careful to note, "confirmed by looking at United States experience".⁸⁸

Turning to non-agricultural productivity, they again stress the United States experience, noting that that country has never maintained

86. Ibid., p. 294.

87. Ibid.

88. Ibid., p. 296.

a rate of increase greater than 2.5 per cent for any period of five or more years since 1929.⁸⁹ Though they recognize that in Canada certain factors (increasing population density, increasing economies of scale, possible improving terms of trade) may give this country a productivity rate of increase advantage over the United States, they conclude that debit items (increasing economies of scale confined to only a few industries, Canada has rarely exceeded their "best guess" figure in the past) will hold Canada to "2.0 per cent annual increase in output per man-year in non-agricultural employment".⁹⁰

5. Labour Productivity - RCHS

Brown notes that "the long-run rate of decline of average annual hours of work per worker in Canada has been -0.80 per cent, 1926 to 1961"⁹¹ but that the post-war yearly compound rate of change has been -0.67 per cent. It is this more recent trend that he projects into the future and uses in PR 1 and 2.

Productivity of labour per man-hour states Brown, has grown at a long-term rate of $2\frac{3}{4}$ per cent,⁹² and this is the rate of increase he uses in PR-1. It is assumed he also uses this rate in PR-2 although nowhere does he say so.

It will be seen, then, that in PR-1 and 2 Brown's method is one of extrapolation of the systematic long-term trends which have been observed in the economy in the past".⁹³

In his econometric projections Brown sets out a relationship which

89. Ibid., p. 298.

90. Ibid., p. 301.

91. RCHS, Brown, p. 84.

92. Ibid., p. 95.

93. Ibid., p. 107.

tests "the hypotheses that hours of work are related to the trend of economic development, and also to the business cycle".⁹⁴ One hypothesis is that as output per hour of work rises, man-hours of work per week will decline. The other hypothesis is that at the top of a boom man-hours of work per week will increase (through over-time pay). In the free-running PR-3F this relationship results in man-hours of work dropping at a yearly rate of $3 \frac{1}{3}$ per cent, almost exactly 5 times the historic rate! For growth of GNP to occur under such conditions it is necessary for labour productivity to rise rapidly, and it does - at 5 per cent per annum, almost double the historic rate. "This high rate is due to technical progress, increasing returns to scale, and a rapid growth of capital".⁹⁵

In PR-3C Brown sets about correcting the obvious structural defects of PR-3F; that is, the functional forms of parameters in the model which gave extreme results not likely to be found in the real economy - such as those described above. He starts by correcting the hours equation from the linear form, which let hours fall too fast, to the exponential form. Thus "the time path of hours would conform in growth with the exponential decline of PR-1 and PR-2".⁹⁶ Secondly, he slows down the rate of technical progress used in his production function and, thirdly, he slows down the equation of demand for private investment.

These adjustments result in PR-3C showing man-hours of work declining at a rate of -0.6 per cent per annum while labour productivity

94. Ibid., p. 149.

95. Ibid., p. 167.

96. Ibid., p. 173.

grows at a rate of 2.9 per cent per man-hour per annum⁹⁷ - the former figure a little lower than the historic trend while the latter is somewhat higher.

5. Labour Productivity - ECC

As previously mentioned on page 39, Drabble divides the economy into three sectors, agricultural, public, and commercial non-agricultural. He obtains productivity in the agricultural sector residually by making direct estimates of output and employment in this sector at potential; that is, the percentage increase in output per man-year plus the percentage decrease in employment yield the percentage increase in productivity per man-year. His projection of employment has already been discussed; that of output will be discussed on pages 70-72.³ The projection of the increase in productivity in agriculture is $3\frac{1}{2}$ per cent per man-year between 1963 and 1970.⁹⁸ Drabble makes no estimate of man-hours of work in agriculture, nor, having regard to the fact that output is estimated directly, is it necessary that he should do so. Indeed, his derived estimate of farm labour productivity is useful itself only as a check: a figure too far out of line with the recent past would suggest further examination of the direct estimates of farm output and employment.

Drabble notes that "DBS estimates of output of the public administration sector are based upon estimates of labour inputs implying constant productivity ... because of the conceptual and practical problems in determining the output of this sector in any more direct fashion".⁹⁹

97. Ibid., p. 180.

98. ECC, Staff Study No. 2, p. 20.

99. Ibid., p. 23.

Discerning no underlying trend in recent variations, Drabble decides to accept this practice and projects to 1970 a constant level of output per worker in public administration, based on the average between 1956 and 1963.

Drabble notes that productivity in community services appears to have declined quite sharply since 1945, probable mostly because of the increase in part-time and less skilled workers. Part of the explanation may also be found, according to Drabble, in errors in the unofficial estimates of employment derived from the Labour Force Survey. Drabble finally concludes that with a return to potential levels of GNP "output per man would decline at a rate no faster than that indicated by extrapolating the declining trend in average hours of work and assuming constant man-hour productivity".¹⁰⁰ Since Drabble does not give the trend of hours of work in the community services component, it must be assumed to be equal to that in the commercial nonagricultural sector discussed below.

To obtain a projection of the potential annual average of man-hours input of paid workers Drabble uses the DBS productivity study of the average hours worked by paid employees in the commercial non-agricultural sector from 1947 to 1973. He fitted a smoothed trend line to obtain a series of hours worked at potential. Noting that in only one year did this potential trend line deviate by more than one per cent from the actual, he projected the hours trend at potential to 1970 by following "closely the trend suggested by a mathematical fit of the 1947-63 data".¹⁰¹ The result is a decline from 39 man-hours of work a week in 1963 to approx-

100. *Ibid.*, p. 24.

101. *Ibid.*, p. 28.

imately $37\frac{3}{4}$ in 1970 - a rate of decline a little less than in the preceding seven years.

Turning to man-hour productivity of paid workers in the commercial non-agricultural sector, Drabble notes that the post-war rate of growth was fairly steady and averaged 2.4 per cent per annum, one or two tenths of a percentage point higher before 1956, lower by very slightly more after 1956. After some cross-checking by reference to longer term trends, Drabble finally adopts a straight-line log trend (implying a constant rate of growth) to project productivity with GNP at potential. Labour productivity thus derived is projected to increase at 2.5 per cent per man-hour per annum.

6. Output - RCCEP

Based on the work of Hood and Scott as set out above, the Royal Commission's Final Report states its formula for deriving Gross Domestic Product at factor cost: "workers times average hours worked by a man in a year, times output per man-hour".¹⁰² These forecasts are made separately for each of the three sectors (government and community services, agriculture, and business). Gross National Product at market prices is then obtained by subtracting from GDP at factor cost net payments abroad of earnings of factors of production and by adding indirect taxes less subsidies and an inventory valuation adjustment.¹⁰³ The last item, a technical one, plays no part in the forecasts but the others do and Hood and Scott now turn to their methods of forecasting them.

Hood and Scott tabulate the 1926-55 record of indirect taxes less subsidies as a percentage of GDP at factor cost and note that the proportion

102. RCCEP, Final Report, p. 325.

103. RCCEP, Hood and Scott, p. 221.

has been remarkably constant. With the exception of three years - wartime 1943-45 when the proportion varied between 9.1 and 10.9 per cent - the proportion has remained within the narrow range of 11.2 (wartime 1942) and 16.6 (depression 1933). Accordingly, the authors base their forecast "on the assumption that the average value of this proportion for the years 1947-55 would continue to hold"¹⁰⁴ - when the proportion varied by no more than 1.2 percentage points.

Net payments abroad of earnings of factors of production turn out to be practically entirely a case of payments of interest and dividends. Hood and Scott record the interest and dividends received and paid by Canada from 1938 to 1955. Looking to the future, the authors assume that foreign investment in Canada will continue to increase between 1955 and 1980 but that this increase will be greater in the early part of the period. Further they foresee that some foreign earnings will not be remitted but will be ploughed back. They forecast that Canada's net payments abroad in 1970 will amount to \$722,000,000.¹⁰⁵ This compares to net payments abroad in 1955 of \$328,000,000.

In a later chapter entitled "Divisions of Employment, Output and Expenditures", Hood and Scott "report on forecasts of broad components of the aggregates".¹⁰⁶ These forecasts were done by other researchers and though efforts were made to achieve consistency between their work and that of Hood and Scott, such consistency was not always achieved, first because of lack of time and secondly because of "the limitations of the techniques available. Economists are not as adept as they would

104. Ibid., p. 222.

105. Ibid., p. 223.

106. Ibid., p. 307.

wish at tracing in the records of past performance the interrelations of changes in various parts of the economy".¹⁰⁷ (This problem of reconciliation or co-ordination is also discussed at the beginning of the present chapter).

As was pointed out on page 44, Fullerton and Hampson's basic method for forecasting output in the secondary manufacturing sector was to apply "estimates of output productivity and hours of work to the 1953 employment figures".

Turning to particular industries, they state, for example, that their 1980 bakery products "forecast of a doubling of output assumes consumption linked more closely to population than to income, with items other than bread showing the highest gains and imports negligible".¹⁰⁸ They use a productivity increase estimate of $2\frac{1}{2}$ per cent - higher than recent Canadian experience but below the estimated United States rate of $3\frac{1}{2}$ per cent from 1949 to 1953.

In their brief statement, Fullerton and Hampson give few details of their methods. However, it can be seen that they use United States experience as a check against their own predictions. They have more confidence in their prediction of a higher future rate of productivity increase in Canadian bakeries because of the currently higher United States rate. The authors subscribe, at least in part, to the theory that Canada lags behind the United States technologically (and culturally) and that this lag tends to shorten. It can also be seen that Fullerton and Hampson have applied an income-consumption ratio to bakery products and have come up with the not unexpected conclusion that a population of,

107. Ibid., p. 308.

108. RCCEP, Fullerton and Hampson, p. 188.

say, 25 million with \$50 billion to spend will do more business with the baker than will a smaller population with the same real total national income. Also, the richer people become the more they will substitute cakes and pies - and other foods - for bread.

Fullerton and Hampson accept the general forecast of The Bank of Nova Scotia's study on the primary iron and steel industry¹⁰⁹ that output in 1980 will be somewhere between 12 and 14 million tons. However, taking into account the fact that the Bank based its forecast on a lower forecast of 1980's GNP, assuming a continuation of the recent decline in the import share of the market, "and allowing for increased manufacturing content per ton through a greater concentration of output in more complex products",¹¹⁰ they consider it reasonable that the constant dollar value of net output should tend towards the higher limit.

The Bank of Nova Scotia adopts the usual procedure of first reviewing the past before discussing the factors affecting steel expansion. They note the conservatism of the industry bred by the wide fluctuations in demand natural to so basic an industry.¹¹¹ On the other hand, cost-reducing methods introduced to maintain a given market share can lead to an increasing market share through the displacement of higher cost imports. The Bank's study searches for such areas of growth and finds them in electrolytic tinning, skelp, silicon sheets and strip. "The outlook, in short, is for a continued increase in the volume of those thin

109. RCCEP, The Canadian Primary Iron and Steel Industry. Study by The Bank of Nova Scotia (Ottawa: Queen's Printer, 1956).

110. RCCEP, Fullerton and Hampson, p. 192.

111. RCCEP, Bank of Nova Scotia, pp. 37-8.

flat-rolled steels already produced and for an increasing variety of products, though no doubt many specialty lines of which Canadian usage is small will not be made for many years to come."¹¹²

The Bank's study also looks at the world-wide situation and predicts that where there are shortages, as in structural steels and plates, Canadian steel production is likely to expand.

Basing itself on forecast population growth in line with the other Royal Commission studies and, as mentioned above, on a slightly lower future GNP, the Bank's study notes that "the Canadian per capita production and standard of living would be somewhat higher than that now prevailing in the United States".¹¹³ The Bank does not immediately conclude that Canada's 1980 per capita steel consumption would then be "somewhat higher than that now prevailing in the United States". That would be too easy. Rather, the Bank notes that such factors as considerable United States exports of steel and future technological improvements in steel use tend to cause the United States to produce more steel per capita now than Canada will when its per capita income has reached the present United States level. The trend to substitution of other materials for steel also tends to cut down on the increased future production of the latter.

The Bank stresses the great importance of the growth prospects of the steel-using industries in assessing future steel consumption in Canada. In this regard, the Bank notes the striking divergences in the recent pattern of steel uses in Canada and the United States and the United Kingdom. Here, as elsewhere, the forecast is for greater similarity in

¹¹². Ibid., p. 40.

¹¹³. Ibid., pp. 40-1.

the future to the present United States pattern.

Having projected the growth of Canada's iron and steel industry in this way, the Bank checks its results by noting that if Canadian steel production continues to increase at a somewhat faster rate than GNP, then the steel production of the target year will fall within the predicted range. Interestingly enough, the Bank did not allow itself to be swayed by the fact that its second check - namely, with the forecasts made by the steel producers themselves - indicated lower future production than the Bank predicted.¹¹⁴ Which is just as well, for as has already been noted, the Bank was conservative enough already in predicting future GNP.

The Bank concludes its survey of the future by assessing the most likely areas for building the increased steel-making capacity. Its choice is happy: "somewhere on the St. Lawrence close to the Montreal market".¹¹⁵ Long before Becancour was chosen, the Bank had noted that "a large mill there, using Labrador ore and low-freight U.S. coal brought back through the Seaway in returning ore vessels, is, indeed, a quite likely development of the next quarter century."

The Sun Life Assurance Company's study of the automotive industry¹¹⁶ devotes four chapters to the past and the present, the development of the Canadian automotive industry, the demand for motor vehicles, the position of the industry today, and trends in prices and costs - and one to the outlook.

The first method of obtaining estimates of future sales of passenger

114. Ibid., pp. 47-8.

115. Ibid., p. 49.

116. RCCEP, The Canadian Automotive Industry, Study prepared by The Sun Life Assurance Company of Canada (Hull: Queen's Printer, 1956).

cars was basically a residual one of projecting future registrations (vehicle population) on the basis of population over twenty years of age (using the Royal Commission's population projections based on 75,000 per annum net immigration) and ownership or "density" assumptions. "This involves initially a calculation of the penetration sales needed to achieve the density projected, and adding to the result the replacement sales expected on the basis of the likely trend of scrappage".¹¹⁷ The Sun Life forecast that automobile density would not increase in the future as fast as it had between 1945 and 1955. It was considered that the ten-year lag behind the United States in automobile density prevailing in 1955 was shorter than normal and was caused by the distorted "make-up" demand of the post-war period and by the heavy spending in 1954-55. Since the war passenger car density had been increasing in Canada at almost double the United States rate. There is here an obvious reliance on the assumption that there is a normal (though slowly diminishing) lag in Canadian performance behind the United States.

Finding DBS automobile scrappage statistics "incomplete" and "misleading", the Sun Life study recalculated them on an adjusted basis. Even then, the study was not emphatic in its forecasts:

Since between 80% and 90% of new (i.e. first time) ownership is incurred through purchase of used cars, and present cars have vastly more built-in mileage than pre-war cars, it is felt that density may well increase at a greater rate, and scrappage at a somewhat slower rate, than has been assumed by the industry.¹¹⁸

The Sun Life study also forecast new car sales by the method of disposable income - personal expenditure analysis. Estimates of personal

117. Ibid., p. 103.

118. Ibid., p. 105.

expenditures on new passenger cars were obtained from DBS and related to personal disposable income. "Expenditure figures were divided by the average 1954 retail price of automobiles to obtain units purchased by individuals, of which an additional 20% was added to obtain total sales figures",¹¹⁹ because of the DBS estimate that 20% of new car sales is for business purposes. The results "checked-out well with projections made via the density analysis".

The Sun Life study forecast truck production by using generally similar methods as those adopted for passenger cars. The study noted that "the phenomenal growth of Canada's truck population between 1936 and 1954 of 370% has resulted in Canadian truck density today comparable to that of the U.S."¹²⁰ But the study discounts the possibility of a continuation of so high a rate of growth for the result would be "density figures of unrealistic proportions". The Sun Life therefore projects that future truck registrations will increase at a rate of 3% per annum rather than the previous 9%. "Density was calculated in terms of the labour force, believed to be the most useful population aggregate for these purposes, while scrappage assumptions reflecting the low rates of recent years were used".¹²¹

The second method, like that for passenger cars, used a national accounts aggregate but this time it was the correlation of truck sales to GNP that was sought, not to personal disposable income. The Sun Life study again discounted high post-war values, preferring to forecast the trend from the lower and most recent figures, those of 1954 and 1955, when truck

119. Ibid., p. 106.

120. Ibid.

121. Ibid.

sales averaged about 0.80% of GNP. Again, the results obtained by a projection on this basis "compared satisfactorily with estimates obtained by other methods".¹²²

It would be possible at this point to analyze the methods used for projecting output in the remaining 13 industrial sector studies carried out for the Royal Commission. There would seem to be little point in doing so for already in the three sectoral studies reviewed projections have been seen which use past trends (adjusted in the light of foreseeable changes), invariances (income-consumption ratios, disposable income to personal expenditures on cars), and intercountry comparisons (with the United States).

6. Output - Caves and Holton

Output in 1970 is projected by three methods. The first, and simplest is the employment approach and consists: 1) of a projection of the population and of the labour force participation rates; from these are derived the 1970 labour force; and 2) a projection of the increase in labour productivity per man-year to 1970 (separately for agriculture and nonagricultural industries - see page 46 above). The increase in the labour force times the increase in labour productivity per man-year gives the increase in GNP between 1955 and 1970 and, hence, 1970's GNP.

The second method is a sectoral projection and is based on demand (the techniques of projecting demand are discussed below, see pp. 81-92). The simple summation of the four categories of final demand (consumption, investment including inventory change, government, and net foreign balance) results in a 1970 GNP¹²³ less than one per cent greater than the GNP

122. Ibid., p. 107.

123. Caves and Holton, p. 147.

derived by the first method. Caves and Holton have no reason to be concerned about this small difference, nor are they. They are content to point out they may have slightly over-estimated the demand for some consumer goods. They are also right in noting that the close agreement of their two forecasts gives no reason for fearing either demand-pull inflation or secular stagnation.

But the second method consists of more than this, for Caves and Holton wished to use the estimate of GNP based on aggregate demand as a check on their estimate of GNP based on the output of the individual industries or sectors - the third or input-output method.

The authors had recourse to the DBS interindustry table for 1949 which they first condensed to their sixteen-sector version of the economy and then derived the matrix of structural coefficients relating each sector's individual inputs to its total output. From this structural matrix it is possible to "calculate the final demand implied by any total output pattern for the economy".¹²⁴ But since Caves and Holton wished to work in precisely the opposite direction - from an estimate of the level of final demand to the required total outputs - they calculated instead the inverse of the 1949 structural matrix.

Since the authors were interested in the economy of 1970, not of 1949, they had to ask themselves whether the 1949 inverse coefficients could be expected to remain stable over time or whether they would be affected by: "(1) changes in technology; (2) changes in the relative prices of inputs; (3) changes in the scale of production; (4) changes in the commodity composition of a sector's output".¹²⁵

124. Ibid., p. 412.

125. Ibid.

Discussing the fourth source of possible change first, Caves and Holton note that the possibility "has been explored by trying different aggregations on actual interindustry tables and observing their effect on the predictions generated".¹²⁶ Apparently the effect has been small. The other sources of changes can only be assessed by looking at the behaviour of observed coefficients over time. Since Canada had an interindustry table only for the year 1949, Caves and Holton had recourse to the experience in other countries where such statistics have existed for a longer time. Such experience seems to show fair stability of the interindustry coefficients in the long-run although they are subject to short-run variations over the business cycle.

Caves and Holton's next steps are typical of their methods when confronted with gaps in Canadian statistics. They ran "a test on the United States data to discover how much the structural coefficients - the set of figures giving 'dollar's worth of input per dollar's worth of total output' - varied on the average over decade intervals".¹²⁷ They determined that an intelligent forecaster who had made the obvious adjustments to the 1929 interindustry coefficients and then calculated the 1939 total outputs would not have been out more than ten per cent in any major sector.

The authors then forecast changes in the Canadian coefficients to 1970 using three sources of evidence: (1) historic trends in the coefficients of the United States interindustry tables for 1919, 1929 and 1939; (2) differences between the coefficients of the Canadian economy in 1949 and the United States in 1947 to see what structural trends the

¹²⁶. Ibid., p. 413.

¹²⁷. Ibid., p. 414.

latter might suggest will become apparent as the Canadian economy becomes more industrialized; (3) general knowledge about current trends in the relative importance of various intermediate goods - for instance, larger inputs of electricity into agriculture.¹²⁸

All this allowed Caves and Holton to forecast what percentage of total output would be supplied in 1970 by each sector.

This input-output method for projecting output is based on both demand and supply. Starting with agriculture the authors note that "aggregate demand is determined by the number of persons to be supplied, their purchasing power, and their propensity to spend their incomes for farm products".¹²⁹ Because of the availability of adequate Canadian data in this field, Caves and Holton do not have to fall back on United States experience although they accept as confirmation their discovery of consistency between the Canadian and American researches into marginal income elasticity of demand for food.

However, when it comes to projecting the consumption of major farm products, Caves and Holton again revert to reliance on United States evidence. In their view "the great cultural similarities between the two countries" should lead one to "concede the point without resort to a desk calculator".¹³⁰

When sizable differences are found between Canadian and United States experience, Caves and Holton here, as elsewhere, forecast a reduction of the gap. Remarking on the fact that per capita tobacco consumption is higher in the United States, they state that "the difference between Canadian and American rates of consumption seems largely

128. Ibid., p. 415.

129. Ibid., p. 432.

130. Ibid., pp. 435-6. UNIVERSITY OF OTTAWA SCHOOL OF GRADUATE STUDIES

due to income differences, implying a movement of Canadian consumption toward the higher United States figure".¹³¹

Having determined the domestic demand for agricultural products in 1970, the authors now turn to the export demand - not easy of projection because of international competition and comprehensive agricultural programs in both exporting and importing countries. "How long and how earnestly they will combat the principle of comparative advantage is even more difficult to foretell than what will happen to the pattern of comparative advantage itself".¹³²

This said, Caves and Holton make a noble effort to forecast the export market for Canadian wheat. A discussion of the International Wheat Agreement leads on to the normal geographic distribution of Canadian wheat exports; this necessitates "projections of the population and income changes which may control wheat consumption in these countries in 1970;"¹³³ and this must be followed by an appraisal of potential production in these countries. The efficiency of Canadian producers, the special qualities of their products, and the probable export policies of Canada's competitors, especially the United States, all are discussed. Even the possibility of poorer weather in North America in the next decade is noted. About the only aspect not mentioned is the future weather in China and Russia and this, as we now know, was highly important! However, Caves and Holton can hardly be faulted even here for they say that "the prospective import situation for non-European countries is difficult to project."¹³⁴

131. Ibid., p. 444.

132. Ibid., p. 445-6.

133. Ibid., p. 447.

134. Ibid., p. 449.

All this allows Caves and Holton to project the export demand for Canadian wheat in 1970. Coupling this with the domestic demand already calculated leads them to the conclusion that there will be "a market for 474,000,000 bushels of Canadian wheat in 1970".¹³⁵

By similar methods Caves and Holton forecast the 1970 demand for other major Canadian agricultural commodities. Summing this demand they came up with the total demand for agricultural products. They then turn to the supply side with the obvious query as to whether land under cultivation will "have to be expanded to meet these rising requirements for agricultural products".¹³⁶

This raises the question of productivity. In the case of wheat, for example, their conclusion is that the upward trend in yields per acre will continue because of "improved use of fertilizer, crop rotation, and other cultural practices".¹³⁷ Indeed, the higher 1970 requirements can be produced "with one million acres less than were under wheat cultivation in 1955".

Though their conclusion is different, for example, in the case of meat - because of a much larger projected increase in demand, an extra 1,400,000 acres will be needed in 1970 - Caves and Holton point out that "this amount is trivial beside the land now considered suitable for agricultural settlement;"¹³⁸ and they cite estimates to the effect that eastern Canada alone has 14,000,000 acres potentially available for settlement.

135. Ibid.

136. Ibid., p. 453.

137. Ibid., p. 454.

138. Ibid., p. 455.

Because of the deliberate and all-inclusive method of investigation they adopt, Caves and Holton are able to reach all-embracing conclusions: "to meet the 38 per cent increase in farm output required by 1970 there will be about a 15 per cent decline in the number of farms and a decline of some 20 per cent in the farm labour force."¹³⁹

But the authors do not stop there, for their method of detailed analysis allows them "to describe the prospective changes in the character of agricultural production in Canada's four major regions".¹⁴⁰ Inevitably, and properly, this brings them more directly into the field of public policy prescription, for forecasts of regional growth cannot be made without analysis of the causes of differences in the interregional growth rates and without analysis of the federal government's usual policy of attempting to mitigate the differences. This is discussed below on pages 210-212.

The method of regional analysis has another advantage: to provide a check on the results obtained earlier by the broader aggregative methods.¹⁴¹

Caves and Holton's methods of determining Canada's 1970 output of minerals (and of the products of the forests and the seas) are essentially similar to the methods used to determine agricultural output. Since most of Canada's mineral output is sold abroad they note that it depends on:

- 1) the world demand for the individual minerals
- 2) trade and exchange restrictions which may prohibit buyers from importing from the cheapest sources, and
- 3) the cost of production at sources of supply which compete with Canada relative to Canadian production costs.¹⁴²

Relying on their basic assumption that economic activity will remain at a high level in the industrial countries and referring to their

¹³⁹. Ibid., p. 458.

¹⁴⁰. Ibid.

¹⁴¹. Ibid., p. 466.

¹⁴². Ibid., p. 468.

assumption that trade restrictions will be eased slowly, the authors project continued strong general demand for minerals. Turning, then, to the third determinant they summarize their conclusion that especially because of technical knowledge, the availability of capital, and accessibility of her minerals, "Canada will continue to be^a leading mineral producer."¹⁴³

With regard to supply they were able to make extensive use of the report of the U.S. President's Materials Policy Commission¹⁴⁴ suitably adjusted in the light of developments since the report was prepared. The report contains projections of the non-communist world's supply and demand for resources and Caves and Holton examine Canada's share on the supply side to see what factors seem to be shaping this production. "With the country's share estimated for 1970, the domestic disappearance was projected, giving as a residual the amount available for export."¹⁴⁵

In projecting manufacturing output in 1970, Caves and Holton take as given the projections they have already made on population (Chapter IV Table I below), GNP (Chapter IV Table VII below), personal disposable income (page 81 below) and investment (page 86 below).

As they claim, their methodology is straight forward:

In most instances it has been possible to construct time series of domestic disappearance and then examine the historic determinants of that magnitude. Next, export and import levels were studied to see whether the reasons for future changes in the flow of international trade in the product could be clarified.¹⁴⁶

The authors acknowledge their good fortune in being able to check

¹⁴³. Ibid., p. 469.

¹⁴⁴. U.S. President's Materials Policy Commission, Resources for Freedom (Washington: 1952) 5 vols.

¹⁴⁵. Ibid., p. 470.

¹⁴⁶. Ibid., p. 571.

their results against the industry submissions to the Royal Commission on Canada's Economic Prospects which were being presented while Caves and Holton were preparing their projections.

Another step in the input-output method consists in a comparison of the output projections of the industrial sector in 1970 with the sector's output in 1954 to see whether the implied rate of growth was consistent with the authors' earlier retrospective discussion concerning the relative importance of manufacturing in the economy. In the final step the regional distribution of output (and employment) is projected by examining the distribution in earlier years to determine to what degree a westward trend was in evidence and its causes.¹⁴⁷

Caves and Holton grant that it would be ideal to determine the level of output of the service, or tertiary, industries as they did for the primary and secondary industries, that is by examining the determinants of the gross value of output. But available data are too incomplete for this. Therefore the authors turn to the National Accounts, more specifically to the figures for national income originating in the tertiary sector:

The gross value of output of, say, retail trade is the revenue from sales. The income originating in retail trade by contrast is the revenue from sales less all payments to other firms. It consists mainly of the wages paid and net profit received by retail firms and can be thought of as the payment to the labor and capital (including land) engaged in the enterprise.¹⁴⁸

Caves and Holton note that they cannot simply "project each of the individual tertiary industries by projecting each individual industry's share of national income originating"¹⁴⁹ for there is no consistent pattern

¹⁴⁷. Ibid., p. 572.

¹⁴⁸. Ibid., p. 618.

¹⁴⁹. Ibid.

In the historical record of national income originating in tertiary production. They therefore resort to forecasting employment in the tertiary sector. Not only is there a stable relation between services employment and other variables but for the reconciliation of the size of the services sector with their forecasts of the rest of the economy, Caves and Holton "need an employment figure rather than a figure for either gross output or value added".¹⁵⁰

The authors point out that though the share of national income originating in the services is very variable, "a highly stable relation exists between employment in the separate components of the services sector and gross national product."¹⁵¹

As an independent check of the employment-income trend the authors refer to census data in both Canada and the United States which allows them to "calculate ratios between the growth rates of the labor force in various tertiary industries and the growth rate of the total labor force".¹⁵² When this check validated the projections based on the employment-income relation, the authors rested content. When, however, in the case of the "services" segment the employment-income relation called for a growth rate even higher than the census data which forecast a growth rate already about 84 per cent greater than total employment, then Caves and Holton chose the more conservative figure.

The authors examined the history of the British and American inter-industry wage structure and found there confirmation of their projections of the wages in Canada's tertiary sector. Finally they found evidence

150. *Ibid.*, p. 620.

151. *Ibid.*

152. *Ibid.*, p. 621.

supporting their forecast of a slow increase in the tertiary sector's share of total employment in their own forecast of increasing labour force participation rates for women.¹⁵³ (See Chapter IV, Table III, note 3, below).

6. Output - RGHS

Brown analyzes growth by reviewing "the factors which produce output - labour, capital and socio-technical change."¹⁵⁴ Simply stated, he uses a more explicit production function than one which projects increased output on the basis only of increases in labour productivity and employment although, of course, implicit in increases in labour productivity is the part played by capital and socio-technical change.

Brown's assessment of the record reveals the following long-term growth rates per annum: labour input (total man hours), $\frac{3}{4}$ per cent; capital, $2\frac{1}{4}$ per cent; technical progress, 1.7 per cent. By combining these input growth rates into his growth formula Brown derives a rate of growth of 3.2 per cent. This compares with a growth rate of real GNP from 1926 to 1961 of 3.5 per cent. However, as Brown stresses, this rate is neither an optimal nor a ceiling rate. On the basis of empirical evidence which shows the Canadian GDP in the civilian sector growing at a rate in excess of 5 per cent in 5 different years when the economy was not just climbing out of unemployment, Brown assumes "that an optimal growth rate for Canada is of the order of 5 per cent."¹⁵⁵ And this is the growth rate achieved in PR-1 and 2.

In the econometric projections lower growth rates are attained

153. Ibid., p. 630.

154. RGHS, Brown, p. 92.

155. Ibid., p. 93.

because of the heavy unemployment and sharp decline in man-hours of work built into the model by the equations referred to at pages 36 and 48 above. Output is a function of technical progress, total employment, average hours of work per worker per year, and real capital in productive use.¹⁵⁶

6. Output - ECC

John Dawson analyzes the domestic demand for food at both the retail and farm levels as well as the export demand prospects before suggesting that in 1970 there will be "an increase in total demand for Canadian agricultural products of about 20 per cent, or an average annual increase of about 2.5 per cent."¹⁵⁷ He next charts the post-war agricultural production using a three-year moving average and extends the trend line at a somewhat lower rate than the very high 1961-63 average. Thus production in 1970 is projected to increase about 20 per cent over the 1961-63 average,¹⁵⁸ which ensures a balance between production and demand.

While he accepts Dawson's calculation of agricultural employment at potential output in 1970 (see page 40 above) it appears that Drabble does not accept his projection of the growth of agricultural supply and demand. By using the concept of "normal" output (that is, output that does not assume an optimum combination of chance factors), Drabble fits "a straight-line logarithmic trend to a seven-year moving average of actual farm output in the post-war period."¹⁵⁹ By this method Drabble calculates that the growth of potential agricultural output from 1946 to 1956 and from 1956 to 1963 was 1.5 per cent per annum and that the same

¹⁵⁶. Ibid., p. 148.

¹⁵⁷. ECC, Staff Study No. 11, p. 7.

¹⁵⁸. Ibid., p. 9.

¹⁵⁹. ECC, Staff Study No. 2, p. 17.

rate of growth will apply from 1963 to 1970.¹⁶⁰

As already noted, Dawson projects a rate of increase of about 2.5 per cent from 1963 to 1970. In addition, he states agricultural production increased at an annual rate of about 2 per cent between the early post-war years and 1963. This discrepancy between Drabble and Dawson is not explained, although Drabble refers to the latter's study. The reason cannot lie in Dawson talking of actual production while Dawson talks of potential for, in fact, since the war the average of the actual production is identical to the potential. Since Drabble's study of output also deals with the other sectors while Dawson's does not, Drabble's rate of increase agricultural production will be used hence forth.

As noted on page 41, output in the public sector, in Drabble's projection, does not hinge on employment and productivity but rather employment is derived from output and productivity. To obtain his 1970 estimates of output in the public sector, Drabble makes projections of the two component groups, public administration and community services, adjusted "in the light of independent studies of the demand for public services at potential."¹⁶¹ Stating "the figures finally adopted were consistent with the demand estimates postulated in the First Annual Review", Drabble projects an annual increase in potential output in the public sector from 1963 to 1970 of 4.3 per cent,¹⁶² while the Review projects an annual increase of 5 per cent. This, however, does not indicate an inconsistency. The Review states what the rate of growth must be to attain potential output by 1970; Drabble is stating what the rate of

160. Ibid., p. 45.

161. Ibid., p. 21.

162. Ibid., p. 45.

growth should be if the economy had been at potential in 1963. In 1963, however, the output gap was 6 per cent.

The method used by the Review to obtain the required "rate of change in the government sector is based upon a review of expenditure by all levels of government, using a functional classification as a framework for analysis"¹⁶³ - functional categories such as defence, education, and social welfare.

For the estimate of the potential output of the commercial non-agricultural sector Drabble adopts the method favoured by most of the other forecasters. The estimate is derived as the product of "the man-hours of paid workers at potential and the potential man-hour productivity of paid workers."¹⁶⁴ Had the economy been on its potential growth path in 1963, output of the commercial nonagricultural sector would have had to grow at a rate of 4.9 per cent per annum to remain on its potential growth path to 1970, while total output of the economy would have had to grow at a 4.6 per cent rate.¹⁶⁵

However, for the economy to grow from its actual rate in 1963 to its potential in 1970 the rate of growth of the commercial non-agricultural sector¹⁶⁶ will have to be 6.1 per cent per annum while total output will have to grow at a 5.5 per cent rate.

7. Allocation of Output - RCCEP

(a) Consumer Spending

David W. Slater's method of predicting the aggregate expenditure

¹⁶³. ECC, First Annual Review, p. 113.

¹⁶⁴. ECC, Staff Study No. 2, p. 31.

¹⁶⁵. Ibid., p. 45.

¹⁶⁶. ECC, First Annual Review, p. 48.

on consumption once GNP has been independently forecast is divided into two steps: "first, estimating the personal disposable income and second, forecasting the relationships of consumer expenditure to disposable income."¹⁶⁷

Slater notes that between 1953 and 1955 the deductions from the income stream as net revenue of governments and for gross business saving averaged 31.6 per cent of GNP. He predicts that this relationship will continue into the future and "thus personal disposable income will amount to about 68.4% of GNE."¹⁶⁸ Yet he considers that this ratio may fall a little between 1955 and 1965, thereafter returning gradually by 1980 to the 1955-65 level.

To arrive at this prediction he examines the trend of net government revenue at all levels (that is, gross government revenue less transfer payments, subsidies and interest on the national debt) and notes that it has risen from 11.2 per cent in 1928 to 18.1 per cent in 1955 - in large measure because of defence expenditures. Expecting these expenditures (which include public social capital investments) to account for a smaller proportion of GNP in the future while non-defence spending would account for a slightly higher proportion, Slater predicts net government revenue will slowly decline to 16.9 per cent of GNP in 1970.

Slater also examines gross business saving - depreciation and undistributed corporate profits. He examines the historical record of the trends of these two components, referring to the work of Hood and Scott who, by examining past trends and projecting depreciation into the future, have forecast "that depreciation allowances as a proportion of GNE will

167. RCCEP, Consumption Expenditures in Canada. Study by David W. Slater (Ottawa: Queen's Printer, 1957), p. 50.

168. Ibid.

increase fairly rapidly between 1955 and 1965 and will then gradually fall".¹⁶⁹ It is mainly for this reason that he expects the ratio of personal disposable income to GNE to fall between 1955 and 1965. Because government revenue from corporation taxes rises as GNP rises, Slater considers it unlikely that the rates of corporation income tax would be raised. On the other hand since he expects the corporate sector to grow somewhat relative to the total economy, Slater concludes "that the undistributed profits would be expected to increase a little more rapidly than G.N.E. in the future."¹⁷⁰

Slater's next step is to decide on "the future relationship between consumption and disposable income".¹⁷¹ He reviews first the historical record in Canada, the United States, The United Kingdom and some other countries and concludes that there is "a strong tendency for a constant (though differing as between countries) proportion of consumption to income."¹⁷² However, he points out that this historical constancy, this invariance, could be the result of offsetting forces which may be different in the future, thus changing the future consumption - income ratio. This consideration leads him to an examination of these forces or factors.

Starting with subjective factors, that is, with psychological attitudes, Slater reasons that the current prosperity should tend to give people less reason to save for a rainy day. Turning to the objective factors he starts with the stimulus to the aggregate consumption ratio caused by increasing urbanization and gives it as his opinion that with a slower rate of decline in farm population, this stimulus will be less

169. Ibid., p. 55.

170. Ibid.

171. Ibid., p. 57.

172. Ibid., p. 58.

pronounced in the future. Increasing family size, however, will have an opposite effect as will the trend towards more comprehensive social security measures and towards the equalization of the distribution of incomes. Lessened assistance from family and friends will be more than offset by increasing private and public insurance and pension arrangements.

On the other hand, the changing population age structure, changes in the rates of interest, in the ratio of non-human wealth to income and the relative decline of non-farm unincorporated business, all these, according to Slater, are either indeterminate in their influence or appear to have had little influence on the consumption ratio in the past, and are unlikely to have significant influence in the future."¹⁷³

Slater finally concludes that "long-run consumption - disposable income will be unchanged from present levels, i.e. about 94% of personal disposable income".¹⁷⁴

With regard to forecasting the distribution of consumer expenditure among the major groups of commodities, Slater summarizes his method in the form of a series of questions:

We ask first, what have been the past trends? Next, what have been the circumstances underlying or conditioning these trends? Third, in what ways are future circumstances expected to be different from those in the past and how are these changes expected to alter the trends? Finally, judgments are expressed about the prospects.¹⁷⁵

Emphasizing that even the most sophisticated work on analysis and forecasting of consumer demand has its limitations, while his own procedures are of the less sophisticated type, Slater states that his "judgments must

173. Ibid., p. 65.

174. Ibid.

175. Ibid., p. 72.

be treated quite frankly as a rough exploratory view of prospects".¹⁷⁶

7. (b) Investment (housing, business (including private social capital), government social capital)

The method used by Hood and Scott to forecast industrial investment (new non-residential construction and new machinery and equipment) requires a prior forecast of the capital-output ratio for industry.

First, however, the authors determine the present gross stock of capital held by industry by their cumulation method which is based on "annual investment expenditure figures and estimates of the service lives of the assets that are used by the various industries".¹⁷⁷ To obtain estimates of these service lives, the authors use the division of investment expenditure into two categories, construction, and machinery and equipment, that is kept up to date by DBS.¹⁷⁸ They then examine the effective life of assets in detail by industry, noting, for example that in the steel industry it "is shortening rather than lengthening, because of technological progress".¹⁷⁹

The capital-output "ratio for industry has as its numerator the gross stock held by industry ... and as its denominator the Gross Domestic Product (GDP) at factor cost of industry. It can also be considered as the sum of the construction-output ratio and the ratio of machinery-and-equip-

176. Ibid.

177. RCCEP, Hood and Scott, p. 234.

178. Ibid., p. 237.

179. Ibid., p. 240.

ment to output".¹⁸⁰

Hood and Scott tabulate the record of the ratio of the gross stock to GDP at factor cost from 1926 to 1955. The overall decline is clearly apparent. Moreover, the structures to GDP ratio since the second world war also shows a moderate decline, while, on the other hand, the machinery and equipment to GDP ratio shows a pronounced and consistent rise. The authors predict a continuation of these two trends, one falling slowly, the other rising more rapidly, into the future.

Before reaching this conclusion, however, Hood and Scott examine the effect of future shifts in output on the machinery and equipment ratio. They start with an examination of the percentage distribution in 1946 and 1955 of the gross stock of machinery and equipment between the following six sectors: agriculture; resource industries; primary manufacturing; secondary manufacturing; transport, storage and communication; and trade, services, and construction.¹⁸¹

Basing themselves to a large extent on the Royal Commission's companion studies as well as on experience elsewhere, especially in the United States, Hood and Scott find strong evidence for reaching the conclusion already noted, namely "a pronounced increase in the (machinery and equipment) ratio for every sector and in the overall ratio".¹⁸²

With regard to the aggregate fixed gross capital-output ratio they predict a very slow rise so that by 1970 it will stand at 2.638¹⁸³ (whereas from 1945 to 1955 it averaged 2.340).

180. Ibid., p. 284.

181. Ibid., p. 292.

182. Ibid., p. 298.

183. Ibid., p. 285.

Industrial investment is, finally, now forecast by the following steps:

1. Forecast of GDP for industry in 1949 dollars at factor cost.
2. Forecast of the capital-output ratio for construction.
3. Forecast of replacement needs.
4. Capital gross stock equals 1 x 2.
5. Increase in gross stock.
6. Investment forecast equals 5 x 3.¹⁸⁴

The projection of the housing and private and government social capital side of investment is covered in a separate Royal Commission study by Yves Dubé, J. E. Howes and D. L. McQueen, who start by noting that

There are two great difficulties with any projection based on past expenditure. The first is that information on social capital investment prior to 1951 is not available in much detail. The second is that for the last 25 years spending on housing and social capital has been carried out under a succession of extraordinary circumstances.¹⁸⁵

Therefore, the authors base their collection of methods as far as possible on the population growth projections of Hood and Scott, and on need. Dubé, Howes and McQueen stress that the use of "need" as a criterion excludes considerations of finance. The assumption is that between 1955 and 1980 Canada will be able to afford all the housing and social capital it needs, including the making good of backlogs, in accordance with a "reasonable standard".

Their method appears in its purest form in the projection of investment in hospitals:

A physical standard is established - the average number of hospital beds which, in the opinion of competent persons consulted, should

184. Ibid., pp. 299-300.

185. RCCEP, Housing and Social Capital. Study by Yves Dubé, J. E. Howes and D. L. McQueen (Ottawa: Queen's Printer, 1957), p. 32.

be provided for each 1,000 of population. The number of beds that would be required adequately to serve the expected population of 1980 is then calculated, and the existing "bed-stock" subtracted. The resulting figure is then multiplied by an estimate of the average cost of new hospitals per bed to yield a forecast of investment in hospitals over the 25-year period.¹⁸⁶

The method of projection of housing and elementary school requirements is similar except that a derivative of the overall population forecast is used: "a forecast of family and non-family households in the case of housing, and a forecast of school-age population in that of schools".¹⁸⁷

With regard to secondary school requirements the authors have recourse to trends, while taking account of such factors as population shifts away from rural areas, school consolidation, reduction of crowding, and reconstruction and replacement. Projection of university requirements is also based on past trends: an assumption is made "as to what enrolment is likely to be as a proportion of the university age-groups by 1980".¹⁸⁸ And it is noted that this proportion has been rising: in 1920-21 it was 3.9 per cent; in 1954-55, 7.5 per cent.

Construction of roads and streets could not be projected with the population-needs method. Three other methods are used. The first is based on construction estimates made by governments at all levels. The second "is based on actual construction expenditure since the Second World War and on the forecast rise in vehicle traffic".¹⁸⁹ In this method past annual construction expenditure per vehicle is multiplied by the projected

186. Ibid.

187. Ibid., p. 13.

188. Ibid., p. 83.

189. Ibid., p. 118.

vehicle registrations. The third projection is based on a projection of total annual vehicle-miles together with a "needs" factor which takes account of backlog and of replacement.

The construction of miscellaneous government buildings and installations were projected on the basis of past expenditure. No practicable alternative existed.¹⁹⁰

Because much social capital requirements are the result of urbanization, Dubé, Howes and McQueen devote a chapter to this to see what trends they can discover in this major and continuing population shift. Their method of projection of urban social capital requirements is implicit in their premise:

Broadly speaking, and without implying that the relationship between size and per capita cost is necessarily a smoothly ascending one, one may venture to say that the more the increase in population accrues to the large metropolitan areas, the more expensive it is likely to be to provide the necessary increase in capital.¹⁹¹

7. (c) Government Spending

The Royal Commission does not spend much time estimating future government expenditures. As noted above on page 73, Slater bases his forecast on the trend of government expenditures. Hood and Scott also review the recent past and, foreseeing no major new expenditures and no fundamental change in government philosophy, predict "a rise in the ratio to GNE of government current nondefence expenditure above its value in the 1950's but not above values it has attained in peacetime years of fairly full employment".¹⁹² They also predict a moderate decline in defence expenditures as a proportion of GNE.

190. Ibid., p. 13.

191. Ibid., p. 17.

192. RCCEP, Hood and Scott, p. 320.

In short, the Royal Commission foresees an end to the trend of government expenditures rising as a proportion of GNE.

7. (d) Savings

Hood and Scott examine the savings record by categories back to 1927 and then summarize the recent past: "on the average from 1953 to 1955, personal saving accounted for about one-fifth and business saving for one-half of total saving, while government saving made up one-fifth and the inflow of capital associated with the deficit in the current account of the balance of payments amounted to nearly one-tenth."¹⁹³

Although no clear trend can be seen in the record, Hood and Scott express the belief that by 1980 business saving may be as much as 63 per cent of the total of all savings because of the increase in depreciation allowances arising "from the greater importance of machinery and equipment relative to structures in the stock of capital".¹⁹⁴

Savings as a proportion of GNE are estimated by Slater (see above pages 72-76). Hood and Scott refer to Slater's work and project that in the future gross national saving will be equal to gross investment - they assume that both the capital and current accounts of Canada's international transactions will be independently in balance.

7. Allocation of Output - Caves and Holton

(a) Consumer Spending

Caves and Holton lead off their chapter on personal consumption expenditures by describing what they term a simple approach to forecasting changes in such expenditures:

Estimate the consumption function, relating the total volume of consumer expenditure to personal disposable income and whatever other variables are deemed relevant. Secure forecasts of these

193. Ibid., p. 325.

194. Ibid., p. 326.

independent variables determining total consumption, and figure the volume of consumer expenditures they imply for the date of the forecast. Calculate income elasticities of consumer expenditure on any desired set of classes of consumer goods and services. Using the income forecast for the target year, figure the consumer expenditures implied by the income elasticities for each class of goods and services at such an income level. Check the total of these consumption categories against total consumption estimated from the consumption function; they may not agree for a variety of reasons. Eliminate any disagreement between them by altering the estimates of particular classes of consumption expenditure until their total agrees with forecast total consumption.¹⁹⁵

This is the starting point of their method. Since there were few budget studies available in Canada, Caves and Holton use time series as a basis for computing income elasticities. However, they also calculate elasticities from cross-sectional data to use as a check on the former set.¹⁹⁶

The forecasting model used "assumes that consumers in the aggregate have stable preference patterns which have historically determined the total amount and pattern of personal consumption expenditures in connection with the level of disposable income and random variables."¹⁹⁷

The authors note that changing relative prices, changing income distribution and changing consumer tastes can all invalidate this assumption of stable preference patterns. Caves and Holton stress the effect on income distribution of the changing age distribution of Canada's population. It is precisely the two age groups with the lowest rate of saving - those between 18 - 24 and those over 65 - which will increase in the next decade relative to the rest. But this is no problem for "insofar as we know how age changes affect consumption this can be taken into account

195. Caves and Holton, p. 307.

196. Ibid., p. 309.

197. Ibid.

in setting our forecasts."¹⁹⁸

While admitting that changing consumer tastes at first sight appears to be the worst threat to the consumption forecasting model, the authors' conclusion is sanguine:

If average rates of innovation in different sorts of consumption goods persist into the future, if the prestige commodities of the past remain the prestige commodities of the next decade, if the rates of change of consumption patterns in the past have enough momentum not to be altered violently before 1970, forecasting the future size and distribution of consumption on the basis of past trends seems not to be an especially risky venture.¹⁹⁹

Caves and Holton are impressed by published research which "clearly shows that the strongest force determining any year's personal consumption expenditures is current personal disposable income."²⁰⁰ They note regretfully that information on long-run changes in the Canadian consumption-income relationship do not go back beyond the period of good national income estimates, 1926 on. Therefore they use this more recent data "plus whatever can be inferred from the superior long-run consumption and saving data for the United States"²⁰¹ - their usual procedure when faced with a blank.

From this examination, they conclude that the consumption-income ratio of the next fifteen years will differ little "from that prevailing in the more normal years of the last few decades".²⁰²

These considerations lead them to the method finally adopted:

The order of march was first to establish upper and lower limits on total personal consumption, then to calculate the consumption total implied by use of income elasticity forecasts of separate expenditure categories (it falls between these limits). Finally, some qualitative adjustments were made in gingerly fashion to take account of certain ways in which we expect future consumption

198. Ibid., p. 312.

199. Ibid., p. 314.

200. Ibid.

201. Ibid., p. 318.

202. Ibid., p. 319.

patterns to deviate from an extrapolation of past experience.²⁰³

Caves and Holton use a short-run consumption function based on 1926-55 experience and the personal disposable income implied by their "best-guess" GNP estimate to arrive at their first estimate of 1970 consumption. Accepting this as a lower boundary, they fix a "comparable upper boundary by figuring the average propensity to consume for peace-time full-employment years"²⁰⁴ since 1926. This results in a figure a little less than three per cent higher than the lower boundary figure. The range is not great and tends to increase confidence in the projection. When Caves and Holton calculate "a consumption function based only on the prosperous peace-time years of the 1926-55 period, thereby deriving the trend of the normal average propensity to consume rather than its mean value",²⁰⁵ they come up with a figure only a little less than two per cent higher than the lower boundary figure. The range is even smaller.

The authors now derive personal consumption in 1970 by the alternative disaggregative method of estimating particular categories of personal consumption expenditures. Time series were available for their eight major categories of consumption although these could not be projected without modification for not only are changes occurring in product composition by various types of retail outlets (and the time series are based precisely on retail sales by types of outlets) but also much of the total consumer expenditures has been included in ill-defined categories. Not for the first time Caves and Holton have recourse to United States research, this time to the Twentieth Century Fund's America's Needs and

203. Ibid., pp. 322-3.

204. Ibid., p. 323.

205. Ibid.

Resources to help them unravel the Canadian data.²⁰⁶

Caves and Holton regressed the thirty-four available consumption time series on personal disposable income in six different ways:

- (1) undeflated; (2) undeflated, 1942-45 excluded; (3) deflated to 1952 prices; (4) deflated to 1952 prices, 1942-45 excluded; (5) deflated per capita; (6) deflated per capita, 1942-45 excluded.²⁰⁷

The authors settled on the use of the deflated series because of the ambiguity of projecting an undeflated series. They end up with a 1970 consumption forecast obtained by applying each regression equation to their forecast 1970 personal disposable income figure. This consumption forecast turns out to be nicely mid-way between the lower and upper boundary just discussed.

The authors stress that their latest forecast is not simply a mechanical projection of the 1926-55 trends, for they have taken account of the previously mentioned changes in the age structure of the population as well as of the most significant changes in the trends in the post-war period. Thus they make upward adjustments for "shelter, transportation, the miscellaneous group, and (very slightly) household operations".²⁰⁸

Caves and Holton check their percentage distribution forecast for 1970 consumption against the long-run (back to 1900) data that are available. They also make a check on their income elasticities "by comparing them with income elasticities derived from cross-sectional data"²⁰⁹ provided by a 1953 DBS survey. In both cases Caves and Holton find support

206. Ibid., pp. 324-5.

207. Ibid., p. 325.

208. Ibid.

209. Ibid., p. 326.

for their consumption forecast based on time-series data.

Finally, the authors rearrange their consumption estimates in the form of a classification of consumer demand according to sectors of the interindustry table.²¹⁰ This involves the estimation of imports (see page 116) entering directly into consumption in 1970 which then have to be subtracted from the interindustry consumption totals. Apart from this, no new estimate is involved for the personal consumption figure derived by this method is identical to the one derived by expenditure category.

7. (b) Investment (housing, business (including private social capital), government social capital)

Caves and Holton forecast total investment in 1970 by two methods. The first is concerned with the capital required to produce the expected future output and involves an examination of the way the capital-output ratio has behaved in the past to see whether it has been sufficiently systematic that a trend may be detected. If a trend is found, the future value of the capital-output ratio may be projected.

Because, however, of the difficulty of measuring a nation's total capital stock, this first method is concerned with examining "over a period of several years the increase in net national product and the increase in capital stock (which is identical with the total amount of net investment) associated with it".²¹¹ Thus is found the marginal capital output ratio (MKOR). Multiplying it by the already forecast increase in output for the target year gives one the investment required in that year.

After examining the historical record of the capital-output ratio in Canada; after assessing the factors which, on balance, tend to be

210. Ibid., p. 329.

211. Ibid., p. 331.

causing its slight decline; and, finally, after comparing the value of the capital-output ratio thus derived with its currently a little lower value in the United States - to be expected because of the relatively great importance in Canada of such capital-intensive industries as agriculture, construction, and transportation - Caves and Holton conclude the "capital-output ratio in 1970 would be 3.35, compared to 3.41 for the years 1951-55".²¹² Both figures "include the accumulation of inventories historically associated with output increases".

Using this ratio Caves and Holton make a tentative projection of total investment. From the 1970 GNP already projected they deduct estimated depreciation to derive net national product (NNP). Knowing the rate of increase of NNP (derived from the rate of increase already projected of GNP), they are able to project the amount by which NNP will be increasing in 1970. Multiplying this by the marginal capital output ratio of 3.35 gives net investment. Adding estimated depreciation gives gross business capital formation (to which is finally added government investment to give total national investment).

The second method is both less specific and more flexible and involves seeking statistical correlations between investment components and other economic data on the assumption that a high correlation exposes a crucial factor which people somehow consider when they decide to undertake a particular sort of investment.²¹³

In this way Caves and Holton seek to explain residential construction, inventory accumulation, machinery and equipment, and nonresidential construction.

Taking into account the recent heavy residential construction in Canada and the current decline in family formation (because of the depressed

²¹². Ibid., p. 343.

²¹³. Ibid.

baby crop of the 30's) Caves and Holton foresee five to seven years of slackening off of house construction until about 1962. After this date depreciation of old housing and the coming to family formation age of the wartime babies will start another construction cycle which will probably reach its peak in 1971. The authors' 1970 prediction for residential construction is increased slightly over the figure derived from residential construction's relation to GNP and the rate of population growth.²¹⁴

Caves and Holton note that inventory accumulation is another investment component whose long-run determinants seem fairly clear. Predicting that this accumulation will continue its decline as a proportion of GNP as Canada continues the filling-up process, they set its 1970 ratio at 1.77 per cent (down from 1.8 per cent).

Since investment in machinery and equipment has shown an extremely close and constant relation to GNP in "normal years", Caves and Holton waste no time in predicting no change for 1970.

Estimation of 1970's non-residential construction was not so easy. The authors computed "the average ratio in the past five years of investment in machinery and equipment to total gross investment"²¹⁵ for each of the sectors into which they divide the economy. Since they found no clear likelihood of change in the historic trends and since, moreover, they have already forecast the building cycle will again be nearing its peak in 1970, they make the "absolutely crucial assumption" that the ratios will be the same in 1970. They then distribute by simple arithmetic

214. Ibid., p. 346.

215. Ibid., p. 349.

the forecast of machinery and equipment investment among the economy's sectors. "If the assumption of constant ratios is correct, then in 1970 investment in machinery and equipment will be 39 per cent of the total of this category plus total investment in construction".²¹⁶ The authors then distribute this total by sectors in accordance with the study on output and technology trends that they have made for these sectors. Subtracting total machinery and equipment investment and previously forecast residential housing from total investment gives total private non-residential construction. When government construction is added (see page 91), total nonresidential construction is derived. It should be noted that this government construction is equivalent to government social capital or investment although the DBS National Accounts include it under government expenditures.

Their second method of forecasting 1970 investment completed, Caves and Holton finish with a breakdown of investment by interindustry sector. This does not involve a new forecast or a new method but simply a rearrangement. And it is a simple one at that because in their "highly aggregated interindustry table almost all investment expenditures go to four sectors - construction, metal products, electrical apparatus and supplies, and imports".²¹⁷

7. (c) Government Spending

In the opinion of Caves and Holton expenditures by all levels of government are projected with the smallest margin of error by linking government expenditures to GNP. They note that since 1952 ordinary government expenditures have been almost exactly 26 per cent of GNP except

216. Ibid.

217. Ibid., p. 353.

in the recession year 1954. (Defence expenditures, by their definition, become extraordinary when they exceed their 1952 level of \$1.5 billion in 1952 dollars. Included in government expenditures are government social capital or investments, and transfer payments.) Assuming no major changes in governmental functions at any level and a balanced federal budget, the authors deem it "unlikely that by 1970 public finance will absorb over 26 to 27 per cent of GNP".²¹⁸ However, because of increasing urbanization, greater emphasis on social services, and a continuation of the trend of the federal government putting more funds at the disposal of the provinces, Caves and Holton predict either "stability or even a slight decline in the ratio of the federal budget to all public finance".²¹⁹

Having set the upper limit, Caves and Holton now project public finance at the three levels of government and by major category within each level. For some reason, which they do not explain, their medium projection of defence expenditures is not set at \$2 billion (1952 dollars) whereas, as mentioned above, they had agreed to call any defence expenditures over \$1.5 billion "extraordinary". However, even a \$2 billion (1952 dollars) defence budget in 1970 represents a sharp reduction from the proportion of GNP spent on defence in 1954. Caves and Holton assume we will be a little farther from the verge of war in 1970.

The authors' predictions of the other categories of government spending is by their usual straightforward method of projecting past trends as modified whenever future significant changes appear on the horizon. Their detailed analysis leads them to conclude that there will be "a

218. Ibid., p. 364.

219. Ibid., p. 365.

slight relative reduction in government purchasing power to perhaps 23.5 per cent of GNP".²²⁰

Caves and Holton end their chapter with an allocation of government purchases of goods and services classified by the sectors of their inter-industry table. To do this they first netted out of total 1949 government expenditure all items not consisting directly of purchases of currently produced goods and services. Then the percentage which purchases of goods and services constituted of total expenditure was computed for each functional category of expenditure. Third, the percentages were applied to the functional estimates of 1970 total government expenditures, which they had made by the method just described. Adjustments were made where changes in the character of expenditures were foreseen - for example, more administrative services required by health and welfare in 1970 than in 1949 because of expanded health services. All prices were converted to 1955 values. Finally, "the percentage distribution by function of government purchases of goods and services for 1949 and 1970 were compared to see how they would alter the total pattern of government purchasing".²²¹

Having made the necessary largely qualitative judgments on the basis of these forecast changes, the 1970 government demand for goods and services was finally estimated. For that part of government expenditures falling into the category of construction we call government social capital or investment, see page 89.

7. (d) Savings

Caves and Holton make no specific projection of the supply of savings in Canada. As is shown on page 115, they predict that Canada

220. Ibid.

221. Ibid., pp. 384-5.

will not then be short of domestic savings so that recourse must be had to foreign capital. Part of the reason for this sanguine approach stems from their survey of the immediate past: "From the beginning of 1955 to the beginning of 1957, the Canadian banking system expanded its general loans ... by nearly 50 per cent".²²² Of course, Canada was also importing much foreign capital during this period but, as pointed out on page 115 Caves and Holton regard this as a temporary self-liquidating phenomenon caused by Canada's need of much foreign machinery and equipment during an investment boom.

7. Allocation of Output - RCHS

(a) Consumer Spending

Continuing his method, essential to an econometric model, of searching for invariances, of fixed relationships between variables, Brown summarizes the record back to 1926 of the percentage allocation of total Canadian output among major categories of final demand. Defining national consumption to include both consumer spending and all government spending less public investment, he concludes that

In the past there has been a tendency for us to save 24 per cent of GNP and consume 76 per cent on national consumption and defence when at high employment and not in major war. For Projections 1 and 2, however, it was decided to assume a national savings percentage of only 21 per cent, at 4 per cent unemployment. The reasoning behind this assumption was that, although our natural desired rate of saving might still be 24 per cent or more, as we become a richer and more mature economy our investment opportunities may fall to 21 per cent, barring major innovations. To maintain high level employment under these conditions government policy would have to reduce desired national saving S_{no} to 21 per cent.²²³

Turning to consumer spending proper, Brown notes in the post-war

222. Ibid., p. 93.

223. RCHS, Brown, p. 100.

period "a clear downward trend in the proportion allocated to non-durables, and an upward trend in the proportions allocated to durables and to services".²²⁴ He projects these trends graphically.

In PR-1 and 2 Brown projects consumer spending to increase at an annual rate of $4\frac{1}{2}$ per cent. Though noting that this would be a higher rate of growth than that experienced in past periods, he considers it "can be rationalized by the higher population growth rate in the projection plus the high employment assumption".²²⁵ This brings out an essential point in the use of invariances: past relationships must not be blindly projected into the future; account must be taken of all factors likely to influence future trends.

In econometric projection PR-3F consumer spending grows at only a 3 per cent rate, partly because of the high level of unemployment and partly because the share of GNP allotted to private investment grows. This in turn was the result in part of steady growth, "and partly because the investment equation seemed to generate too much demand".²²⁶

In PR-3G consumption at first declines as a proportion of GNP but eventually (after 1970) recovers and then exceeds its initial share. Again, this is caused by the values Brown allots the parameters of his equations rather than because he really predicts the economy will behave in this way: "in our search for structural adjustments and policies which would take the economy along a high employment growth path, we have inadvertently reduced the saving ratio slightly".²²⁷

224. Ibid., p. 101.

225. Ibid., p. 112.

226. Ibid., p. 171.

227. Ibid., p. 181.

7. (b) Investment (housing, business (including private social capital), government social capital)

Brown examines both the trends in private and public investments separately as percentages of GNE and their growth rates since 1926. While growth of public investment has accelerated in the post-war period, private investment's rate of growth has lagged since 1957.²²⁸

In PR-1 public investment is found as a remainder; that is, it is equal to total government spending less government consumption and defence expenditures. It grows at an annual rate of $6 \frac{1}{3}$ per cent. Private investment (including both housing and business) is also found as a residual. Since there is no foreign sector in PR-1 (or, alternatively expressed, exports are equal to imports and both current and capital accounts are independently in balance), private investment is equal to private savings which in turn are equal to national savings less public investment.²²⁹

In PR-2 public investment is again found as a residual in the same way. But despite public investment being found as a residual, Brown has still ensured that built into the equations which determine the other variables is a residual sufficient to allow public investment to grow at the same high yearly rate as in PR-1 of $6 \frac{1}{3}$ per cent. Brown considers this speed-up appropriate to handle the increased level of services demanded of government, to make up for deficiencies in social capital, and to help achieve full employment on a high growth path.²³⁰

Private investment, too, is still found as a residual but is no longer equal to national savings because, with the foreign sector now

228. Ibid., pp. 102-3.

229. Ibid., pp. 113 and 121.

230. Ibid., p. 128.

included in the model, capital inflows permit national investment to exceed national savings. Therefore, private investment is equal to national savings plus capital inflows and less public investment. Built into the projection is the post-1957 trend of a lagging rate of growth of private investment. Its yearly rate is only $3\frac{3}{4}$ per cent.

Here, for the first time, Brown divides private investment into its three categories of residential construction (or housing), non-residential construction, and machinery and equipment. Brown predicts that their rates of growth may differ slightly reflecting "the possibility that the wealthy society may choose to put a little more resources into dwellings, and that plant and construction may become of less relative value than the increasingly complex machinery which it houses".²³¹

In the econometric projections public investment is a function of employment and the change in all government expenditures less public investment and defence expenditures.²³² Also, as in all Brown's equations, there is a random or stochastic component representing the aggregate effects of minor omitted variables.

In PR-3F this public investment equation results in a low rate of growth - only 3.7 per cent per annum.²³³ This, of course, does not coincide with Brown's assessment of future trends (see page 94 above), but is due to the heavy unemployment and slow rate of growth of consumption both public and private.²³⁴

However, as already mentioned on page 93 above private invest-

231. Ibid., p. 129.

232. Ibid., p. 147.

233. Ibid., p. 168.

234. Ibid., p. 171.

ment grows more than in proportion to GNP: its annual rate of growth is 5.2 per cent.²³⁵ The private investment equation is a function of gross property-enterprise income, change in GDP, total national stock (private and government) of fixed capital, real value of liquid asset holdings of business firms and institutions, the real hourly wage rate and private investment itself of the previous period.²³⁶

As stated on page 48²³⁷ above PR-3C's function is to correct the structural defects in the econometric model which were revealed in the free-running PR-3F. To reduce the vigour of the private investment function, for it had been growing faster than practically anything else, Brown decided to add cumulative negative amounts to the constant term of the equation,²³⁷ that is, to the random or stochastic component. This slowed annual growth in private investment to 2.5 per cent,²³⁸ quite a bit less than the growth rate of GNP, 4.054 per cent.

Despite the low growth rate of public investment, 3.7 per cent, Brown did nothing to increase it "because the investment equation of the private sector was already too strong, and required structural adjustment to restrain it".²³⁹

7. (c) Government Spending

Brown summarizes the record back to 1926 of defence or military spending by government as a percentage of GNE and of government spending (less public investment and military spending) both as a percentage of GNE

²³⁵. Ibid., p. 169.

²³⁶. Ibid., p. 147.

²³⁷. Ibid., p. 173.

²³⁸. Ibid., p. 178.

²³⁹. Ibid., p. 174.

and with regard to annual rates of growth. He concludes that military spending will remain at its 1961 proportion of 4 per cent of GNE (although in a footnote he notes that "the ratio has fallen below 4 per cent in 1964"),²⁴⁰ while the remainder of government spending will "rise gently to 13 per cent of GNP in 1991".²⁴¹

In PR-1 Brown simply projects the annual rate of growth of total government expenditures (including military expenditures and public investment) to be equal to its "long-range growth rate in the past, 1926-61"; that is, $5\frac{1}{2}$ per cent a year. Since military expenditures remain a constant proportion of GNP (4 per cent), their rate of growth is equal to GNP's yearly rate of growth; that is to 5.4 per cent. Also since, as stated on page 94 public investment grows at $6\frac{1}{3}$ per cent a year, it follows that government expenditures less public investment but including military expenditures is projected to grow at a rate just slightly higher than GNP, that is between 5.4 and 5.5 per cent per annum. This is also the rate of growth derived in PR-2.²⁴²

In Brown's econometric projections, government consumption (that is, total government spending less that for military needs and public social capital) is a function of GDP values 1927-1941, 1946-1953, and 1954-1961, with particular emphasis being given to the trend of the years 1954-1961, for beginning in 1954 "graphical analysis indicated a change in the relationship of government consumption to GDP."²⁴³

In PR-3F, because of the increasing share going to private investment, this method results in a decrease between 1961 and 1970 of government

240. Ibid., p. 99.

241. Ibid., p. 101.

242. Ibid., p. 127.

243. Ibid., p. 147.

spending as a proportion of GNE of almost a percentage point.²⁴⁴

As noted on page 96 in PR-30 Brown restrains the growth of private investment to such an extent that it grows less quickly than GNE. The result is a higher share for public (and private) consumption. Thus between 1961 and 1970 government spending as a percentage of GNE grows by a percentage point.

7. (d) Savings

"The Gross National Saving of the economy (S^n)," writes Brown, "would be equal to Gross National Investment, if there were no capital inflow or outflow, no foreign trade balance. We define S^n as equal to GNE less national consumption C^n less defence consumption G_M ."²⁴⁵ In his view, which he backs up with an historical assessment, full employment is only achieved in Canada when the ex post facto gross national saving ratio reaches 24 per cent of GNE. Despite this, as already noted on page 92 in PR-1 and 2 Brown assumes a gross national saving ratio of 21 per cent with 4 per cent unemployment. He acknowledges that "this would put us on something below a high growth path, but may present an easier basis for both high employment policy and more immediate expansion of foreign aid."²⁴⁶

In the econometric model gross national saving is not derived as an equation but is simply an identity equal to GNP less consumer spending and government spending (including military spending). Alternatively, gross national saving is equal to government investment (public capital) plus private investment (business gross fixed capital formation), plus the change in inventories, less the balance of payments deficit on current

²⁴⁴. Ibid., p. 172.

²⁴⁵. Ibid., p. 88.

²⁴⁶. Ibid., p. 100.

account, and less the residual error of estimate in GNP.

7. Allocation of Output - ECC

(a) Consumer Spending

In analyzing the composition of future demand, the Economic Council sought guidance in its "studies of the relevant patterns and relationships of the past and by our assessment of certain expenditures requirements necessary for the attainment of potential output".²⁴⁷ Selected periods in the past when use of resources was high or approaching full employment reveal remarkable stability in consumption expenditures - between 66.5 and 68.3 per cent of GNE.

Based on the assumption that the economy will move to its potential growth path by 1970, the Economic Council projects consumption growing at the rate of 5.1 per cent per annum²⁴⁸ while GNE (= GNP) grows at a rate of 5.5 per cent. This results in a slight decline from the 68.3 per cent of GNE going to consumption in 1962-63 (when consumption was relatively high) but is a necessary decline if investment is to grow at the high rate required to ensure a return to growth potential.

This broad aggregative method of projecting future demand is backed up by an assessment of the basic factors influencing demand; namely, the international environment, particularly the level of economic activity in the United States and the agreement among the twenty member countries of the Organization for Economic Co-operation and Development to strive to increase their GNP's by 4.1 per cent a year; population growth, particularly the increase in family formation as the war and immediate

²⁴⁷. ECC, First Annual Review, pp. 55-6.

²⁴⁸. Ibid., p. 57.

post-war babies start marrying each other; potential income levels, with these assumed to rise on a per capita real basis by 3.4 per cent per annum - a high rate indeed, (see Table IX of Chapter IV below); and urban growth, although this has more significance for social capital, housing and municipal expenditures.

The Economic Council notes that consumer expenditures in real terms per capita have increased at an average annual rate of 1.7 per cent since the late 1920's²⁴⁹ and then, on the basis of their earlier population projections and their calculations of potential consumer spending, project that per capita consumer spending will rise by an average of 3.0 per cent per year from 1963 to 1970. The Council estimates that by 1970 Canadians will be spending as much per capita as did Americans in the early 1950's.

Finally the Economic Council disaggregates projected consumption expenditures into the three major components as follows:

	Average Annual Rate of Change 1963-1970
Durable goods	6.6 %
Non-durable goods	3.6
Services	<u>6.4</u>
Total	5.1 % ²⁵⁰

Only the spending on nondurables^{is} expected to grow less rapidly than in the period 1956-63. This is, of course, in accordance with all that time series surveys and budget data reveal about the marginal propensities to consume various types of goods.

7. (b) Investment (housing, business (including private social capital), government social capital)

Housing.--The Economic Council bases its five-page summary of the 1970

249. Ibid., p. 61.

250. Ibid., p. 63.

projection of housing construction on a study by Wolfgang M. Illing.²⁵¹ Recognizing that housing construction takes place in response to demand and, specifically, to "the need to increase the housing stock in relation to expanding population, and the need to maintain the housing stock as a consequence of diverse withdrawals of dwellings from use,"²⁵² Illing starts his projection with a survey of the demographic developments especially significant to housing demand: household formation. He notes also the effect of rising incomes and the recent trend towards far greater emphasis on the construction of apartments - a trend which he considers most likely to be further accentuated as urbanization continues. He assesses the trend in total housing stock and in the percentage vacant. Illing summarizes his method as follows:

The general technique employed in this study consists in the projection of demographic data to obtain the changes in occupied housing stock by 1970, and the appraisal of certain additional factors which tend to exert indirect influence on the level of construction. Particular emphasis is placed on identifying the direction and extent of the various causal flows on the determination of housing demand.²⁵³

Because of the incompleteness of data, especially in housing stock, Illing considers he could not use macro-economic functional relationships - invariances - such as those between new construction and its determinants, except in a few limited instances as checks on his projections.

Illing uses an intercountry comparison with the United States in completing his assessment of Canadian growth patterns in family and household formation. He uses the same method in discussing new residential investment; for example, he compares Canada's record in the Fifties of

251. ECC, Housing Demand to 1970. Staff Study No. 4 by Wolfgang M. Illing. (Ottawa: Queen's Printer, Dec. 1964).

252. Ibid., p. 1.

253. Ibid., p. 2.

housing construction in relation to population with the records of twelve other industrially-advanced nations - and notes that Canada's rate was by far the lowest. Despite this and the expected strength in net family and household formation, Illing does not foresee between 1963-70 so vigorous an expansion in housing demand as occurred after the war for there now exists no substantial backlog in effective demand for housing and the net household formation is expected to be lower than in the immediate post-war period.²⁵⁴

Implicit in Illing's projections is that construction will keep pace with effective demand - a reasonable assumption since a higher proportion of GNP has gone to residential construction in the past than Illing projects for the future. Illing does note, however, that an area of uncertainty is created by the effect of changing credit conditions on the availability of mortgage money - essential to an effective demand for housing.²⁵⁵ Finally, Illing assesses the effect of a change in government policy towards making more low cost housing available. Realistically, he holds out little hope of such a change.²⁵⁶

Business-(including private social capital).--The Economic Council's five-page summary of the business investment outlook to 1970²⁵⁷ is based on two staff studies. One, by B. A. Keys,²⁵⁸ uses the same method of determining

254. Ibid., p. 26.

255. Ibid., p. 29.

256. Ibid., pp. 30-2.

257. ECC, First Annual Review, pp. 68-72.

258. ECC, Special Survey of Longer Range Investment Outlook and Planning in Business. Staff Study No. 6 by B. A. Keys (Ottawa: Queen's Printer, Dec. 1964).

business investment plans as do DBS and the Department of Trade and Commerce in their annual "Private and Public Investment in Canada, Outlook and Regional Estimates" - that of going directly to business corporations and companies and asking them their investment intentions. However, Keys was interested in the period seven years ahead, not for just a single year.

Keys conducted his survey almost entirely by personal interviews. Time and staff not being available for as complete a survey as those done by DBS, the survey was restricted to 81 companies which, nevertheless, accounted for slightly over half of all business capital investment in Canada, excluding that in agriculture, institutional services and housing. Also, Keys selected the companies most likely to be making the largest capital expenditures up to 1970: utilities, pulp and paper, chemical, steel, automotive, petroleum and mining. In short, "growth" industries.

Keys' method appears appropriate for, at the most, a three or four year period ahead. Indeed, accuracy of the projection diminishes markedly after one year for there appears to be an accelerating tendency to under-estimate future investment the farther into the future one peers. From 1963 to 1966, investment intentions reported showed increasing investment although the rate of increase was diminishing. From 1967 on the reported intentions showed diminishing investment year by year. Yet, "virtually none of the executives interviewed indicated an expectation that capital expenditures would in fact turn downward later in the period from the peak level projected for 1966".²⁵⁹

In a considerably longer study, Derek A. White projects business investment to 1970 after recording recent Canadian investment experience

²⁵⁹. Ibid., p. 5.

and analyzing the factors underlying it.²⁶⁰ He surveys business investment both under its main components of non-residential construction, machinery and equipment, and changes in non-farm business inventories, and then subdivided under agriculture, resource-related, and other business. He further subdivides resource - related investment into ten categories. White ends this phase of his assessment of the past by recording the regional distribution of investment.

A short chapter is devoted to comparing the Canadian investment record with that of other developed countries.

Noting that "the overall capital-output ratio in any country is partly the result of the goods and services mix of its output",²⁶¹ White undertakes an analysis of Canadian capital-output ratios covering 22 industry groups which accounted for over 80 per cent of business non-residential construction in 1963. His analysis ends with a comparison of capital-output ratios in Canada and the United States. He summarizes this section briefly:

The level of investment in a country may be regarded as the sum of two components:

1. The flow of replacements of discards from the gross capital stock; and
2. Changes in the gross capital stock. The size of the second component may in turn be regarded as dependent upon:
 1. The size of the initial aggregate gross capital output ratio;
 2. The extent of the rise in output;
 3. The magnitude of the change in the aggregate capital-output ratio; and;
 4. Interactions between the output change and the capital-output ratio change.

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

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

260. ECC. Business Investment to 1970. Staff Study No. 5 by Derek A. White (Ottawa: Queen's Printer, Dec., 1964.)

261. Ibid., p. 21.

and shifts in the output mix.²⁶²

To project business investment to 1970 White studies the implications of several different growth rate assumptions, "utilizing capital-output ratio projections based upon different degrees of aggregation of the capital stock and GDP data for the 22 industries".²⁶³ He establishes that simple extrapolation of the post-1950 trends in the capital-output ratios results in unsustainably high estimates of future investment.

Using broad estimates of the trends in output in a number of major industries gives information as to changes in the future mix of output, which in turn reveals part of the changes in the future aggregate capital-output ratio. Trends in capital-output ratios are next projected graphically for ten major industry groups, with adjustments as judged necessary being made for immediate post-war and Korean war distortions as well as for such trend-changing factors as economies of scale.

The capital-output ratio method being obviously unsuitable for the projection of social capital investment (government or private), White projects private social capital investment by extrapolation of past trends. Because such investment showed a spurt in 1962-63, his projection is not straight line but shows a slightly increasing rate of investment as 1970 approaches.²⁶⁴

White uses the same method of extrapolation to project investment in the finance, insurance and real estate, and commercial services sectors; but here, because no recent upward bias has been recorded, the projection is straight line.

262. Ibid., pp. 35-6.

263. Ibid., p. 38.

264. Ibid., p. 45.

In agriculture White again extrapolates past investment trends, while taking account of the pattern of past expenditures on agricultural machinery and equipment and the assumed service lives of the various classes. This leads him to project a marked hump in investment on this component between 1964 and 1968.

Government social capital.—Although White does not concern himself with projecting future public social capital investments, he does chart the 1946-64 record by major components as percentages of GNP.²⁶⁵ It is noteworthy that this percentage tripled over the period with the highest relative and absolute increases being shown by schools and universities.

The Economic Council sees no reason for assuming that government social capital expenditures will merely keep pace with increasing GNP in future. On the contrary, after assessing all the relevant factors such as even more rapid increases in motor vehicles, the demographic pattern with its bulge in the young adult population, the rise in per capita income, heightened levels of commercial activity, increasing pressures for post-secondary technical schools and universities with especial emphasis on postgraduate training and research, advancing concepts of man's right to health, and the whole range of increasing recreational facilities and municipal services as urbanization continues, the Council projects that public capital expenditures will increase at an average rate of 7.5 per cent,²⁶⁶ higher than housing construction at 6.3 per cent and lower than business fixed investment at 10 per cent. All categories of investment, of course, are projected to increase faster than GNP at 5.5 per cent. Indeed, GNP would not increase at this high rate unless investment increased

²⁶⁵. Ibid., p. 13.

²⁶⁶. ECC, First Annual Review, p. 75.

even more quickly.

7. (c) Government spending

Since the Economic Council's method of projecting output was that of disaggregation into broad sectors, its method of projecting government expenditures or output has already been described at pages 71-72.

It will be noted that these expenditures were projected on the basis of public demand for government services at all three levels. A staff study prepared for the Council reveals that tax revenues, at the federal level at least, will not stand in the way of the supply of these services.²⁶⁷

D. J. Daly's study reveals that had the economy been operating at capacity in 1960, federal revenues would have been \$1.1 billion greater. With some \$250 million less in unemployment insurance disbursed, the actual federal budget deficit of some \$250 million would have become a surplus of \$1.1 billion, provided all other receipts and expenditures remained unchanged²⁶⁸ - a highly unlikely occurrence, of course, because of the deflationary drag of such a surplus.

Because of basic exemptions and the progressive nature of income taxes, the marginal propensity to pay income taxes increases faster than income. In addition "when the Canadian economy is operating at less than potential output, the relatively most seriously depressed sectors of incomes and expenditures are essentially those comprising the tax base for about 85 per cent of federal revenues."²⁶⁹ Thus Daly concludes that, with the economy on its potential growth path in 1970, "the indicated increase in federal revenues is far larger than committed increases in expenditures under existing programmes, or the new or changed programmes

267. EGC, Federal Tax Revenues at Potential Output, 1960 and 1970. Staff Study No. 9 by D. J. Daly (Ottawa: Queen's Printer, 1966).

268. Ibid., p. 3.

269. Ibid., p. 7.

suggested in the MacPherson, Gill and Hall Royal Commission reports".²⁷⁰

These considerations lead the Economic Council to project, on the basis of present tax rates, "a possible surplus for all governments combined of the order of \$2,250 million."²⁷¹ Considering such a surplus inappropriate - in the first place the economy would not reach potential if subjected to such a deflationary drag - the Council comes out in favour of "a combination of levels of tax rates and expenditures which would yield a rough balance"²⁷² at potential output.

Thus, despite the high rate of investment in public capital projected (see page 106), government expenditures are projected to grow at a rate of 5.0 per cent a year,²⁷³ lower than the 5.5 per cent rate of growth of GNP.

7. (d) Savings

Though Frank Wildgen discusses the part played by income, credit conditions, wealth or net worth, and tastes in the supply of savings he concludes that "empirical evidence indicates that it is almost impossible to overemphasize the predominant importance of the level of income in determining the level of saving".²⁷⁴ His own presentation of the empirical evidence is highly convincing: over the five business cycles since the war, "the highest rate of Gross Private Saving has deviated from the lowest rate for any of the other groups of years by only 0.81 per cent of

270. Ibid., p. 8.

271. ECC, First Annual Review, p. 125.

272. Ibid., p. 197.

273. Ibid., p. 114.

274. ECC. National Saving at Potential Output to 1970. Staff Study No. 10 by Frank Wildgen (Ottawa: Queen's Printer, Dec, 1964), pp. 8-9.

GNP." If the immediate postwar and the present expansions are omitted "the greatest variation among the remaining periods amounts to only 0.10 per cent of GNP."²⁷⁵

Gross National Saving is not so stable and this is almost entirely caused by the marked instability of Gross Government Saving which in turn is caused not by variations in public investment but by movements from surplus to deficit positions and back again.

Making an intercountry comparison, Wildgen notes that since the war "the rate of National Saving in Canada has on average exceeded that in the United States by almost one third."²⁷⁶ He draws no conclusion useful for prediction from this, remarking simply that "in spite of the relatively higher rate of total saving in Canada there has been a persistent net inflow of long-term capital from the United States into Canada".²⁷⁷ This he attributes to the higher rate of business investment in Canada and to the extensive foreign ownership of Canadian industry.

Finally, in making his projection, Wildgen essentially "merely extrapolates the average post-war rate of Gross Private Saving at high employment levels," giving the trend a slight upward adjustment (approximately one per cent of GNP) "to take account of the high level of activity postulated for 1970".²⁷⁸

The Economic Council accepts this view and projects a rate of gross private saving of close to 20 per cent of GNP, with "gross national saving in the order of 23 per cent" of GNP.²⁷⁹

²⁷⁵. Ibid., p. 24.

²⁷⁶. Ibid., p. 16.

²⁷⁷. Ibid., p. 21.

²⁷⁸. Ibid., p. 28.

²⁷⁹. ECC. First Annual Review, p. 131.

8. International Trade and the Balance of Payments - RCCEP

Exports.—R. V. Anderson's detailed assessment of Canada's export prospects starts with a review of the experience of the thirty years from 1926 to 1955.²⁸⁰ He deals with the magnitudes of Canadian exports, both in absolute terms and relative to GNP. He then notes the major exports of the past and those whose importance has been growing recently and seems destined to continue growing. He ends his first chapter with a description of the export markets, both in overall terms and by commodities.

In his second chapter Anderson continues his historical survey, now concentrating on the determinants, "the major factors which influence the size of the export movement".²⁸¹ However, he does not attempt an econometric model: "no mathematical causal relationships are suggested". He notes that "the level of activity (or incomes) in other countries remains an important basic determinant of the level of Canada's exports",²⁸² the United States being, of course, by far the most important of these other countries. He next discusses the negative influence on Canadian exports of the restrictions on imports imposed by foreign countries as well as these countries' other protectionist devices and schemes of export promotion. On a more positive note he describes the Canadian government policy of encouraging trade through bilateral concessions and through the adoption of a generally liberal commercial policy. But he is careful to stress that "the various influences which have been reviewed would all be of little significance if the world, and the United States in particular, did not have strong needs for the commodities which Canada can produce on

280. RCCEP. The Future of Canada's Export Trade. Study by R. V. Anderson (Ottawa: Queen's Printer, 1957), pp. 1-28.

281. Ibid., p. 29.

282. Ibid., p. 30.

competitive terms".²⁸³ Anderson concludes the chapter with an analysis of the post-war shift in the direction of Canada's exports.

Dealing at last with the future, Anderson states his - and the Royal Commission's - basic assumptions: no major war and generalized full employment. He then sets out his reasons for believing the future will bring a continued lessening of restrictions on imports, greater convertibility, and reduced refuge in bilateralism - all tending to increase international trade and, in consequence, Canada's exports. However, he sees the development of regionalism, notably the European Common Market, as having trade-reducing potentiality. He ends the third chapter with a review of the economic prospects in each of the main Canadian export market areas.

Anderson completes his sectoral analysis with "an examination of the nature and prospects for the trade, commodity by commodity."²⁸⁴ This assessment is based both on the productive capacities of the various export industries - with the necessary information drawn from the industry studies carried out for the Royal Commission - and on the import capabilities of the several markets, already assessed in general terms. Thought is also given to the capabilities of Canada's competitors in each major export field to determine what share of the world market Canada can expect to maintain or gain.

The last step in the study is to fit the sectoral analysis now completed into the overall analysis of Canada's economic prospects carried out by the Royal Commission as well as "to draw together the elements of the forecast, to consider its reasonableness, to make certain adjustments,

283. Ibid., p. 35.

284. Ibid., p. 133.

and to examine the implications of the result".²⁸⁵ A comparison of the projected exports is made with the imports projected by another Royal Commission study to see whether the difference in magnitude, if any, is feasible having regard to Canada's balance of payments position. The export projection is also compared to the projected GNP to see whether the former bears a proportionate relationship in keeping with an assumption concerning the appropriate size of exports to GNP of a maturing country.

Imports.—David W. Slater's study on imports devotes a chapter to a description of Canada's import trends and another to an analysis of these trends before setting forth "a general qualitative view of Canada's import prospects, together with the development of some simple statistical import relationships".²⁸⁶ Admitting that this "over-all or aggregative approach ... has the weakness of neglecting many relevant factors and much economic intelligence" and "provides little basis for judging the prospective content and geographical characteristics of Canada's imports",²⁸⁷ Slater proceeds to a detailed analysis of import prospects. These imports he derives mainly as implications of Canadian economic growth:

On the one hand, the rapid growth in investment in machinery and equipment, and expenditures on consumer durables and miscellaneous manufactured consumer goods imply rapid growth in imports. On the other hand, the development of Canadian fuel resources together with the expected relative improvement in the average competitive position of Canadian manufacturing activities, due to the growth in the Canadian economy, will tend to limit imports.²⁸⁸

285. Ibid., p. 103.

286. RCCEP, Canada's Imports. Study by David W. Slater (Ottawa: Queen's Printer, 1957), p. 2.

287. Ibid., p. 78.

288. Ibid., p. 164.

Comparison of the export and import projections reveals that a current account deficit of some \$850,000,000 is projected for 1970.²⁸⁹

To see whether capital account imports would be forthcoming in sufficient amounts to make good this current account deficit, Irving Brecher and S. S. Reisman "look at the historical position for any discernible trends which may shed light on what might reasonably be expected in the future".²⁹⁰ They note a downward trend between 1926-54 in the net use of foreign resources as a percentage of net capital formation. Though with very high levels of domestic investment this ratio rose in the period 1954-56, the authors consider that the growing maturity of the Canadian economy will prevent a reversal of the long-run past trend.

On the other hand, an examination of the profitability of foreign-owned enterprises in Canada leads Brecher and Reisman to conclude that foreign capital will continue to be available in amounts sufficient to make up the current account deficit.

3. International Trade and the Balance of Payments - Caves and Holton

Caves and Holton arrive at their 1970 projection of Canada's international trade and net foreign balance through an examination of "trends in the structure of Canada's import and export trade and future mechanism of adjustments of the Canadian balance of payments."²⁹¹

The authors note that in 1956 78 per cent of Canadian exports went to the United States - United Kingdom market while 84 per cent of Canadian

289. Ibid. Derived by interpolation between the actual current account deficit of 1955 and the projected 1980 deficit.

290. RCCEP. Canada-United States Economic Relations. Study by Irving Brecher and S.S. Reisman (Ottawa: Queen's Printer, 1957), p. 159.

291. Caves and Holton, p. 386.

imports came from these two countries. In each case the great bulk of trade was carried on with the United States. This heavy concentration of trade with two other nations is a condition that has existed for decades if not centuries. The only basic change since 1901 is that Canadian trade has become more and more concentrated with the United States at the expense of the United Kingdom.

Caves and Holton table the percentages of Canadian exports by degree of manufacture since the turn of the century and note that in 1950 40.7 per cent of Canadian exports were fully manufactured - a tenth of one per cent lower than the proportion half a century earlier. And even this percentage is deceptively high for much of it is made up of fully manufactured newsprint whose value added is very low.

These two sets of facts - that eighty per cent of Canadian trade is with the highly industrialized United States and United Kingdom and that the great bulk of Canadian exports are resource-based - lead Caves and Holton to conclude that "attention can be centered on the future demands of these two industrial nations with reasonable certainty that trade with the rest of the world will not develop at violently different rates."²⁹²

Therefore the authors examine and predict the rate of growth of the American and British economies to 1970. Yet they do not neglect what trends they can detect in the development of the European Economic Community and of the European Free Trade Area. However, they conclude that fundamental economic forces will continue to increase the proportion of Canada's trade with the United States and the Western Hemisphere generally.

292. Ibid., p. 394.

In projecting specific export classes Caves and Holton look at the following:

- 1) prospective rate of growth of income and demand in the countries which are the best customers for each export;
- 2) trends in Canadian supply - that is, the excess of Canadian productive capacity over probable domestic consumption, and
- 3) potential output of producers competing with Canada in the export of each commodity.²⁹³

Turning to the prospects for the balance of payments, Caves and Holton describe how Canadian imports usually grow faster than her exports when Canada is growing faster than her main trading partners - usually because Canadian booms are accompanied by a high level of investment which necessitates the importation of much machinery and equipment. However, the authors see no danger of Canada requiring to import long-term capital over any extended period:

At some time in the next decade or so the effect of current heavy capital formation will be to expand export availability of many primary products and some manufactures and furnish stiffer competition for manufactured imports, thus tending to turn the current account deficit around as suggested in the description of past experience.²⁹⁴

This explanation of the forces at work lead Caves and Holton to project greater relative importance of Canadian exports of nonferrous metals, newsprint, and petroleum in 1970 with a lessened proportion on the import side of many types of consumer goods, especially soft goods.

Their final conclusion is that Canada will have a small export surplus in 1970, roughly sufficient in their view to balance net dividend and interest payments abroad.

293. Ibid., p. 400.

294. Ibid., p. 405. It might be noted in passing that this prediction was unsuccessful because of heavy over-investment - and, hence, excess capacity - in the consumer goods industries during the 1954-57 boom. STUDIES

But the authors do not leave it at this for they now put their total exports figure to the test of a commodity by commodity analysis.²⁹⁵ They determine the productive capacity of the economy for the good in 1970 and subtract from this the projected domestic demand. This gives them the export potential which they examine in the light of their prediction of the demand for the good in the several foreign markets.

Thus the authors carry out a double-barrelled sectoral analysis, first in the export sector and then in the industrial sector. They end with an overall analysis which consists of fitting all their previous conclusions into an inter-industry table.²⁹⁶ In this way they ensure complete consistency between their separate analyses of future GNP, industry outputs and exports.

In carrying out their inter-industry analysis Caves and Holton calculate that "an increase of \$100,000,000 in Canadian exports would raise Canada's import requirements by \$14,500,000 in order to satisfy the technical requirements for the production of exports".²⁹⁷ This 14.5% import requirement compares with the Norwegian figure of 30% revealed by their input-output studies.²⁹⁸

In much of their projection of the Canadian economy Caves and Holton make use of intercountry comparisons, mostly with the United States. But they make no use of intercountry comparisons, least of all with the United States, when it comes to Canada's exports. They rightly note the uniqueness of an advanced industrial economy still greatly dependent on the export of

295. *Ibid.*, chapters 15-19.

296. *Ibid.*, p. 410-11.

297. *Ibid.*, p. 129.

298. P. J. Bjerve, *Planning in Norway 1947-56* (Amsterdam: North-Holland Publishing Co., 1959), p. 167.

of staples - and very low value-added newsprint - to a single market.

8. International Trade and the Balance of Payments - RCHS

Brown's PR-1 takes no account of the foreign sector; all investment is met from domestic sources. This simplifying assumption is relaxed in PR-2: it is now "assumed that as Canada matures both natural economic forces and government policy will cause the capital inflow to diminish in relative terms though it may still continue to rise in absolute terms.

In this projection, capital inflow is taken to decline from 2.1 per cent of GNP in 1961 (excluding residual error) to approximately 0.0 per cent in 1991".²⁹⁹

Since interest and dividends paid abroad less interest and dividends received from abroad are expected to rise from \$566 million in 1961 to \$1,505 million in 1991³⁰⁰ (both in 1957 dollars), this can only mean that Brown expects Canada to have a surplus on merchandise trade of at least \$1,505 million in 1991. And most likely the figure would have to be considerably higher than this to make up for Canada's probable continuing deficit on transportation and freight charges, let alone business services and tourist travel.

But this does not appear to be a satisfactory method of projecting Canada's exports. Canadian exports are not simply a passive residual that can be expected to rise sufficiently over the period covered by a long-term projection to achieve the objective set by the forecaster of a balance in the current account and zero net foreign capital requirements. PR-2 does not give us a useful method of estimating Canada's future exports.

In his econometric projections, Brown assumes a steady growth of exports of three per cent per annum.³⁰¹ Though this is better than treating

299. RCHS, Brown, p. 128.

300. Ibid., p. 136.

301. Ibid., p. 153.

exports as a residual and may be useful as a first approximation for a long-term projection, this method can hardly serve as a model for a medium-term projection. This is further discussed on page 135 below.

8. International Trade and the Balance of Payments - ECC

J. R. Brown's study³⁰² makes use of invariances in projecting the value of Canada's exports in 1970. He starts with an analysis of Canadian export trends since 1900 in regard to quantities of both agricultural and non-agricultural commodities and to their markets. He deals next with the raw material requirements of industrial countries, especially the United States. The emphasis on raw materials is not unwarranted: in 1963 no less than 63 per cent of Canada's exports fell into the category of forest products, minerals and chemicals, while only 12 per cent could be classed as highly manufactured. (Downs excludes newsprint from this latter category).

Downs fits the volume index of Canadian non-agricultural exports to all countries to the combined index of industrial production of the OECD industrial countries for the period 1926 to 1963 and calculates from this that "the volume of non-agricultural exports to all countries grew at an annual average rate some 1.13 times the rate of growth of world industrial production."³⁰³ By a similar method he calculates that "the volume of non-agricultural exports to the United States grew at an average annual rate some 1.14 times the rate of growth of United States industrial production."³⁰⁴ However, during the period 1953-63 the export elasticity to the United States was not 1.14 but rather 1.37. Downs discounts the

302. ECC, Export Projections to 1970. Staff Study No. 8 by J.R. Downs (Ottawa: Queen's Printer, Dec., 1964).

303. Ibid., p. 8.

304. Ibid., p. 9.

plausibility of so high an elasticity for the period 1963-70, settling instead for the figure of 1.20 which obtained in the period 1949-63. This upward adjustment in the case of the elasticity for Canadian exports to the United States entails an off-setting downward revision to 1.00 for exports to the countries of Western Europe and Japan.

Thus since Downs calculates that the United States industrial production would increase by 5 per cent per annum, he projects Canadian non-agricultural exports to the United States increasing at the rate of 6 per cent per annum. Similarly, with industrial production in OECD industrial countries increasing at the rate of 5.5 per cent annum, Canadian non-agricultural exports to all countries are predicted to increase at the rate of 6.2 per cent ^{per} annum.

At this stage Downs makes use of an intercountry comparison, demonstrating that Sweden, which exports similar materials as well as manufactured products, had an elasticity of exports coefficient of 1.75 between 1953 and 1963. Downs finds evidence here that his projection of a Canadian export coefficient of 1.13 is not unreasonably high.

Turning to agricultural exports Downs examines the potential world demand for wheat in some detail before projecting Canada's share of that market in 1970. He apparently implicitly assumes that Canadian producers can meet both the export and domestic demand.

With regard to all other agricultural exports, including fishery products, Downs, in very cursory fashion, concludes on the basis of the trends of the past decade that their rate of growth will be 1.5 per cent per annum.

Downs now disaggregates further his projection of non-agricultural exports, dividing them into three groups: "two groups of materials; namely, forest products, and all other materials (metals, minerals, fuels,

and miscellaneous); and a group of highly manufactured products defined as those classified in the Dominion Bureau of Statistics exports section, 'end products inedible.'³⁰⁵ This disaggregation takes place within the projected growth rate of 6.2 per cent per annum already computed for non-agricultural exports. Again the method of invariances is used and no independent check for consistency is achieved. However, market projection analyses were consulted to ensure that markets would in fact exist for these categories of Canadian exports in 1970.

Surprisingly, Downs manages to complete his work without a single reference to a companion study by M. G. Clark.³⁰⁶ One would have thought a study with chapter headings as mentioned below would have had some bearing on an assessment of Canada's future exports: "Trends in World Trade", "Underlying Developments", "Kennedy Round of Trade Negotiations".

Few would wish to decry Downs' adoption of the method of invariances but it is hard to understand why he would not use all the data that were to hand to check the plausibility of his own projection.

Though Downs and Clark complete their parallel studies independently, the Economic Council's chapter entitled "International Trade and the Balance of Payments" is based on both.

The Council begins with an analysis of past trends and relationships, laying particular emphasis on "three important features of Canada's historical international economic relations".³⁰⁷ The first is the economy's heavy dependence upon international trade, with merchandise exports usually

305. Ibid., p. 16.

306. ECC, Canada and World Trade. Staff Study No. 7 by M. G. Clark (Ottawa: Queen's Printer, Dec., 1964).

307. ECC, First Annual Review, p. 78.

making up half of the output of Canada's goods-producing industries. The second is the "recurrent pattern of large deficits in merchandise trade and current-account payments during periods of high-level activity".³⁰⁸ The third feature is the high degree of concentration of Canada's trade with the United States.

The Council assesses the international economic environment concluding that "Canada has been adversely affected by the shift in the structure of international trade".³⁰⁹ Regarding the future, the Council holds that

Canada's export potential by 1970 will be determined essentially by four factors: the growth of foreign markets; access to these markets; the competitive capabilities of Canadian suppliers in terms of both their relative efficiency and their relative international cost and price position; and the marketing skills and aggressiveness of Canadian traders in exploiting opportunities for increased and diversified exports.³¹⁰

In assessing the growth of foreign markets the Council adopts the Downs method of invariances as well as the results he derived. The Council notes that the "growth rate for Canada's nonagricultural exports of about 6.2 per cent per year between 1963 and 1970...would be roughly in step with the annual increase of 5.9 per cent in nonagricultural production associated with our estimate of potential output."³¹¹

The Council notes the difficulty of projecting trends of agricultural exports - special or random circumstances such as those that led to the very

308. Ibid., p. 79.

309. Ibid., p. 82.

310. Ibid., pp. 85-6.

311. Ibid., p. 87.

large wheat exports of 1963 and 1964 cannot be forecast. The Council decides that agricultural exports in 1970 will not be substantially different from the high 1963 level.

Finally, based on its examination of the trends in foreign markets, the Council estimates that for Canada to achieve its export potential for all products in 1970, exports must increase at an annual average rate of 5.3 per cent.³¹² Within the total, however, manufactured exports must increase at least at 10 per cent a year if potential export growth is to be achieved since raw and processed materials cannot, on the basis of the projected trends in world demand, increase even at the 5.3 per cent rate.

Turning to imports, the Council takes account of "past relationships and the high rate of increase in domestic output, income and spending, which would be associated with the attainment of potential output by 1970", to estimate that imports will attain "an average annual growth of 6.5 per cent in volume ... from 1963 to 1970".³¹³

The Council juxtaposes its summary of its exports and import projections:

Our merchandise export and import potentials have been calculated on the basis of a number of important underlying assumptions and have relied essentially on past relationships between trends in Canadian trade and trends in Canadian and world demand and supply. The export potential of \$9.8 billion by 1970 looks towards an export performance which would be roughly in line with those which have typically been associated with earlier periods of rapid and sustained growth in Canada and in the world economy. The import potential of \$10.2 billion, on the other hand, has been postulated on assumptions which imply that Canadian imports will not rise quite as fast in relation to output as in earlier periods of rapid domestic and international growth.³¹⁴

³¹². Ibid., p. 90.

³¹³. Ibid., pp. 92-93.

³¹⁴. Ibid., pp. 93-94, (1963 dollars).

What is implied here is that the moderate trade surplus of 1963 might be replaced by a quarter billion dollar trade deficit in 1970. If the trend of increasing deficits in receipts and payments for services should continue - and rising GNP would tend to accelerate the trend rather than retard it - then "the attainment of potential output by 1970, could, on the basis of past economic relationships, result in a current account payments deficit in the order of \$1.5 billion to \$2 billion by the end of the decade".³¹⁵

9. Prices and Monetary Trends - RCCEP

As pointed out in Chapter I (page 1), the Royal Commission, for the sake of simplicity, assumes there will be "no change in the general price level or in price relationships".³¹⁶ Nothing, then, can be said about the Royal Commission's views on prices and monetary trends except to note again that they themselves point out that their assumption is "completely unrealistic" and that Hood and Scott "assumed that the eroding force of inflation will be restrained".³¹⁷

9. Prices and Monetary Trends - Caves and Holton

As mentioned in Chapter I (page 5), Caves and Holton assume an annual increase in the price level of one or two per cent. In setting their GNP projection in constant dollars they stress the importance of remembering "the likelihood that the prices of some goods may change relative to the prices of others".³¹⁸ They expect a relative lowering of the prices of agricultural goods vis-a-vis non-agricultural goods and add that they made some allowance for this in estimating the probable productivity growth rate in agriculture.

315. Ibid., p. 95, (1963 dollars).

316. RCCEP, Final Report, p. 4.

317. RCCEP, Hood and Scott, p. 2.

318. Caves and Holton, p. 305.

9. Prices and Monetary Trends - RCHS

Brown notes that for some purposes it is useful to convert future real volume or physical value estimates to their money costs in market prices. "To do this one must attempt to project future movements of price levels. These will be composed of trends, cycles and irregular movements."³¹⁹ Brown, however, attempts to project only a trend in the implicit price index of GNE. He does so by looking at long-term trends. From 1926 to 1962 the price level of GNE rose at a yearly average of $2 \frac{1}{8}$ per cent while more recently, from 1954 to 1962, it rose annually at 1.94 per cent. It is this latter growth rate that Brown uses to project GNP in current dollars.

Like the Economic Council, Brown makes no attempt to project relative price changes, nor, unlike the Council, does he consider monetary trends.

9. Prices and Monetary Trends - ECC

Unlike the three previous projections, the Economic Council devotes a full chapter to this topic. Its projection is based essentially on a study of changes in prices and costs and in the money supply during the most recent period, which was also one of marked stability in the price level, 1953-63. During these years annual consumer price increases averaged 1.4 per cent, while those of all goods and services averaged 2.0 per cent. While recognizing that this decade contained a lengthy period of relative stagnation with an unemployment rate that became unacceptably high towards the end of 1957 and still had not been reduced sufficiently by 1963, the Council considers the period 1953-63 a better guide to the future than the immediate post-war period, 1946-53, when two severe bouts of inflation occurred.

319. RCHS. Brown, p. 115.

The Council believes that the "high standard of performance as regards prices and costs" of the period 1953-63 "should be possible of achievement" in the period up to 1970 despite the attainment of the potential growth path for the following reasons:

- the recent record of price stability under conditions of strengthening demand and the devaluation of the Canadian dollar;
- the higher productivity growth which we indicate as being possible for the years ahead;
- stronger internal and external competition;
- price consciousness for particular products among consumers and purchasers; and
- various policy measures to facilitate attainment of this objective.³²⁰

The policy measures referred to by the Council will be discussed below in Chapter VI.

The Council further assumes "that there will not be strong international price pressures affecting the Canadian economy and, in particular, that reasonable price and cost stability will be maintained in the United States". Both here and in discussing expansion of the money supply and credit conditions generally, the Council takes full account of the great complications faced by Canada in trying to achieve its price and monetary objectives, as well as those of potential growth, if prices are rising rapidly in the United States or if much unemployment exists there.

While believing that the objective of prices as stable as in the 1953-63 period can be achieved, the Council recognizes that a higher rate of increase of real output to 1970 will require "a more rapid increase in the money supply than took place during the past decade".³²¹

The Council takes it for granted that there will be "a reasonable degree of flexibility in the pattern of relative prices"³²² but makes no

320. EGC. First Annual Review, p. 105.

321. *Ibid.*, p. 108.

322. *Ibid.*, p. 102.

attempt to project what relative price changes are likely to occur. This is hardly surprising for predictions concerning relative price changes of goods can be no better than such predictions concerning rates of interest or prices of stocks and shares. To the extent that such predictions are believed, discounting will take place so that the pattern of future prices will already be reflected in to-day's prices.



CHAPTER III

ASSESSMENT OF DIFFERENCES IN TECHNIQUE

Caves and Holton claim two advantages for their product over that of the Royal Commission : "First our work makes much more elaborate use of cross-checks for internal consistency. Second, we have been much more explicit than the commission in pinning our outlook for the future onto our interpretation of Canada's past".¹ This claim appears justified, for by adopting the double-barrelled method of making first an overall projection and then sectoral projections, followed by reconciliation in an input-output table, Caves and Holton have indeed made "much more elaborate use of cross-checks". This is not to claim, however, that the projections made by Caves and Holton will necessarily give a more accurate picture of the future than the projections made by the Royal Commission.

Projections depend on more than technique. An inferior overall technique may be more than compensated for by better assumptions, by more successful elaboration of past trends, by wiser judgment and by more massive resources.

Except in the case of agricultural productivity, the Royal Commission makes straight-line projections throughout. The other forecasters are much less adverse to forecasting changes in trends for one reason or another - the most notable being an increase in the marriage and birth rates after 1965 as the war and post-war babies start to marry.

1. Population

Stukel notes that one of the two reasons for his population projections being different from those of Hood and Scott is that he is able to use "more recent and comprehensive data including the results of

1. Caves and Holton. pp. x-xi.

the 1961 Census".² However, in the present comparative study differences based on changed data will not show up because they have been compensated for to ensure that the only differences would be those caused by differences in assumptions and techniques.

Stukel's second reason for his population projections being different from Hood and Scott's is "some variation in methods used".³ Indeed, this variation in methods is what distinguishes the population projections of the Royal Commission and Caves and Holton on the one hand from those of Stukel and Miss Kasahara on the other. The earlier approach concentrated on the extrapolation of trends, varied as necessary in accordance with assumptions as to future changes in trends. The later approach is more mathematical with the age specific death rates of the newly born (age 0-4) being calculated to establish the survivorship of every age in the group. For other age groups age specific mortality rates were taken at the middle of the quinquennium. The first approach would tend to appeal more to the general economist, the second to the statistician.

Of the four, Caves and Holton are the only ones who make an intercountry comparison to guide, or to back up, their projection.

2. Civilian Labour Force and Labour Participation Rates

All the projections were made using the same methods: the essential element in each case was the determination of the trend by age groups and sex of the labour participation rate. Both Caves and Holton and the Economic Council make great use of an intercountry comparison with the United States, while the Royal Commission and Brown are satisfied to base their projections solely on observable Canadian trends.

2. RCHS, Brown, p. 270.

3. Ibid.

Caves and Holton sum up the main reason for the difference between their results and those of Hood and Scott (and, indeed, of all three other studies) in these terms:

it seems fair to say that we have been bolder than Hood and Scott in assuming that trends apparent in the post-war data will continue and that Canadian laborforce participation will come nearer to resembling the pattern in the United States.⁴

It is apparent that Caves and Holton were in error in their assumption. By 1965 they were short 374,000 in their labour force projection while Hood and Scott, whose work was based on statistics a year or so earlier, were 223,000 short in the 50,000 net immigration projection and 92,000 short in their preferred 75,000 net immigration projection. There is no doubt that the fault lies in Caves and Holton's labour participation rates (despite the impossibility of comparing their age-group rates with the overall rate of the other studies (see pages 148-150)), for Caves and Holton's 1965 population forecast of 19,509,000 compares very favourably with the actual figure of 19,571,000 and is, indeed, bracketed by Hood and Scott's two figures of 19,374,000 (50,000 net immigration) and 19,679,000 (75,000 net immigration).

3. Employment and Employment Ratio

All the projections (except for Brown's econometric projections) are based on the assumption of a high level of employment, meaning variously 96 or 97 per cent of the labour force employed. Total employment is then easily derived by multiplying the labour force by the employment ratio. This "full" employment ratio is itself estimated by an examination of past trends, and in the case of the Economic Council, by an estimation of the economy's potential.

But none of the projections stop there. Both Hood and Scott and

4. Caves and Holton, p. 281.

the Economic Council divide the economy into three sectors (government, farm and business) and allot the employed workers to each sector. Since the business sector employment is derived residually, these procedures are in no sense a check on the employment total. Hood and Scott divide the government sector into five subsectors and extrapolate past trends to project employment while the Economic Council divides the government sector into two subsectors and projects employment by estimating output of government services in 1970 after considering demand for these services. In their Royal Commission study Drummond and MacKenzie base their estimate of a decrease in the rate of decline of farm employment on the increasing demand of a rising population. Dawson's Economic Council study also takes account of demand but, closer to the fact, is also able to note and project the effect on farm employment of the relationship between low farm incomes and increasing urban incomes.

Unlike Hood and Scott and the Economic Council, Caves and Holton do make a second and independent projection of employment by carrying out an industry by industry study - a true sectoral projection. Unfortunately, as explained in Chapter II (pages 32-34), the authors do not place confidence in the employment projection of their sectoral study.

Brown's method in his econometric projections is fundamentally different from all the others - as would be expected from the use of an econometric model. The method is basically one of the use of invariances.

4. Labour Productivity

The Royal Commission, Caves and Holton, and the Economic Council base their projections of productivity and man hours of work on past trends.

While Caves and Holton estimate the trends separately in the agricultural and non-agricultural sectors, the Royal Commission and the Economic Council adopt the more precise method of dividing the economy into

three sectors: agricultural, private business, and government.

Brown, too, uses trends in PR's-1 and 2 but without dividing the economy into sectors. In his econometric projection, Brown necessarily uses in variances with productivity related to the trend of economic activity. The accurate results of PR-3C show this to be a useful method - at least as a check.

Caves and Holton refer to the estimate of productivity growth of the Royal Commission on Canada's Economic Prospects as "avowedly optimistic".⁵ They note that the Commission's staff based their estimates of a non-agricultural productivity growth rate between 2.5 and 3.25 per cent (with a "best guess" of 2.875) on post-war experience - an experience both more recent and assessed in the light of better data. Caves and Holton consider that "there is no justification for completely disregarding earlier statistics unless some net bias is suggested, and the commission gives no reason for expecting one".⁶ Also Caves and Holton doubt that sustained employment is so conducive to rapid productivity gains. Again they confirm their judgment by reference to the United States experience.

Despite this appeal to authority it appears that the honours go to Hood and Scott as Chapter IV will reveal.

5. Output

The Royal Commission, Caves and Holton, and the Economic Council all use the employment approach to project GNP. However, while the Royal Commission uses this method by projecting growth in output separately in the three sectors of agriculture, private business, and government, Caves and Holton make their projections separately in only two sectors: agriculture

5. Caves and Holton, p. 299.

6. Ibid., p. 300.

and non-agriculture. Moreover, the Economic Council uses the employment approach only in the private business sector, while projecting output in the government sector by the use of trends, and in agriculture by an analysis of trends in both demand and supply.

Caves and Holton, of course, go beyond the overall employment method by also carrying out full sectoral projections, which stress demand, and by effecting a final reconciliation in an input-output model of the entire economy.

Odd man out as usual, Brown projects output in PR's-1 and 2 by using a more explicit production function than the others, modified upwards in line with empirical evidence as to change in trend. In the econometric projections output is projected by the use of an equation.

In projecting output of individual industries, some of the Royal Commission's studies use invariances; but, as noted at the beginning of Chapter II above, these sectoral studies of output cannot be summed to yield an independent estimate of GNP.

6. Allocation of Output

All of the projections use invariances to project future consumption: basically, the consumption-income ratio or the consumption function. In addition, Caves and Holton make an independent check by disaggregating and estimating broad categories of future demand.

In the projections of private business investment the Royal Commission and the Economic Council use average capital output ratios while Caves and Holton use the marginal capital output ratio (MKOR) - a more precise instrument for the calculation of future investment. Moreover, they back up this projection by using other invariances than the MKOR to forecast long-range investment.

On the other hand, in PR-1 and 2 Brown finds investment simply as

a residual - likely the least precise method. In the econometric model Brown derives investment from an equation, from invariances which, because of the large number of interacting variables, may well give results no better than the weakest assumption built into the model.

Only the Economic Council uses the survey of investment intentions method. It is a method highly useful - indeed, the best - for short-term forecasting in a country with a well-developed business organization. But the method seems really to be of no use for any period longer than, say, three years and even then its usefulness diminishes sharply for any look into the future greater than a year.

The method of population-need, reinforced by trends used by the Royal Commission, seems the best suited to project housing and public and private social capital requirements; better than the modified extrapolation of trends method used by Caves and Holton. However, the Economic Council's assessment of the effective demand for housing is a method essentially similar to the Royal Commission's. It is worth noting that the Economic Council does not let its intercountry comparison sway it into discounting the projection based on effective demand.

The Royal Commission, Caves and Holton, and Brown base their projections of government expenditures on the extrapolation of trends, modified where necessary. The Economic Council's projection is based on a forecast of public demand for government services and, on the supply side, on a study of the revenue accruing to the government from a full employment budget.

Both the Royal Commission and Caves and Holton base their savings projections on past trends. In effect, both studies make the happy projection that in the future gross national savings will equal gross national investment; that is, that Canada will be neither a net lender nor borrower abroad.

Brown bases his projection of gross national savings in PR's-1 and 2 on a modification of past trends. He recognizes, of course, as does the Economic Council, that gross national investment will be greater than savings by the amount of net borrowing abroad. In Brown's econometric projections savings are found simply as an identity. The Economic Council's method of deriving gross private savings is through use of the savings-income relationship or invariance, backed up by an intercountry comparison. In effect, a projection based on an invariance is equivalent to the extrapolation of a trend.

There is little, then, to choose between the various projections of savings. All use basically similar methods.

7. International Trade and the Balance of Payments

The methods used by Caves and Holton for projecting Canada's exports are the most thorough of those assessed and should produce the best results - although, in any particular case, assumptions and unforeseen factors, which are independent of any method used, inevitably play a part. The Royal Commission's methods are very similar although Caves and Holton are somewhat more thorough in their consistency checks: their inter-industry table is an example.

It makes sense to start, as Caves and Holton do, with an overall historical survey of the country's economy before beginning the detailed sectoral analysis. Export trends and determinants of the past must be examined to decide whether they have relevance for the future. The main export markets must be surveyed in detail from the point of view both of the future size of their national incomes and their capabilities for importing Canada's more important exports. And Canada's productive capacity and domestic requirements must be projected commodity by commodity to determine what surpluses will exist for export. The sectoral analysis is

completed with an assessment of the future export capabilities of Canada's competitors.

An overall analysis should now be carried out. It consists of fitting the exports' projection into the total picture, that is, of relating it to GNP, imports, balance of payments, and the interindustry input-output table. It is at this stage that Brown's econometric method of projecting export growth by a yearly percentage can be used as a subsidiary check. The method used by Downes of the Economic Council, that of invariances, of relating Canadian export growth to the increasing productive capacity of the main export markets, is also useful as a consistency check. But neither of these two mathematical methods seems appropriate by itself when dealing with a country like Canada with ample recent data of export patterns, and with well-established trade channels with industrialized countries whose import requirements can be assessed in detail.

A great deal depends on the aims or use of the projection. If one simply wishes to show, like Brown, that Canada can afford medicare, then a detailed projection of exports is hardly necessary and econometrics will suffice. Also, if one has little time and no resources besides a desk calculator then one should be happy that the econometric method will allow one to project a rate of growth or an invariance into the future.

But if one has the time and the resources - and Caves and Holton showed that one can get along fairly well with only one one-hundredth of the resources of the Royal Commission on Canada's Economic Prospects - then an exports projection should be based on a painstaking assessment of all the factors on the side of demand and supply, foreign as well as domestic.

IV

CHAPTER IV

RESULTS OF THE PROJECTIONS OF THE CANADIAN ECONOMY TO 1970

With the lengthy preliminaries ended, it is now possible to compare each projection side by side with the actual data and with estimates based on the most recent data in a succession of tables. But the projections are not compared in their "raw" form. Each projection's base year figures were the then most up-to-date ones available from the Dominion Bureau of Statistics. Practically invariably, however, after each projection had gone to press DBS issued revised statistics. Each projection has therefore been revised throughout to incorporate the most recent DBS revisions. This was not simply a question of making the revision in the base year and letting it go at that. The initial revision had to be added to each subsequent year after the revision had been multiplied by the projected growth factor. For example, if 100,000 was added to the base year figure and the projected compound yearly rate of increase was 3.5 per cent, then 103,500 would be added to the second year and $(100,000 \times (1.035)^2 =)$ 107,122.5 would be added to the third year, and so. It is well to stress at this point that all yearly rates of growth are compound, that is, per annum per annum.

In this way all projections were brought to a common base and were made directly comparable. To permit easier reference back to the original sources, details of each adjustment are given with the tables.

The following table lists the years used in each projection. In each column the first year is the projection's base year. The years selected for the comparative study are underlined.

Obviously, it was necessary to use each projection's base year as well as the 1970 terminal year; this justifies the selection of 1955, 1961,

RCCEP	Caves & Holton	RCHS-Brown	ECC (SS no 1 and 2)
<u>55</u>	<u>55</u>		
60	60		
		<u>61</u>	
			<u>63</u>
			64
<u>65</u>	<u>65</u>		<u>65</u>
		<u>66</u>	<u>66</u>
			67
			68
			69
<u>70</u>	<u>70</u>		<u>70</u>
71		71	
80		91	

1963 and 1970. Additional reasons for selecting these years as well as the reasons for selecting the other years are as follows:

1961 - year of decennial census.

1963 - as close as possible to being midway between 1955 and 1970.

1965 - year used by three of the four projections and last year for which complete data are available.

1966 - beginning of second of Brown's five-year periods; year used by the Economic Council; current year - some preliminary data available, the rest may be estimated with high degree of accuracy.

Figures for years not used by an author were derived by

(a) calculating the author's projected rate of increase over the five-

year period in which the blank year(s) fall(s);

- (b) deriving the compound yearly rate of increase or growth factor;
- (c) multiplying the figures for the first year of the five-year period by the yearly growth factor to the power equal to the number of years from the first year to the year(s) whose figures it is desired to derive.

In brief, in preference to the less accurate straight-line interpolation, logarithmic interpolation is used, or, alternatively expressed, straight-line interpolation on semi-log paper. This method is basically similar to the one referred to at the beginning of this chapter and used to revise each projection's initial figures.

Notes to Table I (which follows on page 139)

1. References RCCEP, Hood and Scott. Table 4. 15 p. 175 and pp. 338-342.
Caves and Holton: p. 276.
RCHS, Brown: p. 186.
ECC, Staff Study No. 1, p. 9.
DBS. National Accounts: Income and expenditure, 1962, p. 66; *idem* 1964, p. 58 and Weekly Bulletins 13 Aug. 65; 20 May, 66, p. 12.

2. RCCEP. Hood and Scott. The figures in column (a) and (b) have been adjusted from Table 4, 15, p. 175, because:

(a) The authors base year (1955) figures are low by 96,000 even though they use actual figures obtained from DBS. The discrepancy is explained by a note to Table 12 on page 1204 of the Canada Year Book 1962: "At every census the previous post-censal estimates, made at June 1st each year, are adjusted to the newly recorded population figures". Accordingly, the Hood and Scott figures have been adjusted by adding 96,000 to the 1955 figures and by adding 96,000 times the growth factor to the subsequent years. The growth factors for five-year periods are:

	1955-60	1960-65	1965-70
50,000 immigration	11.54%	10.59%	10.15%
75,000 immigration	12.45	11.46	10.86

TABLE I

TOTAL POPULATION OF CANADA (1)
(as at June 1st - thousands)

	(a)		(b)		(c)		(d)		(e)		(f)	
	RCCEP		RCCEP (2)		Gaves & Holton (3)		Brown		EGC			
Net immigration at rate p.a. of	50,000		75,000		100,000 to 40,000		50,000		50,000		Actual 1955-65 (4) (DBS) Estimated 1966-70	
1955	15,698		15,698		15,698		15,698		15,698		15,698	
1961	17,863		18,035		18,023		18,238		18,238		18,238	
1963	18,606		18,842		18,752		19,035		18,896		18,896	
1965	19,374		19,679		19,509		19,867		19,646		19,571	
1966	19,747		20,083		19,811		20,296		20,039		19,907	
1970	21,339		21,826		21,070		22,112		21,729		21,375	
% Increases	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.
1955-63	18.52	2.14	20.03	2.23	19.45	2.25	21.26	2.44	20.37	2.34	20.37	2.34
1963-70	14.69	1.98	15.84	2.12	12.36	1.68	16.16	2.16	14.99	2.015	13.12	1.776

(b) Hood and Scott exclude the population of the Yukon and the North-West Territories from their figures since the populations of these two territories are also excluded from the civilian labour force population. To ensure comparability with the other total population projections, the populations of the territories have been added back in. The original Hood and Scott figures and the successive adjustments are as follows:

Successive Adjustments to Hood & Scott's
Population Figures to Achieve Common Basis
with other Projections

(thousands)

	(a)	(b)		Net immigration at rate p.a. of	
	Yukon & N.W.T.	Basic Error		(c)	(d)
				50,000	75,000
Column corr'd		(a)	(b)	(a)	(b)
1955	29			15,573	15,573
				15,602	15,602
		96	96	15,698	15,698
1960	36			17,367	17,508
				17,403	17,544
		107	108	17,510	17,652
1961	37			17,717	17,888
				17,754	17,925
		109	110	17,863	18,035
1963	39			18,453	18,688
				18,492	18,727
		114	115	18,606	18,842
1965	41			19,215	19,518
				19,256	19,559
		118	120	19,374	19,679
1966	42			19,585	19,918
				19,627	19,960
		120	123	19,747	20,083
1970	50			21,159	21,643
				21,209	21,693
		130	133	21,339	21,826

3. Caves and Holton's base year (1955) figure of 15,634,000 is based on estimates by Canadian Economic Research Associates (p. 276, foot-note).

Since this figure is short of the actual figure by 64,000, Caves and Holton's 1955 figure has been adjusted upward by this amount in column (c). The growth factors projected by the authors and which are used to derive the subsequent shortfalls shown are as follows:

	1955-60	1960-65		1965-70	
	Overall	Overall	p.a.	Overall	p.a.
% increase	12.562%	10.405%	2%	8.003%	1.55%
shortfalls at beginning of period	72,000	80,000		86,000	

At page 433 Caves and Holton refer to a population figure of 15,637,000. It is assumed that this is a misprint. In any event, an error of 3,000 is trivial.

4. The estimated figure in column (f) for June 1st, 1966, was derived by calculating the rate of growth from the June 1st, 1965 figure of 19,751,000 to the April 1st, 1966 figure (the latest available) of 19,859,000. This rate of growth for the ten month period is 1.47 per cent or 1.77 per cent over the year. Applying this rate of growth to the June 1st, 1965 figure yields the June 1st, 1966 figure of 19,907,000.

5. The actual rate of growth in column (f) from June 1st, 1961 to June 1st, 1965 is 7.309 per cent, or 1.78 per cent a year. Applying this rate of growth - which is remarkably close to the most recent yearly rate of growth of 1.77 per cent (note 4 above) - yields a June 1st, 1970 figure of 21,375,000. (The rate of growth over the five year period is 9.22 per cent.) In this straight line logarithmic extrapolation of the trend of the past four years it is assumed that factors which may tend to increase the rate of growth (such as an increased rate of marriages as the war and post-war babies come of age) will be balanced by factors tending to

decrease the rate of growth (such as a continuing decline in the birth rate). It will be noted that the two most recent projections, those by Brown and the Economic Council, both predict a higher population in 1970 than is shown in column (f). On the other hand both these projections were above the actual 1965 figures and even more above the estimated 1966 figure in which a high degree of confidence may be placed. An additional reason for confidence in column (f)'s crude projection is the closeness of the Royal Commission's 1965, 1966 and 1970 column (a) figures to column (f)'s - within 200,000 in 1965 and closing to 36,000 in 1970.

Comments on the Results of Table I

Only the Royal Commission's 50,000 net immigration a year projection (column (a)) and Caves and Holton (column (c)) predict a lower population in 1970 than is shown in column (f) but even this Royal Commission projection shows a higher rate of growth than does column (f)'s so that by 1971 only Caves and Holton would be predicting a smaller population than this.

To assess the reasons why all the other projectors predict a higher rate of growth of population in 1970 than does column (f), it is best to examine the record of the crude live birth rate, the death rate, the infant mortality rate, and net immigration since 1955. The information in at least the later years of p. 143¹ tables was not available to any of the projectors.

None of the projections predicted so sharp a drop in the birth rate. The "Pill" was not known in 1955. Its future influence seems to have been ignored in 1963.

The Canadian Statistical Review - Weekly Supplement - 25 May 1966, reveals that the 1966 birth rate will continue the decline: in the first four months of 1966, 131,259 Canadians were born in contrast to 141,819

1 Year	Live births per 1,000	Deaths per 1,000	Infant Mortality (up to 1 yr.)	)per 1,000 live births	Net immi- gration
1955	28.2	8.2	31.2		54,000
56	28.0	8.2	31.9		93,000
57	28.3	8.2	31		203,000
58	27.6	7.9	30.2		48,000
59	27.5	8.0	28.4		47,000
60	26.8	7.8	27.3		25,000
61	26.1	7.7	27.		- 9,000
62	25.3	7.7	28.		- 1,000
63	24.6	7.8	26.		17,000
64	23.5	7.6	23.5		42,000
65	21.6	7.54			66,000

out of a smaller population in the first four months of 1965. In addition the death rate may be fractionally higher in 1966, for 52,458 Canadians died in the first four months of this year in contrast to 50,894 in the same four months last year; that is, 3 per cent more died so far this year while the total population is increasing at a rate of 1.776 per cent. But this difference is negligible compared to the fall in the birth rate. A five point per thousand drop in the birth rate, as seems likely to have

1. The general reference for dates prior to 1961 is Canada Year Book (DBS), 1957-58, 1961 and 1962 editions. The 1965 edition (p. 227) was used for 1961 and 1962. The Canadian Almanac and Directory (Toronto: Copp Clark Publishing Co.) gave information as follows: 1965 edition, p. 451, for 1963 and the 1966 edition, p. 454, for 1964.

The Canadian Statistical Review (DBS) May 1966, gave information (monthly averages of births and deaths) from which could be computed the birth and death rate for 1965.

occurred between 1961 and 1966, means 100,000 fewer Canadians every year. This is also a far more important influence than the low net immigration of four of the last six years although if the increase of the last two years is maintained the Economic Council's prediction of 50,000 net immigration a year between 1963 and 1970 will be borne out.

All this explains why the Royal Commission, Brown, and the Economic Council predict a higher rate of growth of population between now and 1970 than does column (f). But this still leaves Caves and Holton's lower prediction unexplained. Apparently it must remain so for their best guess sees the birth rate still above the depression low of 21 per thousand in 1970, yet this rate will be attained in 1966. It is true that they appear to believe that the death rate will remain closer to 8 per thousand than the present and recent 7.5 - 7.6. But this could not make up for the far fewer births. It does not even make up for the shortfall in net immigration. The answer must be somewhere in Caves and Holton's detailed calculations which are not revealed in their book.

Notes to Table II (which follows on page 145)

1. References: RCCEP, Hood and Scott, p. 187-8.
Caves and Holton, pp. 280-6.
RCHS, Brown, pp. 118, 132.
ECC, SS No. 1, p. 41.
DBS, National Accounts Income and Expenditure, 1962, p.66.
DBS, National Accounts Income and Expenditure, 1964, p.58.
DBS, Canadian Statistical Review, Vol. 41, No. 5 (May, 1966), p. 16.
2. The labour force population excludes:
 - (a) members of the armed forces;
 - (b) Indians living on reserves;
 - (c) inmates of institutions;
 - (d) residents of the Northwest Territories and the Yukon.

Apart from these, the labour force population includes everyone 14 years and over.

3. RCCEP.—Hood and Scott's base year (1955) figure is short of the actual

figure by 73,000. The growth factor between quinquennia and the numbers which were added to each quinquennial figure to ensure comparability with the other projections are as follows:

Growth Factor to year shown					Number added	
Net Immigration	50,000		75,000		50,000	75,000
1960	10.89%		11.84%		80,950	81,643
1965	11.74%	p.a. 2.244%	12.49%	p.a. 2.381%	90,453	92,592
1970	11.89	2.272	12.76	2.431	101,208	105,119

4. Caves and Holton--As explained below in note 3 to Table III (Labour participation rates), Caves and Holton give a projection neither of the labour force population nor of the participation rate. Accordingly, their labour force population was derived by dividing the civilian labour force (Table IV) by the derived labour participation rates (Table III) - in short, by working backwards.

5. RGHS--Brown's base year (1961) figure is short of the actual figure by 43,000. The growth factor between quinquennia and the numbers which were added to each quinquennial figure to ensure comparability with the other projections are:

	Growth Factor to year shown		Number added
1966	12.37%	2.360% p.a.	48,000
1971	12.28	2.343% p.a.	54,000

On the other hand, unlike the other projectors, Brown includes the labour force population of the Yukon and Northwest Territories in his projections. Therefore 38,000 was subtracted from his 1966 figures and 44,000 from his 1971 figures before the above growth rates were calculated.

6. ECC.--The Economic Council's base year (1963) figure is short of the

actual figure by 1,000. Accordingly, 1,000 has been added to all the figures in column (e).

7. The labour force population increased 2.546 per cent between the first quarter of 1965 and the first quarter of 1966. In deriving column (f)'s 1966 estimate it was assumed that this rate of increase will moderate slightly so that it will average 2.5 per cent in 1966. It will be noted that this results in a value slightly less than midway between Brown's and the Economic Council's prediction (13,456,000 as opposed to 13,478,000). It is estimated that the 1970 labour force population will maintain this relative position.

Comments on the Results of Table II

At first sight it may appear strange that column (f), should be predicting a higher rate of growth of the labour force population between 1963 and 1970 than all the projections except Brown and the Royal Commission's 75,000 net immigration projection even though column (f)'s total population growth rate in Table I is the lowest except for Caves and Holton's. This, however, stems from the facts, noted in the comments to Table I, that the birth rate is already lower than anyone had predicted it would be by 1970, while net immigration exceeded 50,000 in 1965 for first time since 1958. New born babies do not join the labour force population at once but about 2/3 of new immigrants do.

Notes to Table III (con't from page 148)

2. RCCEP.—Hood and Scott's labour participation rates were derived by dividing their adjusted civilian labour force figures (Table IV) by their adjusted labour force population figures (Table II).

3. Caves and Holton give the actual 1954 and the estimated 1970 average annual labour force participation rates by labour force age groups. Unlike the other projections, they do not give an overall participation

TABLE III

LABOUR PARTICIPATION RATES (1)

(Labour force as percentage of labour force population)
(All ages, 14 and over, annual averages)

	(a)		(b)		(c)		(d)		(e)		(f)		(g)	
	RCCEP (2)		RCCEP (2)		CAVES & MOLTON (3)		PR-1 BROWN (4)		PR-2 BROWN (4)		ECC (5)		Actual 1955-65 (6) Estimated 1966-70 (DBS)	
Net immigration at rate p.a. of	50,000		75,000		100,000 to 40,000		50,000		50,000		50,000			
1955	52.94		52.94		52.94		52.94		52.94		52.94		52.94	
1961	52.82		52.92		52.22		54.10		54.10		54.10		54.10	
1963	52.75		52.90		52.00		54.33		54.15		53.83		53.83	
1965	52.69		52.87		51.77		54.56		54.19		54.18		54.40	
1966	52.76		52.90		51.66		54.67		54.22		54.44		54.44	
1970	52.99		53.13		51.20		54.89		54.45		55.48		55.48	
Difference	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.
1955-63	-0.19	-0.02	-0.04	-0.005	-0.94	-0.12	1.39	+0.17	+ 1.21	+0.15	+ 0.89	+0.11	+ 0.89	+0.11
1963-70	+0.24	+0.03	+0.23	+0.03	-0.8	-0.11	0.54	+0.08	+ 0.30	+ 0.04	+ 1.65	+0.24	+ 1.65	+0.24

NOTES TO TABLE III

1. References: RCCEP, Hood & Scott, pp. 187-88.
 Caves & Holton, pp. 286-7, 635.
 RCHS, Brown, pp. 118, 132.
 ECC, SS. 1, p. 42.
 DBS, Canadian Statistical Review, Vol. 41, No. 5
 (May 1966), p. 16.

rate. Since they include no estimate of the labour force population by age groups it is impossible to derive their estimate of the overall participation rate directly from their own figures. However, both their total population figures (Table I) and their civilian labour force figures (Table IV) are known. These figures as well as the labour participation rates also exist for the most closely comparable projection, that of Hood and Scott with 50,000 net immigration a year. On the assumption that Caves and Holton (C&H) on the one hand and Hood and Scott (H&S) on the other have derived closely similar labour force populations as percentages of their total population estimates, Caves and Holton's 1970 labour force participation was derived as follows:

H&S total population in 1970, Table I

H&S civilian labour force in 1970, Table IV

X H&S labour participation
rate in 1970, Table III

C&H total population in 1970, Table I

C&H civilian labour force in 1970, Table IV

= C&H labour participation rate in 1970, Table III.

$$\text{i.e. } \frac{21,339}{7,785} \div \frac{21,070}{7,431} \times 52.96 = \frac{2.741}{2.835} \times 52.96 = 51.20$$

It will be noted that this derived projection shows a decreasing overall labour participation rate between 1955 and the 1970 (the intervening years' figures were derived by straight-line, non-logarithmic, interpolation since the greater accuracy of logarithmic interpolation would, in this case, be fictitious). This decrease ties in with the argument of Caves and Holton on pp. 280-6 and in their Table 34 (p. 281) where the sharp projected decreases in the labour participation rates for ages 14-19 (both sexes) and men 65 and over and the slight decrease for men 20-24 appear to more than outweigh the increases projected for women

ages 25-44 and 45-64. Also, at p. 635 Caves and Holton predict that the ratio of total population to labour force will increase from 2.79 in 1954 to 2.92 in 1970 - and to the extent that total population and labour force increase in proportion, this implies a decrease in the labour participation rate. The adjusted figures for Caves and Holton's total population and civilian labour force give ratios of one to the other of 2.798 in 1955 and 2.835 in 1970 (as shown above). The movement is at least in the direction predicted.

4. RGHS.—Brown's labour participation rates were derived by dividing his adjusted civilian labour force figures (Table IV) by his adjusted labour force population (Table II), all multiplied by 100.

5. ECC.—The Economic Council's were derived in the same way as Brown's because, as with Brown, adjustments had to be made to the Council's figures in Tables II and IV.

6. The actual figures in column (g) for 1955 to 1965 are derived by dividing the civilian labour force by the labour force population as given in the DBS publications to which reference is made. The estimated figure for 1966 is derived by extrapolation of trend by adding 0.04 to the 1965 figure for it is noted that the participation rate in the first three months of 1966 is 0.04 higher than in the first three months of 1965. The 1970 figure was derived by extrapolation of trend and by comparison with the Economic Council's projection. Since the column (g) 1966 estimate was equal to the Economic Council's estimate, the 1970 figure is also set equal.

Comments on the Results of Table III

It is here that Caves and Holton's method of intercountry comparison (with the United States) has led them most astray. Although they were right to predict that more and more Canadian women would follow

their American cousins to offices and factories, they were wrong to think this would be more than balanced by Canadian youths in the 20-24 age bracket staying as long in school as they do in the United States and by more Canadians retiring earlier.

It is interesting to note that the participation rate rose 1.24 percentage points between 1955 and 1961, mostly a time of recession, and has risen a further 0.34 points during the last five years of increasing prosperity. Brown, the Economic Council, and column (g) all predict a continuance of this rise as the boom continues to 1970. The basic judgment is that as the work week shortens more and more members of family groups are finding that the material benefits to be derived from working outweigh the disadvantages of the loss of leisure.

Notes to Table IV (con't from page 152)

2. RCCEP.—Hood and Scott give the labour force as 5,555,000 in their base year, 1955. Later DBS figures set the labour force at 5,610,000. Accordingly, Hood and Scott's figures have been adjusted as follows, account being taken of the rates of growth in each preceding five year period:

Immigration rate p.a. 50,000	rate of growth % amount added (thousands)	1955 — 55	1960 10.711 61	1965 11.382 68	1970 12.555 75
75,000	rate of increase % amount added (thousands)	— 55	11.791 61	12.399 69	13.324 78

3. Caves and Molton give the labour force as 5,458,000 in their base year, 1955. Since the actual figure was 5,610,000, 152,000 has been added to their base year figure. The authors make no prediction for intermediate years, simply contenting themselves with forecasting a labour force of 7,230,000 persons in 1970 — an increase of 32.466%. This final figure has been adjusted by adding 152,100 multiplied by the growth factor of 32.466% i.e. by 201,000. Intervening years have then been interpolated,

TABLE IV
THE CIVILIAN LABOUR FORCE (1)
(monthly averages - thousands)

	(a)		(b)		(c)		(d)	(e)		(f)		(g)		
	RCCEP (2)		RCCEP (2)		CAVES & HOLTOM (3)		PR-1 BROWN 5	PR-2, 3F, 3C BROWN (5)		ECC (4)				
Net Immigration of rate p.a. of	50,000		75,000		100,000 to 40,000		50,000	50,000		50,000		Actual 1955-65 (DBS) Estimated 1966-70 (6)		
1955	56.10		56.10		56 10		5,610	5,610		5,610		5,610		
1961	63.46		64.21		62 78		6,521	6,521		6,521		6,521		
1963	66.25		67.28		65.18		6,861	6,839		6,748		6,748		
1965	69.18		70.49		67 67		7,219	7,171		7,104		7,141		
1966	70.84		72.24		68 95		7,405	7,343		7,302		7,325		
1970	77.85		79.88		74 31		8,153	8,090		8,140		8,178		
% Increases	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.
1955-63	18.09	2.10	19.93	2.30	16.19	1.89	22.30	2.55	21.91	2.51	20.29	2.335	20.29	2.335
1963-70	17.51	2.33	18.73	2.48	14.01	1.89	18.83	2.51	18.29	2.43	20.63	2.72	21.19	2.78

NOTES TO TABLE IV

1. References: RCCEP. Hood & Scott p. 185.
CAVES & Holton, pp. 286-7, 634.
RCHS: Brown a) PR-1: p. 118 b) PR-2, 3F, 3C pp. 126 & 186.
ECC: SS. 1, p. 38, SS. 2, p. 54 and ECC p. 42.
DBS: National Accounts: Income and expenditure, 1962, p. 66.
National Accounts: Income and expenditure, 1964, p. 58.

REFERENCES TO TABLE IV
(cont'd)

Canadian Statistical Review, Vol. 41, No. 5, (May 1966).
Weekly Bulletin Vol. 34, No. 21 (27 May 66) p. 2.

based on the constant rate of growth assumed by Caves and Holton.

4. ECC.--Staff Study No. 1 explains at page 29 how the labour force population was converted to an annual average basis from the June 1st estimate. It can therefore be assumed that the civilian labour force figures are on the same annual average basis rather than on the DBS monthly averages basis. To ensure comparability with the other projections the ECC figures in column (f) were reconverted to a monthly averages basis by adding 3,000 to the 1961 figure and 11,000 to the 1963 base year figure, thus making them identical to the DBS figures. Subsequent corrections, which take account of the growth factor, have been made to the later ECC figures as follows:

1965:	12,000
1966:	12,000
1970:	13,000.

5. BCHS.--In like manner, and for the same reason, 3,000 was added to Brown's base year (1961) in columns (d) and (e) as well as 3,000 multiplied by the growth factor (adjusted as shown immediately below) to each of the later year's figures. This added 3,000 to the 1965 and 1966 figures and 4,000 to the 1970 figure. However, although Brown did not include the Northwest Territories and the Yukon in his base year (1961) figures, he did include these two territories in his projections. To ensure comparability with the other projections, the labour force of the two territories has been subtracted from subsequent years' figures as follows:

1963:	-11,000
1965:	-12,000
1966:	-13,000
1970:	-14,000.

The growth rates, once the figures have been adjusted by the subtraction of the territories' labour force, are as follows:

	1961 to 1966	1966 to 1971
PR-1	13.56% (2.576% p.a.)	12.79% (2.437% p.a.)
PR-2, 3F, 3C	12.61 (2.404 p.a.)	12.87 (2.451 p.a.)

6. The actual increase in the civilian labour force between the first four months of 1965 and the first four months of 1966 (the last months for which figures are available) is 3.71 per cent. Though this growth rate is probably more reliable for extrapolation than the 4 per cent increase that occurred between April 1965 and April 1966 it is considered still unsustainably high. Therefore the 1966 and 1970 civilian labour force is estimated by multiplying the appropriate labour force population figures in column (f) of Table II by the analogous labour participation rates in column (g) of Table III.

Comments on the Results of Table IV

Though the results of the various projections had to be derived in various ways, as explained in the notes above, all Table IV is is Table II multiplied by Table III. Therefore nothing need be added to the comments on these two tables except to note the sizable shortfall in the civilian labour force that comes about through underestimating the labour participation rate. Already by 1965 Caves and Holton were 374,000 workers short - over 5 per cent of the labour force. By 1970 the prediction is that they will have underestimated by 747,000 workers - over 9 per cent of the labour force.

Notes to Table V (cont'd from page 155)

2. Since adjustments were made both to Brown's civilian labour force and total civilian employment figures, all the figures in columns (d) to

TABLE V
EMPLOYMENT RATIO (1)
(Employment as percentage of labour force)
(Monthly averages)

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
	RCCEP	RCCEP	CAVES & HOLTON	PR-1 BROWN(2)	PR-2 BROWN(2)	PR-3F BROWN(2)	PR-3C BROWN(2)	ECC (3)	Actual 1955-65 (DBS) Estimated 1966-70	(4)
Net immigration at rate p.a. of	50,000	75,000	100,000 to 40,000	50,000	50,000	50,000	50,000	50,000		
1955	95.61	95.61	95.61	95.61	95.61	95.61	95.61	95.61	95.61	
1961	97.00	97.0	96.0	92.76	92.76	92.76	92.76	92.76	92.76	
1963	97.0	97.0	96.0	94.05	94.03	91.52	90.96	94.47	94.47	
1965	97.0	97.0	96.0	95.35	95.34	90.31	89.21	97.00	96.09	
1966	97.0	97.0	96.0	96.00	96.00	89.69	88.33	97.00	96.89	
1970	97.0	97.0	96.0	96.00	96.00	87.45	88.52	97.00	97.00	
Difference	Over- all p.a.	Over- all p.a.	Over- all p.a.	Over- all p.a.	Over- all p.a.	Over- all p.a.	Over- all p.a.	Over- all p.a.	Over- all p.a.	Over- all p.a.
1955-63	+1.37 +0.17	+1.37 +0.17	+0.37 +0.046	-1.58 -0.28	-1.60 -0.20	-4.11 -0.51	-4.67 -0.58	-1.17 -0.15	-1.17 -0.15	-1.17 -0.15
1963-70	0 0	0 0	0 0	+1.95 +0.28	+1.97 +0.28	-4.07 -0.58	-2.44 -0.35	+2.54 +0.36	+2.54 +0.36	+2.54 +0.36

NOTES TO TABLE V

1. References: RCCEP, Hood and Scott, p. 195; Final Report p. 325.
CAVES & Holton, - see ~~our page 11~~ page 4 above.
RCHS, Brown pp. 84, 118, 135, 169, 178.
ECC, SS. 3, p. 40.
DBS, Canadian Statistical Review, Vol. 40, No. 7,
(July 1965) p. 14; idem, Vol 41 No. 5 (May 1966) p. 16.
DBS, Weekly Bulletin Vol. 34 No. 21 (27 May 1966) p. 2.

(g) were recalculated by dividing Brown's appropriate Table VI figures by the analogous Table IV figures. In other words, Brown's own employment ratios were discarded.

3. Figures for 1965 to 1970 for the Economic Council (column (h) were derived by the same method as were Brown's.

4. The average unemployment rate during the first four months of 1965 was 5.65 per cent and during the first four months of 1966 it was 4.75 per cent. This is a drop of 0.9 percentage points. Subtracted from the 1965 unemployment rate of 3.82 per cent, this would indicate that the 1966 unemployment rate will be 2.92 per cent. However, seasonally adjusted the April, 1966, unemployment rate was 3.3 per cent. Taking the mean, a 1966 unemployment rate of 3.11 per cent is derived, that is, an employment ratio of 96.89 per cent - very close to the Economic Council's assumption of 97 per cent. In keeping with the Economic Council, it is assumed that the economy is capable of being guided by 1970 to the high-level employment ratio of 97 per cent.

Comments on the Results of Table V

Brown's unemployment figures in his PR'3F and 3C are not projections of the probable but are indications of what would happen if the unfavourable trends of the early-1961 economy were to continue unchanged. Of course, Brown, like everyone else, assumes that no government would allow unemployment to rise to $12\frac{1}{2}$ per cent by 1970.

The experience so far in 1966 seems to bear out the Economic Council that Canada can have 97 per cent of its labour force employed.

Notes to Table VI (cont'd from page 157)

2. RCCEP and Caves and Holton.--Since the Royal Commission forecast an employment ratio of 97 per cent and since it is assumed that Caves and Holton's employment ratio is 96 per cent (see Table V in both cases), the

TABLE VI
TOTAL CIVILIAN EMPLOYMENT (1)
(monthly averages - thousands)

	(a)		(b)		(c)		(d)		(e)		(f)		(g)		(h)		(i)	
	RCCEP (2)		RCCEP (2)		CAVES & HOLTON (2)		PR-1 BROWN (3)		PR-3 BROWN (3)		PR-3F BROWN (3)		PR-3C BROWN (3)		ECC (4)		Actual 1955-65 (DBS) Estimated 1966-70 (5)	
Net Immigration at rate p.a. of	50,000		75,000		100,000 to 40,000		50,000		50,000		50,000		50,000		50,000			
1955	5,364		5,364		5,364		5,364		5,364		5,364		5,364		5,364		5,364	
1961	6,156		6,228		6,027		6,049		6,049		6,049		6,049		6,049		6,049	
1963	6,426		6,526		6,257		6,453		6,431		6,259		6,221		6,375		6,375	
1965	6,710		6,838		6,496		6,883		6,837		6,476		6,397		6,891		6,862	
1966	6,871		7,007		6,619		7,109		7,049		6,586		6,486		7,083		7,097	
1970	7,551		7,748		7,134		7,827		7,766		7,075		7,161		7,896		7,933	
% Increases	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.	Over-all	p.a.
1955-63	19.80	2.28	21.66	2.48	16.65	1.94	20.30	2.34	19.89	2.29	13.69	1.95	15.98	1.87	18.85	2.18	18.85	2.18
1963-70	17.51	2.33	18.73	2.48	14.02	1.89	21.29	2.80	20.76	2.73	13.04	1.77	15.11	2.04	23.86	3.10	24.44	3.17

NOTES TO TABLE VI

1. References: RCCEP, Hood & Scott p. 185, Final Report, p. 325.
 RCHS, Brown, pp. 118, 135, 169, 178.
 ECC, p. 42, & SS. 2, p. 54.
 DBS, Canadian Statistical Review, Vol. 40 No. 7, (July, 1965) p. 14.
Canadian Statistical Review, Vol. 41 No. 5, (May, 1966) p. 16.

figures in columns (a) and (b) for 1961 to 1970 were derived by taking 97 per cent of the figures in columns (a) and (b) of Table IV, while the analogous figures in column (c) were derived by taking 96 per cent of the figures in column (c) of Table IV.

3. RCHS.—Brown's original figures include the Northwest Territories and the Yukon (11,000 in 1961) while all others exclude them. Therefore, to ensure comparability, Brown's figures have been reduced throughout by the same amounts as given in note 5, Table IV (page 153). The percentage rates of increase of total civilian employment from 1961 to 1966 in Brown's projections are:

	5 year rate	yearly rate
PR-1	17.52%	3.282%
PR-2	16.53	3.107
PR-3F	8.878	1.716
PR-3C	7.224	1.404

4. ECC.—The Economic Council uses a figure of 6,364,000 for its base year, 1963, in column (a) - a shortfall of 11,000 from the actual figures of 6,375,000. Accordingly, the Council's 1963 figure has been revised upward by 11,000 and the figures for the subsequent years have been by adjusted by the addition of 11,000 times the growth factor as follows:

1965	12,000
1966	12,000
1970	13,000.

5. The 1966 and 1970 estimated figures in column (i) were derived by multiplying the appropriate civilian labour force figures in column (g) of Table IV by the analogous employment ratios in column (i) of Table V.

To derive estimates of output (Table VII) and output per person employed (Table VIII) in 1966 and 1970, it was necessary to break down

the estimated 1966 and 1970 total civilian employment into agricultural and nonagricultural. It was noted that in the five-year period 1960-65 the number employed in agriculture declined by 13,031 per cent or at a rate of 2.48 per cent per annum. This compares with a post-war (1946-65) rate of decline of 3.6 per cent per annum². Though the rate of decline was 5.714 per cent between 1964 and 1965 - as farmers got more and more fed up with low prices for agricultural products in a booming economy - it is predicted that the rate of decline between 1965 and 1970 will be only 10 per cent: the rate of decline will be checked by sustained demand and increasing prices for food products. However, it is also predicted that movement away from the land will continue at a fairly high rate into 1966: the decrease in farm employment in 1966 will be 3 per cent.

Accordingly, the predicted breakdown of employment is:

(thousands)	Agricultural	Nonagricultural
1966	577	6520
1970	540	7393

Comments on the Results of Table VI

Total civilian employment follows directly from the multiplication of the figures contained in Table IV by the analogous figures of Table V.

Again it is interesting to note how Caves and Holton's low labour participation rate has led them to underestimate the actual 1965 civilian employment by 366,000 - by over 5 per cent. It is equally interesting to note that though column (f)'s rate of increase of total population to 1970 is the lowest with the exception of Caves and Holton's, column (i)'s

2. DBS, Weekly Bulletin, Vol. 34, No. 23 (10 June 1966), p. 6.

total civilian employment figure is the highest. As explained in the previous comments, this is the result of our predicted faster rate of growth of the labour force population, high labour participation rate, and high employment ratio.

The breakdown in note 5 above of total employment into agricultural and nonagricultural is especially interesting in view of Drummond and MacKenzie's prediction that employment on the farm would number 733,000 in 1965 (see page 31) while in actual fact it numbered only 594,000. Furthermore, it is predicted that it will number only 540,000 in 1970 and not the 727,000 predicted by Drummond and MacKenzie. Farm employment in 1970 will be 6.8 per cent of total employment, not the 9.4 per cent predicted by Drummond and MacKenzie. In 1955 forecasters had no idea of how strongly impoverished marginal farms would feel the pull of increasingly affluent cities.

Coincidentally, column (i)'s ¹⁹⁷⁰ prediction of 540,000 employed on the farms is identical to John Dawson's prediction which was derived by a much more complex method (see p. 40).

Notes to Table VII (which follows on page 161)

1. References: RCCEP, Hood and Scott, Table 5. 20, p. 226.

Caves and Holton, p. 302.

RCES, Brown, pp. 119, 136, 168, 177.

ECC, SS. No. 2, p. 62.

DBS, National Accounts: Income and Expenditure 1962, p. 28.

National Accounts: Income and Expenditure 1964, p. 20.

Canadian Statistical Review, Vol. 41, No. 5, (May 1966) p. 4.

2. RCCEP.—Hood and Scott's base year (1955) GNP figure is \$21,600,000,000 in 1949 dollars, that is, \$28,579,000,000 in 1957 dollars, a shortfall of

TABLE VII
GROSS NATIONAL PRODUCT (i)
Millions of 1957 dollars

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
	RCCEP(2)	RCCEP(2)	CAVES & HOLTON(3)	PR-1 BROWN (4)	PR-2 BROWN (4)	PR-3F BROWN(4)	PR-3C BROWN (4)	ECC (5)	Actual 1955-65 (5) Estimated 1966-70 (6)
Net immigration at rate p.a. of	50,000	75,000	100,000 to 40,000	50,000	50,000	50,000	50,000	50,000	
1955	29,018	29,018	29,018	29,018	29,018	29,018	29,018	29,018	29,018
1961	36,527	36,976	36,454	35,081	35,081	35,081	35,081	35,081	35,081
1963	39,439	40,087	39,335	38,972	38,956	37,525	37,983	39,145	39,145
1965	42,586	43,459	42,442	43,295	43,259	40,140	41,125	43,569	44,680
1966	44,524	45,500	44,087	45,634	45,586	41,515	42,792	45,966	47,472
1970	53,199	54,677	51,337	54,552	54,795	47,687	51,308	56,941	59,014
% Increases	Over- all	Over- all	Over- all	Over- all	Over- all	Over- all	Over- all	Over- all	Over- all
1955-63	35.91 3.910	38.145 4.122	35.554 3.875	34.30 3.75	34.25 3.75	29.32 3.25	30.89 3.4	34.90 3.81	34.90 3.81
1963-70	34.89 4.369	36.396 4.534	30.512 3.877	39.98 4.92	40.56 5.0	27.08 3.5	35.08 4.39	45.463 5.5	50.76 6.039

\$439,000,000 from the revised DBS figure of \$29,018,000,000. The shortfall has been added to the base year figures in columns (a) and (b) as well as to each succeeding figure times the growth factor. Since Hood and Scott give two estimates of GNP for each of their net immigration estimates, each of the two GNP estimates being based on a different rate of increase of productivity per man-hours, ^{the} mean of the productivity increases (2.875 per cent p.a. p.a.), and therefore of the two GNP estimates, has been taken. The Final Report (pages 327-9) accepts 2.875 per cent as being the most likely productivity growth rate per man-hour.

Hood and Scott's GNP growth rates are:

Immigration at rate p.a. of	50,000			75,000		
	% increase		shortfall	% increase		shortfall
	Overall	p.a.	millions	Overall	p.a.	millions
Rate of increase & shortfall to year shown						
1955-65	46.76	3.910	644	49.77	4.122	657
1965-70	24.92	4.550	804	25.81	4.698	827

3. Caves and Holton simply give GNP in their final year (1970), their "best guess" being \$48,000,000,000 in 1955 dollars. These have been converted to 1957 dollars and the intervening values interpolated. The growth rate over the 15 year period is 76.914 per cent (3.8756 per cent p.a. p.a.).

4. RGHS.--Brown gives GNP in 1961 (his base year) as being \$34,529 millions - a shortfall of \$552 millions.

The adjustments (additions) are as follows:

	PR-1	PR-2	PR-3F	PR-3C	
1966	\$718	\$717	\$653	\$673	millions
1970	858	861	750	806.	

Since during the second 5 year period (1966-1971) in PR-1 GNE and GNP grow at a rate of 4.56 p.a. the 1970 figures were derived by multiplying the projected figures for 1971 by 0.95639. In PR-2 the 1971 figures were multiplied by 0.95522 since the projected rate of growth was 4.688 p.a. In PR-3F the growth rate is 3.5, the multiplier therefore 0.9662. In PR-3C the growth rate is 4.6, the multiplier therefore 0.9561.

5. ECC.—The Economic Council uses GDP estimates in its staff study no. 2. This is unfortunate since it prevents ready comparison with the GNP estimates used in the other studies and in far more common use among the informed public and governments to which the Economic Council addresses itself. On being asked for a ready method of translating their GDP estimates into GNP, the Economic Council replied on September 13, 1965:

The movements over time of GNP and GDP in real terms should be fairly close, as they measure approximately the same thing by two different independent sources of data. GNP is a deflated estimate of final expenditures, and GDP a sum of real output by individual industries. The most complete discussion of the sources of difference is found in Appendix "D" pages 135 to 144 of the DBS Volume "Indexes of Real Domestic Product by Industry of Origin 1935-1961", Catalogue No. 61-505 Occasional.

This is also discussed in the paper by V.R. Berlinguette and F.H. Leacy, in Volume 25 of the Conference on Income and Wealth entitled "Output, Input and Productivity Measurement", pages 203 to 249. These two references should give you all the information you need in connection with your inquiry.

This does not help for a glance at Indexes of Real Domestic Product by Industry of Origin 1935-61 reveals that detailed forecasts of indirect taxes for the years ahead would be required. This DBS publication itself states: "Because the procedures followed in obtaining estimates of constant dollar indirect taxes were so complex, the question will be raised as to why some simple adjustment, such as aggregate indirect taxes, deflated with an index of tax rates, could not be attempted."³ DBS

3. Canada: DBS. Indexes of Real Domestic Product by Industry of Origin 1935-61 (Ottawa: Queen's Printer, 1963), p. 137.

demonstrates in a simple example that "direct deflation of current dollar indirect taxes with a simple index of tax rates will not provide the required result".

It is, then, difficult enough to convert past estimates of GDP at factor cost into GNP at market prices. The conversion of projected values would be a major forecasting and mathematical undertaking beyond the scope of this paper. Moreover, the results, entailing as they must a new source of forecasting error (of indirect tax rates) - and probably a measure of bad mathematics to boot - would simply ensure the continued non-comparability of the Economic Council's derived GNP results with those of the other studies.

Finally, it should be noted that conversion of GDP to GNP is not facilitated by variations in the definition: the Economic Council states the actual GDP in 1961 was \$31,939 millions while Brown sets it at \$35,095 millions (Brown page 118). A discrepancy of \$3,256 millions cannot be explained by DBS issuing revised statistics after a projection has been completed.

Since, despite the above, it was still necessary to compare the Economic Council's output projection with the others, GNP estimates for the Council are simply derived by multiplying the actual 1963 GNP by the growth factor predicted by the Council: 5.5 per cent per annum.⁴

6. The 1966 and 1970 estimates of output in column (i) were derived by multiplying the appropriate total civilian employment figures in column (i) of Table VI by the analogous output per person employed figures in column (i) of Table VIII.

Comments on the Results of Table VII

It will be noted that column (i) predicts an increase of 1966 GNP

4. ECC, First Annual Review, p. 48.

over 1965 of 6.25 per cent. Though this is high by historical standards, it is still lower than the actual increase of 6.65 per cent from 1964 to 1965. The column (i) estimate of GNP is considerably higher than any other estimate. This is partly explained by optimism regarding rising participation rates, employment and productivity but also by the fact that the actual GNP in 1965 was already over a billion dollars higher than the closest estimate.

The feasibility of this high prediction is further discussed in Chapter VI.

Caves and Holton note that the Royal Commission on Canada's Economic Prospects' "best-guess estimate, based on a productivity growth-rate outside of agriculture of 2.88 per cent and annual net immigration of 75,000, implies a GNP growth trend just slightly higher than our best guess"⁵ based on a 2.0 per cent productivity increase and net immigration declining from 100,000 to 40,000 per annum. Caves and Holton conclude that the Commission's "greater optimism would seem to imply greater differences in the forecasts than actually appear, and there may be partially offsetting differences in the assumption the two sets of forecasts make about such factors as the rate of transfer of labour out of the agricultural sector".

Be this as it may, the differences in the two sets of forecasts lead Caves and Holton to forecast a 1970 GNP \$3,340 million less in 1957 dollars than does the Royal Commission - a difference of 6.1 per cent of the Royal Commission's final figure or of almost 0.4 per cent per annum compounded from 1955 to 1970.

Notes to Table VIII (which follows on page 166)

(1) References: ECC. SS 2, Table 31, - p. 62.

5. Caves and Holton, p. 303.

TABLE VIII
OUTPUT PER PERSON EMPLOYED PER YEAR (1)
1957 Dollars

TABLE VIII

	(a)		(b)		(c)		(d)		(e)		(f)		(g)		(h)		(i)	
	RCCEP (2)				CARRIES & BELTON (2)		PR-1		BROWN (2)				(PR-3C)		ECC (2)		Actual 1955-65 Estimated 1966-70 (3)	
Net immigration at rate p.a. of	50,000		75,000		40,000		50,000		50,000		50,000		50,000		50,000			
1955	5,410		5,410		5,410		5,410		5,410		5,410		5,410		5,410		5,410	
1961	5,934		5,937		6,048		5,799		5,799		5,799		5,799		5,799		5,799	
1963	6,137		6,143		6,287		6,039		6,058		5,995		6,106		6,140		6,140	
1965	6,347		6,356		6,534		6,290		6,327		6,198		6,429		6,323		6,511	
1966	6,480		6,494		6,661		6,419		6,467		6,304		6,598		6,490		6,689	
1970	7,045		7,057		7,196		6,970		7,051		6,740		7,165		7,211		7,439	
% Increases	Overall	p.a.	Overall	p.a.	Overall	p.a.	Overall	p.a.	Overall	p.a.	Overall	p.a.	Overall	p.a.	Overall	p.a.	Overall	p.a.
1955-63	13.44	1.59	13.55	1.60	16.21	1.895	11.63	1.38	11.98	1.42	10.81	1.29	12.87	1.52	13.49	1.595	13.49	1.595
1963-70	14.80	1.99	14.88	2.00	14.46	1.95	15.42	2.07	16.39	2.19	12.43	1.69	17.34	2.31	17.44	2.32	21.16	2.78

2. In each case (except for the estimates in column (i)) the results were derived by dividing the appropriate figures in Table VII (Output) by the analogous figures in Table VI (total civilian employment). This was done even in the case of the Economic Council's projection, though it included a table showing output per person employed, because of the adjustments it was necessary to make to the Council's figures in Table VI and VII.

3. To derive the 1966 and 1970 estimates in column (i), it was necessary to calculate the future overall rate of increase of productivity per man-year. In agriculture the annual trend (1946-65) rate of change in productivity (output per person employed) is 5.3 per cent, while in the commercial non-agricultural sector it is 2.5.⁶ To derive the overall rate of increase in productivity each sector was weighted in accordance with predictions concerning the future sectoral breakdown of employment (Table VI, Note 5) as follows:

Increase in Productivity in 1966 =

$$\frac{105.3 \times 577}{7097} + \frac{102.5 \times 6520}{7097} = \frac{607.581 + 6683}{7097} =$$

$$\frac{7290.581}{7097} = 102.7276, \text{ i.e. } 2.7276\% .$$

Increase in Productivity in 1970 =

$$\frac{(105.3)^5 \times 540}{7933} + \frac{(102.5)^5 \times 7393}{7933} =$$

$$\frac{699.094 + 8364.501}{7933} = \frac{9063.595}{7933} =$$

$$114.2518, \text{ i.e. } 14.2518\% .$$

In other words, estimated output per person employed increases by these percentages in 1966 and 1970 over the known 1965 level.

6. DBS Weekly Bulletin Vol. 34, No. 23, (10 June, 1966), pp. 5-6.

Comments on the Results of Table VIII

This table shows the increasing efficiency of the economy: the increasing productivity per man-year. The high output per person employed figures of column (i) for 1966 and 1970 stem from the high GNP figures of Table VIII, column (i), which more than make up for the high total civilian employment figures of Table VI, column (i). This^{is} as it should be for a fundamental assumption about the Canadian economy is that the more people employed the more efficient the economy becomes because of the more intensive use of overhead capital.

Caves and Holton greatly underestimated the compound yearly rate of increase of labour productivity (pages 45-47). They set the growth rate of agricultural productivity at 1.5 per cent per man-year when it should be 5.3 per cent, and the non-agricultural growth rate at 2.0 per cent per man-year instead of 2.5 per cent. Drabble of the Economic Council was closer to the agricultural productivity growth rate with his prediction of 3.5 per cent per man-year (page 49).

Notes to Table IX (which follows on page 169)

1. This table was derived throughout by dividing the appropriate figures in Table VII (output) by the analogous figures in Table I (population).

Comments on the results of Table IX

This is the pay-off: the objective of policy is, or should be, the increasing welfare of the people. Because of lower population and higher GNP projections column (i) predicts the average Canadian will be over 5 per cent better off in 1970 than does the Economic Council.

It should be noted that today's decreasing birth rate increases per capita income, for babies do no work and are simply consumers. But fewer babies today means a decreasing rate of increase of the labour force twenty years from now. And this will mean a decreasing rate of increase

TABLE IX
OUTPUT PER CAPITA PER YEAR (1)
1957 dollars

	(a) RCCEP		(b) RCCEP		(c) CAVES & HOLTON		(d) BROWN PR-1		(e) BROWN PR-2		(f) BROWN PR-3F		(g) BROWN PR-3C		(h) ECC		(i) ↑ Actual 1955-65 Estimated 1966-70	
Net immigration rate p.a. of	50,000		75,000		100,000 to 40,000		50,000		50,000		50,000		50,000		50,000			
1955	1,849		1,849		1,849		1,849		1,849		1,849		1,849		1,849		1,849	
1961	2,045		2,050		2,023		1,924		1,924		1,924		1,924		1,924		1,924	
1963	2,120		2,128		2,098		2,047		2,047		1,971		1,995		2,072		2,072	
1965	2,198		2,208		2,176		2,179		2,177		2,020		2,070		2,218		2,283	
1966	2,255		2,266		2,225		2,248		2,246		2,045		2,108		2,294		2,385	
1970	2,493		2,505		2,436		2,467		2,476		2,157		2,320		2,621		2,761	
Increases	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.	Over- all	p.a.
1955-63	14.66	1.73	15.09	1.77	13.47	1.59	10.71	1.28	10.71	1.28	6.60	0.80	7.90	0.96	12.06	1.43	12.06	1.43
1963-70	17.59	2.34	17.72	2.36	16.11	2.16	20.52	2.76	20.96	2.76	9.44	1.30	16.29	2.18	26.50	3.42	33.25	4.19

Λ

CHAPTER V

LESSONS TO BE LEARNT FROM ECONOMIC PROJECTIONS MADE IN CANADA

In a country with well-developed national accounts statistics, such as Canada, it is well to start with an overall or aggregate projection for this yields early on the possible or desirable rate of growth of GNP. The contrasting method of starting with sectoral projections, necessary when sufficient information is lacking, yields this rate of growth only at the end, by summation of the sectoral projections. It is likely that this result will not be the highest rate of growth the country could attain.

A complete projection of the Canadian economy, then, involves starting from an aggregate projection, proceeding with an analysis of the different sectors and, finally, comparing the aggregate projection with the results obtained from the study of the different sectors, so that any necessary reconciliation can be made.

While the details will be analysed step by step below under the headings of Overall Projection and Sectoral Projection, it is well to stress here the main lessons to be learnt from the use of the employment method for projecting economic growth in Canada.

It is necessary to start with a total population projection. This requires assessment of two minor variables (the death rate - minor because of its recent high constancy - and the infant mortality rate) and two major variables (the birth rate and net immigration). At first sight the birth rate might not appear to offer much difficulty - until it is realized that Canada's birth rate has dropped 20 per cent in five years, mostly

under the apparent influence of the "Pill" - and this means 100,000 fewer Canadians every year. No one had projected such a drop. Net immigration is even harder to project, for two of the three main factors influencing it are beyond Canada's control: conditions in the countries of emigration (mostly Western Europe) and in the country which receives by far the majority of emigrating Canadians: the United States. The current deflation in Britain increases immigration to Canada while a recent change in the United States' law governing entry from Canada has sharply reduced Canadian emigration. While Britain's recurring crises may now be almost predictable, the change in the United States' law was quite unpredictable. The effect of both, as well as increased immigration from other countries, is expected to give Canada a net immigration in 1966 of some 150,000.¹ This is 75,000 higher than even the Royal Commission's comparatively high projection.

Though the drop in the birth rate and the increase in net immigration have tended to cancel each other out, there is no reason to expect that unforeseen changes in these two population variables will usually be in offsetting directions. Indeed, the opposite is more likely to occur: hard times in the past have usually brought both fewer babies and fewer immigrants. Thus there is merit in the method adopted by both the Royal Commission on Canada's Economic Prospects and the Royal Commission on Health Services in making several population projections each based on a different net immigration forecast.

The second step is the labour force population projection. Since, by definition, the labour force population excludes all those under the age of 14, an incorrect birth rate projection does not show up in this

1. The Minister of Citizenship and Immigration recently forecast gross immigration to Canada in 1966 of 200,000.

population projection for 14 years. Not so, however, for an incorrect net immigration projection, for approximately two-thirds of those coming to or leaving Canada are aged 14 or over. The relatively greater importance of the net immigration project^{ion} - at least for periods up to 14 years - is readily apparent.

The third step is the projection of labour participation rates. An incorrect forecast here of two to four percentage points, as occurred with Caves and Holton, can make a sizable difference to the values derived in the fourth step, the civilian labour force - and, indeed, in all the succeeding steps. Therefore, the factors leading to changes in the labour participation rates, by labour force population age groups and by sexes, must be carefully assessed. The experience of Caves and Holton makes it appear that the method of making an intercountry comparison with the United States is less suitable here than with most other facets of the Canadian economy.

The fifth step is to project the employment ratio. This projection depends on the forecaster's assessment of the future level of economic activity and, on the assumption that he projects "full" employment, what he means by "full" employment. This depends on the projector's views concerning the level of employment that can be sustained without inflationary pressures creating imbalances sufficient to bring on a recession. Both Brown and the Economic Council are right to stress that their projected maximum employment ratios are not constants: such ratios can be increased - unemployment can be reduced even more - by increasing the mobility of the labour force. Measures which, for example, upgrade the working skills of sizable numbers of workers may, therefore, be expected to increase the maximum employment ratio.

The sixth step, total civilian employment, is derived directly from

the multiplication of the figures for the civilian labour force by the employment ratio.

The seventh step yields gross national product. This is derived from total employment, hours of work per man per year, and changes in productivity. In Canada the decrease in hours of work per man per year is practically invariably outweighed by increases in employment and in productivity. The most important parameter here is the increased productivity. Although its overall value can be projected on the basis of past trends, its effect on the nation's welfare is such that every effort should be made to project its value industry by industry. The overall productivity increase is then derived from the weighted averages of these sectoral productivity changes.

The eighth step yields output per person employed per year and is derived by dividing GNP by the total employment figures. It is a measure of the efficiency of the economy. The normal year to year increases result from the increased productivity per man per year.

Finally, the ninth step, output per capita per year, is derived by dividing GNP by the total population figures. Its yearly increase is the measure of the addition to welfare.

1. The Overall Projection

By any set of criteria full employment and a high rate of economic growth are primary national goals. A rapidly expanding gross national product (GNP or Y) can normally only be achieved with an efficient use of all factors of production and this necessarily implies close to full employment of the labour force. Also, economic growth is usually defined in terms of increase in GNP or of increase in GNP per capita. It therefore follows that the overall projection is mainly concerned with determining the future rate of growth of GNP.

(a) Projecting GNP

Four basic methods exist:

(i) Projection from past growth rates

(ii) Projection through invariances

(iii) Projection by broad sectors

(iv) Projection through employment.

(i) Projection from past growth rates.—Once the past rate of growth of GNP has been determined, the necessary future marginal capital output ratio (MKOR), the necessary ratio of savings out of GNP (S/Y), etc., are derived with a view to deciding either (A) the possible or (B) the desirable future rate of growth of GNP.

(A) The possible future growth rate.—The determination of what growth rate is possible in future is an objective question which involves the forecaster in as complete an examination as possible of his country's economy and the main trends of its development, especially that of its recent past. Extraordinary, random, or irregular features, such as wars, must be extracted for they conceal the trend. By their very nature their future occurrence cannot be forecast.

Simple extrapolation of past trends may be appropriate in highly developed countries which have continued an unhurried advance over many years. But such countries have certainly sufficient data to permit more detailed and sophisticated analysis. Simple extrapolation would not have much meaning in an underdeveloped country unless the forecaster doubted the government's ability to take useful action. In Canada simple extrapolation would also generally give poor results, for though Canada's per capita income is high, a country so greatly under foreign influence and still greatly dependent on the export of staples, with an economy so open, cannot blithely look forward to the continuation of whatever trends

were discernible at the start of any particular projection.

The detailed review of a country's past growth can often be supplemented by a look at other countries, especially those which have reached a more advanced stage of development. For Canada this will usually mean the United States. This method can prove useful even if it does nothing else than moderate wishful thinking. But the method itself must be used with caution for it is possible both to ignore similarities between countries as well as to neglect differences. The same forecaster can commit both errors and end up doubly wrong. That Canada has many similarities to the United States can scarcely be denied but no useful projection can be based on any of them before they are carefully examined. A projection encompassing the early adoption in Canada of a recent United States' innovation may turn out to be correct but this would only likely be so if the forecaster had compared and contrasted all aspects of the two countries' economies related to the use of the new technique. This examination would include relative factor endowments and might well look into sociological and political aspects. Constraints must not be overlooked, still less rejected: if the United States, like Hertz, is first there may be more to it than the simple fact that the United States started before Canada. After all, England had its industrial revolution before the United States but is now first neither in GNP nor in income per capita, to name but two criteria.

(B) The desirable future growth rate.—The determination of what growth rate is desirable in future is a subjective question which involves the forecaster in deciding what must be done to meet per capita income and employment goals. The question must be kept entirely separate from the previously considered objective question dealing with the possible growth rate. But even the fixing of a desirable growth rate must take account

of capabilities: it still must be related to past growth rates in one's own and other countries, especially, again, the more advanced. It is common for a forecaster to assume that his country will catch up to the leader either because the more advanced country he is striving to emulate will grow more slowly in the future or because his country will grow more quickly than the fore-runner did at a comparable period in his past. There is no a priori reason for expecting either to occur. The emulation syndrome often leads to a desired rate of growth greater than the possible. If a political decision is then made to set an impossibly high growth rate, the economist must at least not compound the sin by trying to prove such growth can be achieved.

2. Projection through invariances.—This method is basically the reverse of the first one for the marginal capital output ratio (MKOR) and other ratios, deemed to be invariant, are determined first and from them the future rate of growth of GNP is then derived.

MKOR is defined as $\Delta K / \Delta Y$. (The increase in real capital over the increase in GNP.) The rate of change of GNP is derived as follows:

$$\frac{1}{\text{MKOR}} \times \frac{S}{Y} = \frac{\Delta Y}{\Delta K} \times \frac{S}{Y} = \frac{\Delta Y}{Y} = \dot{Y}$$

(where $\Delta K = I = S$).

S/Y is the average propensity to save and is an invariance for a given country at a given period.

Invariances are often combined to form a model of the economy, varying from the most simple to advanced econometric types. R. F. Harrod's is one of the simplest:

s = Average propensity to save (APS)

$k = \frac{\Delta K}{\Delta Y}$ = Marginal capital output ratio (MKOR)

Then, with $\Delta K = I = S$,

$$sY = \Delta K \text{ and}$$

$$k\Delta Y = \Delta K$$

$$\therefore sY = k\Delta Y$$

$$\therefore \frac{s}{k} = \frac{\Delta Y}{Y} = \dot{Y}$$

i.e. the rate of growth of GNP depends on the ratio of the average propensity to save and the MKOR. For example, let $Y = 100$,

$$S = 12 \quad \therefore s = 12/100$$

$$k = \Delta K / \Delta Y = 3$$

$$\text{Then } \frac{s}{k} = \frac{\Delta Y}{Y} \quad \text{i.e. } \Delta Y = \frac{s}{k} \times Y = \frac{12 \cdot 1}{100 \cdot 3} \cdot 100 = 4$$

$$\therefore \frac{\Delta Y}{Y} = \frac{4}{100} = 4\% = \dot{Y}$$

Should the growth rate thus derived be lower than the desired rate, the possibility of increasing the rate can be determined by investigating the feasibility of decreasing k or increasing s . This involves decomposition of the national income aggregates, i.e. sectoral analysis with which we deal later.

It will be noted that use of k , of the MKOR, in the Harrod model assumes a constant ratio between capital and GNP; regardless of changes in labour productivity. The use of this model, then, is more appropriate in under-developed countries where capital is the scarce factor and where increased output can, at least for periods ranging up to five years, only be expected by increasing the supply of capital. Unskilled labour is in excess supply.

In more developed countries the Cobb-Douglas function yields a model of a simplicity equal to Harrod's but with the relationship of GNP to capital extended to include also the relationship to labour. In the United States the Cobb-Douglas approximation is $Y = e(t) L^{\frac{3}{4}} K^{\frac{1}{4}}$. This reveals

that if employment (labour) is increased by 10%, GNP will increase by $\frac{3}{4} \times 10\% = 7.5\%$, while a similar increase in capital in use will increase GNP by 2.5%. In other words, the MKOR in the United States is 4. In India, on the other hand, the Cobb-Douglas function is: $Y = e(t)L^{0.4}K^{0.6}$.

Models used for projections vary in complexity from a dozen to two hundred equations. Brown, for example, uses 29 equations with 29 endogenous variables and 23 predetermined variables (14 exogenous and 9 lagged).² As a rule the equations are expressed in constant monetary units and thus seek to explain only real phenomena. Usually no distinction is made between sectors of the economy. If sectors are distinguished, this will only be done broadly.

There are several advantages to the second method of projecting GNP, that of invariances, over the first method, that which is based on past growth rates. In the first place, the second method forces an early consideration of important aggregates and their consistency. One is on safer ground when projections are based on what appears to be an appropriate balance between required investment and savings and between capital and output. The presentation of alternative rates of growth can thus be more firmly based. Secondly, the second method reveals the different ways different rates of growth can be attained or, alternatively, how the same rate of growth can be attained in different ways; e.g. with less capital and a lower MKOR. Thirdly, the second method focuses attention on the consequences and implications of achieving different rates of growth; for example, the necessity for more domestic capital formation or, alternatively, for more foreign investment. The advantages of achieving growth in different ways is thus revealed. Finally, the second

2. RCHS, Brown, p. 157.

method necessitates examination of the feasibility of the desired rate of growth of GNP: if the desired rate entails an increase in the savings ratio from the present 10% to, say, 30%, it will be apparent that this ratio cannot be attained without a fundamental change in the attitudes of the people.

(iii) Projection by broad sectors.--In this method the forecaster considers the possible and desirable rates of growth of broad sectors of the economy and then decides on the rate of growth of the economy as a whole. The rate of increase of productivity in agriculture is determined, by using intertemporal comparisons, separately from its rate of increase in industry. Account is taken of changes in employment in both sectors. This method is really a mix of the first two, but at the broad sectoral level, and is often used as a supplement to them or as a check of their realism. Intersectoral consistencies are examined to see, for example, whether all labour is absorbed.

(iv) Projection through employment.--This method necessitates starting with a projection of population, followed by a projection of the civilian labour force. The labour participation rate is then derived by dividing total population adjusted to ages 14 and over by the civilian labour force.³ The employment ratio is usually determined by assumption concerning the future success of the community in maintaining or working towards full employment. Total civilian employment is then derived by multiplying the civilian labour force by the employment ratio. GNP is finally derived as follows: Civilian employment times hours of work a year = Labour/hours available a year, plus increase in labour productivity = increase in GNP.

3. As educational standards are raised, the age level may be increased from 14 years to 15 or 16 years.

Once GNP has thus been derived this approach permits easy calculation of GNP per person working and GNP per capita.

It is a method particularly appropriate to a country - such as Canada - which sets great store on achieving full employment⁴ and which, for one reason or another, is confident that lack of capital will not prove a constraint on continued economic growth. On the other hand the employment method may lead to too easy an acceptance that an adequate volume of foreign capital will always be available to make up for any short fall in domestic savings as well as lead to neglect of the long-run consequences, political, social, and economic, of massive direct foreign investment.

The fourth method would be hard to use if much unemployment or under-employment existed, for it would be most difficult to determine whether growth of GNP was caused by increase in labour productivity or job shifts. In such cases the method of invariances would probably be more accurate.

Use of any method is dependent on the data and expertise available and the psychology of the forecaster. Ideally, all four methods should be used with the results compared and reconciled. A work of such completeness with all factors considered from several angles, from the side of demand as well as supply, would likely lead to the prediction of different rates of growth of GNP over sub-periods of the total period of the projection. It would be more realistic, more useful.

(b) Projecting the Supply of Capital

(i) Domestic capital.—Projection of the supply of capital is related to the invariance method of projecting the growth of GNP and, as with this method, is particularly appropriate in underdeveloped countries where

4. Cf. Canada. ECC. Potential Output 1946 to 1970. Staff Study No. 2 by B.J. Drabble (Ottawa: Queen's Printer, Dec. 1964), p. 1: "For many years the unemployment rate was accepted as the best indicator of the general level of resource utilization in a national economy."

capital is scarce. However, it should not be neglected even in developed countries, least of all in one like Canada whose periods of rapid growth have coincided with the entry of massive foreign investment.

The supply of capital consists of domestic and foreign capital but foreign investment is not necessarily exactly equal to the increased supply of capital in a country for the influx may stimulate the population either to save and invest more or to save less and consume more.

Domestic savings are the sum of personal, business and government savings.

Projections of personal savings are usually based on knowledge of the savings-income ratio of the past corrected for whatever changes in future distribution that can be foreseen for, in accordance with the theory developed especially by J. S. Duesenberry in his Income, Saving and the Theory of Consumer Behavior, a person's income in relation both to what he previously earned and to what his neighbours now earn is very important for the S/Y ratio, as is the distribution of increments of income. In underdeveloped countries it is natural, indeed almost necessary, to assume that S/Y will increase else the investment essential to increased income per capita will not occur. In developed countries S/Y appears to be constant in the long-run. Business savings are certainly to some degree dependent on profits, other factors include the possibility of outside finance. Government savings are equivalent to the sum of the expenditure on public social capital and the government budget surplus (or less the deficit) and are partly a function of the rate of change of revenue. More to our purpose, it is possible to predict precisely their future size to the extent that the forecaster is privy to government plans and the government holds to its plans.

(ii) Foreign capital.—Foreign capital has a two-fold effect: it adds to

the supply of capital available for investment, and thus supplements domestic savings, and it adds to the supply of foreign exchange. Economically-speaking, only the second effect need be considered: if foreign capital is not used to buy foreign goods but is used only to supplement domestic savings, then it does nothing that cannot be done equally well by the authorities directly increasing the domestic money supply.⁵

Foreign capital, indeed all capital, goes where returns to capital are greatest, not where the need for capital may be greatest. Where capital is lacking, as in underdeveloped countries, returns to capital are usually not high: the man with the empty pocket is not a market - demand must be effective.

Despite the recent and continuing balance of payments' difficulties of the United States there seems to be no reason why Canada should not continue to be a highly profitable area for foreign investment.

Public borrowings in foreign markets need not concern us for they are not related to Canada's need for foreign exchange - except at the time of the short-lived crisis of May-June, 1962. Apart from this, such public borrowings are merely a reflection of lower costs of borrowing abroad.

Foreign aid, also, is of no concern to Canada, except as a supplier. And since Canada's aid usually takes the form of goods, not of liquid capital, no problem of prediction arises since the balance of payments are not affected. In any event, the amounts in question are small in relation to GNP: gifts as opposed to loans amount to a yearly total of barely 0.0125 per cent of GNP.

Canada, unlike underdeveloped countries, seems assured of a ready

5. This is the short- or, possibly, medium-run effect; inevitably, in the long-run increasing supplies of foreign exchange will lead to increasing imports or to an upward revaluation of the domestic currency.

supply of foreign capital. Canada's problem is one of deciding whether her demand for foreign capital is really as great as the recurring current account deficit would make it appear. But the forecaster's concern is not with whether Canada could - or should - get along with less foreign capital. This is - or should be - the concern of government policy. The forecaster's job is done when, on the assumption the supply will remain adequate, he predicts the future course of the demand for foreign capital.

(c) Projecting the Marginal Capital Output Ratio (MKOR)

As previously stated, the marginal capital output ratio (MKOR), or capital coefficient, is defined as $\Delta K / \Delta Y$; i.e. the quantity of real capital required to produce another unit of real output (with other factors of production changing in the proportions given by the production function). The growth rate of GNP is derived from the MKOR as follows:

$$\frac{1}{\text{MKOR}} \times \frac{S}{Y} = \frac{\Delta Y}{\Delta K} \times \frac{S}{Y} = \frac{\Delta Y}{Y} = \dot{Y}$$

(where $\Delta K = I = S$).

The MKOR must not be confused with the marginal productivity of capital (MP_K). The MP_K is the increase in output resulting from the use of a given increment of capital with all other factors of production unchanged. For example, assume a production function containing only capital (K) and labour (L) as variables, then the MKOR and MP_K are derived as follows:

Initial Position		Position No. 2	
		Increase A	Increase B
Inputs	Capital (K)	50	50
	Labour (L)	20	no change
Output (Y)		5	4
			10

Then position no. 2A gives us:

$$MP_k = \frac{\Delta Y}{\Delta K} = \frac{4}{50} = 8\%$$

And position no. 2B gives us:

$$MKOR = \frac{\Delta K}{\Delta Y} = \frac{50}{10} = 5.$$

The MKOR is used especially when capital is scarce relative to labour. In the limit when the opportunity or social cost of labour is zero, that is, the labour that is not used remains unemployed or underemployed to such an extent, usually in agriculture, that it adds nothing to output, then $MP_L = 0$ and, again assuming only two factors of production, MP_k becomes the reciprocal of MKOR.

The national MKOR is the weighted average of the MKOR's of the various sectors of the economy. This is simply stated but not so easily obtained for, in the first place, the use of capital in each sector depends on the supply of other factors there as well as on the supply of capital itself. When labour is cheap compared to capital - not the typically Canadian case - then these competing factors will be substituted for machines and will decrease the amount of capital required. Equally, in the case of an abundance of well-trained labour - at times the Canadian case - these co-operating factors will increase MP_k and will again decrease the amount of capital required.

The fact that the MKOR thus depends on other factors of production than capital makes its precise value hard to determine. The MKOR is also dependent on the gestation period, the time between the investment of capital and the increase in output.

Another factor in the determination of the national MKOR is the relative importance of the various sectors in the economy; and this depends on factors affecting changes in demand. This, of course, involves sectoral projecting, the second broad stage. Still, at the present stage

it is possible to make broad forecasts - subject to co-ordination and reconciliation later. It is possible, for example, to predict that governmental expenditures will show a relative increase or that personal demand will shift more to services relative to commodities. It is important to note that within each sector are included activities with very different MKOR's; it would not be true to say that all capital-goods industries have higher MKOR's than all consumer-goods industries.

The openness of the economy is the final factor affecting the MKOR. This openness is a function of foreign demand for Canada's products and of foreign competition in Canada's domestic market. If, for example, the Canadian textile industry goes under because of the competition of Japanese exports to Canada, then an industry with a low MKOR disappears and the national MKOR rises. Obviously, one of the most difficult areas of projecting is that of the changing patterns of foreign demand and supply.

For all these reasons the projections of the national MKOR made at this overall stage are rough and must be guided by intercountry and intertemporal comparisons. This involves the forecaster in the choice of the relevant MKOR, for the MKOR may vary over short periods in the past because of changes in relevant prices, in technology, and in scale of output. All three changes can lead to variations in the use of capital relative to other factors of production and thus to different MKOR's. In addition, a change in the share of a given industry in the GNP will affect the MKOR. Finally, the shortrun MKOR will be responsive to cyclical, seasonal or climatological changes in output.

It therefore behooves the forecaster, if he looks to the past for guidance, to take a period of at least a year. On the other hand, if the period is too long the relevancy of the period and of the MKOR is diminished.

The Canadian forecaster is at least spared the problem facing those using the intertemporal method in underdeveloped countries: in Canada most of the relevant statistical data are available.

But even if all the relevant statistical data are available and if the average capital output ratio (AKOR) has changed comparatively little for the past century (as in the case of England and the United States), so that the AKOR equals the MKOR, it cannot happily be assumed there will be no change in the MKOR in the future. The estimates of the past AKOR are subject to many imperfections which hide changes in quality and composition: the car of 1900 is not equivalent to the car of 1966; if the AKOR of the automobile industry is the same today as at the beginning of the century this is coincidental rather than significant. Even if the statistics are good, the equivalence of the AKOR's may be the result of opposing forces. And the stability of the AKOR depends on the starting and end dates chosen. Great changes in the AKOR took place within the last one hundred years.

Finally, even if in the long-run in England and the United States the AKOR's do not change and hence are equal to the respective MKOR's, there is no overwhelming reason why this should be so for other countries. In underdeveloped countries the present value of the MKOR will probably be low because much labour is used in relation to capital - although it must always be borne in mind that much of this labour may be so unskilled as to be ineffective so that the scarcest resource may well be skilled labour. And immobility of factors of production leads to inefficient input mixes and therefore to higher MKOR's. Still, as development starts, much overhead capital will be required so that the MKOR will almost certainly rise. Eventually, as linkages form, the MKOR may be expected to fall again. It may well be that the last two stages are applicable to Canada and that Canada is still essentially in the overhead capital building stage.

Though many linkages have certainly been formed, it would seem true that the Canadian MKOR is still high because of the high transportation costs inevitable in a large land with few people. Other things being equal, it would not be unreasonable to assume that an increasing population density will lead to a long-run decline in the MKOR.

In using the intercountry comparison method to determine the MKOR it is, of course, necessary to make comparison between countries at the same stages of development. However, this does not preclude using, for example, the recent value of the United States MKOR as a guide to the future value of the Canadian MKOR, if it is determined that the Canadian economy is sufficiently similar to the United States' economy of a given number of years ago.

Although the MKOR derived at this stage of projecting is a rough measure and must be refined when sectoral projecting is completed, some estimate is still necessary now to determine how much investment is required to get the possible or desired increase in GNP.

Use of the Cobb-Douglas production function ($Y=e(t)L^aK^{1-a}$) to avoid the labour of the search for an accurate MKOR does not help. If 'a' is very low, i.e. if MP_L is very low (as in many underdeveloped countries), then L is close to zero and the function becomes the MKOR anyway. If 'a' is not close to zero, then MP_L must be estimated and this is no easier than deriving the MKOR.

(d) Projecting the Capacity to Import

The balancing of the foreign sector is done through, on the one hand, external payments, consisting of payments for imported goods and services and the service of the foreign capital invested in the country, and on the other hand, external receipts made up of payments for the home country's exports of goods and services and of foreign capital whether

in the form of direct investment, loans or - in the case of some underdeveloped countries - gifts. A balance is necessarily struck between payments and receipts, if necessary by drawing down foreign exchange reserves or, in the last resort, by currency devaluation. It will be evident that the present capacity to import depends entirely on the extent to which present external receipts exceed payments abroad of dividends and interest on past foreign direct investments and loans. It is not, then, only the underdeveloped nations that need to concern themselves with projections of their capacity to import. Canadians, too, have a problem - even if continuing massive United States' investments have masked it.

(i) External Payments

Imports, Quantities.--The projections of imports should be divided into classes: consumer goods (subdivided into foodstuffs, and manufactured goods), raw materials (including fuel) and capital goods. Contrary to popular opinion, consumer goods do not form the great bulk of Canada's imports; in 1965 no less than 60 per cent of Canada's imports were in the capital goods category. This would follow naturally from the view held by some economists that "the typical situation is one where the financial decisions (to invest financially in Canada by foreigners or to borrow financially abroad by Canadians) is the primary autonomous decision and the import of real goods and services follows later on as a result".⁶

Projections of imports are based on invariances, on fixed relations; that of consumer goods on the marginal propensity to import consumer goods; those of raw materials and capital goods on the average import content of

6. George W. Wilson, Scott Gordon and Stanislaw Judek, Canada: An Appraisal of its Needs and Resources (Toronto: University of Toronto Press, 1965), pp. 174-5.

domestic production and investment respectively. These invariances are usually derived from the country's own experiences, that is, from intertemporal comparisons, for the data are more easily obtainable, and more accurate, than most. These invariances are applied to the projections of GNP, and its broad sectors (consumption, investment, government) which have already been made. To a lesser extent intercountry comparisons can also be made.

Even though invariances are, by definition, invariant, allowance must still be made for whatever factors that can be foreseen that are likely to change the propensities to import or the import contents in the future. These factors include obvious changes in trend, such as a decline in land under cultivation; import substitution through, for example, the building of a new manufacturing sector; and governmental restrictions on imports, such as changes in duty-free allowances for tourists.

Again, it must be stressed that the more detailed sectoral work will result in refinements, in changes, in the projections of GNP and in the estimates of future propensities to import. Also, it is at the sectoral level that import substitution is surveyed. Therefore, the import projections, like all the overall projections, will require adjustments once the sectoral work is done.

Imports, Prices.---Import prices should also be projected if a trend can be detected or if fluctuations can be foreseen. Obviously, such a projection would have to be on an unusually rough and broad basis.

Payments on Foreign Capital.---Insofar as governmental borrowings are concerned, projecting repayments of capital and payments of interest represents no problem; information on the past is not required; all that is needed is knowledge of present policies. Servicing of private foreign debt is much more difficult to forecast and, in Canada's case, much more important.

Payments to foreigners because of holdings of private bonds and equity depend on amortization, rates of interest and, especially, rates of profit and whether these profits are reinvested or remitted to the foreign owners as dividends. Still, it is usually possible to detect and project a trend with an accuracy of, say, ten per cent in the year following the start of the projection. Figures for years further in the future will undoubtedly be affected by policy changes of important creditor nations: the United States recent corporation investment guidelines and their potential effect on Canada is a case in point.

(ii) External Receipts

Exports. Quantities.—The first step is to project the growth of GNP in important export market countries. For Canada, with 80 per cent of her exports going to the United States and the United Kingdom, there is no difficulty in selecting the countries for these GNP projections, although future growth of GNP in Western Europe generally would also be surveyed.

The second step is to project, on the basis of income elasticities or invariances, the likely changes in the foreign markets for the home country's goods. The invariances would include input-output relations giving the amount of raw material required for a given output. The probable gains or losses to substitute goods because of new manufacturing techniques and changes in market size and relative prices of inputs must also be projected.

The third stage is to estimate what share of the foreign markets will go to the home country. Account must be taken of probable changes in the policies of foreign governments, such as the United Kingdom restricting imports or joining the European Economic Community. Finally, the forecaster must determine how much of the total production of potential export goods will be absorbed by his own country's domestic consumption.

Exports, Prices.—As with imports prices, again there is less that can be done here. When dealing with quantities at least invariances exist. Prices on the other hand, are the outcome of all the forces of supply and demand. All that can be done is to project them on the trend or cycle - those who projected greatly increased export prices at the time of the Korean^{war} were not proven wrong.

Even the most skilful exports' projection may fail. It is difficult to get such foreign data as income elasticities of demand and the import content of foreign industries. The home country's export market share may change because, for example, of a well-executed selling campaign by a foreign country. Any projection, then, must make allowances for changes in both the prices and quantities of exports. Such changes can be in an offsetting direction or in the same direction. The author of Canadian projections at least has the consolation of knowing that for a main producer - and Canada is a main producer of newsprint, wheat, nickel, and asbestos - changes in prices and quantities are usually in an offsetting direction.

Assuming that imports have not decreased in proportion to the decrease in exports, shortfalls in projected export earnings decrease GNP immediately as well as its rate of growth. In the case of most countries a further result is a decrease in foreign exchange holdings. The typical Canadian result, however, is an increased rate of increase of foreign ownership of Canada's industry and resources.

Imports of Foreign Capital.—The difference between projected external payments on the one hand and earnings on the exports of goods and services on the other is the increase in foreign exchange in the case of a surplus or creditor nation and the decrease in foreign exchange or increase in the foreign capital required to be imported in the case of a deficit or debtor

nation - Canada's case. So far this has presented no immediate problem to Canada. Indeed, as pointed out above on page 188, the cause of much of Canada's deficit on current account is the surplus on capital account, rather than the other way around.

But in the future should it become government policy to restrict foreign investment in Canada or should new foreign capital become less available, then Canada will face a major problem similar to that which underdeveloped countries encounter: that of meeting the continuing interest and dividend payments on the previously contracted borrowings from and investments by foreigners. To be sure Canada will not face the problem to the full for her productive capacity in relation to her population - in large part because of the foreign investments themselves - is able to make these payments with far less difficulty than can the productive resources of the underdeveloped countries, several of which are already paying out each year in interest and dividends to foreigners as much as they receive in new foreign capital.

Still, Canada will then be obliged both to encourage import-substituting industries and to put renewed emphasis on increasing exports.

Projection of import substitution are considered in sectoral programming

As a last resort Canada will also have to devalue its currency and/or restrict imports. Canada would be able to restrict imports far more than an underdeveloped country without hindering economic growth for far more of Canada's imports can be classed as non-essentials or luxuries even though, as previously pointed out (page 188), no less than 60 per cent of Canada's imports are investment goods. But this is not a problem for the forecaster: the government would be responsible for deciding how to meet a continuing disequilibrium in the balance of payments; the forecaster's job is done when he has forecast it.

The projector is responsible, though, for projecting the increased imports of raw materials and investment goods that are required to increase home production either of import-substituting goods or of exports.

Norway, for example, requires 30 kroner of imports for every 100 kroner of exports. Canada, with her larger resource base, is more fortunate, 15 dollars of imports are required for every 100 dollars of exports.

2. The Sectoral Projection

The overall projection provides the basis from which the total available factors of production are distributed among the sectors. Sectoral projecting will reveal discrepancies in the overall projection which will necessitate revision in the overall and sectoral projections until the adjustment is complete. The overall projection is based on broad concepts. The sectoral projection reveals whether the overall is realistic and consistent with the country's social goals, including the goal of economic flexibility which only shows up in sectoral projecting. It needs to be emphasized that overall and sectoral projections are not too different methods; on the contrary, one is the essential complement of the other. In the overall projection, for example, one shows how much taxes are required; the sectoral projection reveals what kind of taxes.

Because of the complexities of a country's economy, it is necessary to proceed by stages. And the overall projection sets the stage: politicians and public can easily grasp an overall model with four or five sectors.

Growth of future overall demand - which is identical to GNP - has already been calculated in the overall projection. The task of sectoral projection is to break overall demand down so that its distribution among all goods and services may be projected. So far the projector has estimated what the economy needs, not what it has; that is, the overall project-

ion deals with demand. The sectoral projection determines demand by sectors and then assesses the capacity of the sectors to supply the quantities demanded.

The sectoral projection starts with an estimate of the future requirements of final consumption, that is, of final goods and services. The second step is an assessment of the demand for intermediate products, including raw materials. Intermediate products are required for the production of consumer goods and therefore the demand for the latter determines the demand for the former. This leads to the study of inter-industrial relations so that it may be determined what intermediate products are required in the production of final goods and services. The third step concerns the requirements for capital goods, for investment, which is, again, to a large degree a function of the demand for consumer goods.

With sectoral demand thus assessed, the forecaster turns to an estimate of the required supply, which can be met either by imports or by domestic production. In countries where the amount of foreign exchange is limited and hence a crucial constraint,

the first step will consist in distributing the predicted foreign exchange resources among such goods as are not produced within the country. The procedure adopted was first, to study possibilities of import replacement in a particular sector of consumption, so as to reduce imports in that sector to a minimum; and secondly, to make a similar study in regard to intermediate goods. In this way, the replacement of capital goods is left to the last, the maximum possible foreign exchange resources being set aside for the purchase of such goods, on the principle that this is the sector where a major increase in the need for imported goods will result from the elaboration of a programme, and where at the same time substitution will be more difficult to effect.⁷

The demand in each sector, less that part met by imports, will give the

7. United Nations, Economic Commission for Latin America, Analysis and Projections of Economic Development. I. An Introduction to the Technique of Programming. (United Nations: New York, 1955), p. 28.

domestic production to be attained. Beyond this point the job of projection is done and the planners and programmers take over. If the projections show that the desired production in any or several or all sectors will not be attained, the government must decide whether its economic and social objectives, including the attainment of the desired or possible rate of growth of GNP, warrants the establishment of sectoral programmes, of channelling the required capital and other factors of production to where they will best help attain the objectives.

(a) Projecting the Demand for Consumption Goods

There are two basic methods used in the projection of demand for consumption goods. The first uses historical time series while the second projects income changes.

Projecting Historical Time Series.---In this method the trend is extrapolated from historical time series relating to various classes of goods. Adjustments are made for all factors that appear to call for them, such as changes in population, changes in urbanization (which lead, for example, to changes in transportation requirements), changes in government services (for example, the addition of school meals), and changes in volume of consumption due to increased income.

To use this method it is necessary to have reliable statistics over a period of at least several years under "normal" conditions. In underdeveloped countries it is more usual to have good statistics of goods available rather than those actually consumed. The method gives especially good results with regard to the consumption of food which is not stored long.

In the underdeveloped countries the method is of little use for projecting the purchases of manufactured goods not yet in use in the country because they are not imported or manufactured in the country or

because the people cannot yet afford them. Canadians do not have this problem. Indeed, when it does happen that their southern neighbours get a consumer good first, as in the case of television, the method can be combined with an inter-country comparison to give a projection of what Canadians will do when the good becomes available to them.

Finally, this first method can also be used in conjunction with the second method, which follows.

Projecting Income Changes.---This method is divided into three parts: first, the projection of income changes; secondly, combining income changes with invariances; thirdly, allowing for changes in parameters.

The projection starts with the changes in GNP and population determined in the overall projection. The greater the rate of population increase, the less the increase in income per capita and the less the change in consumption patterns. The distribution of future increments in income, which is now considered, is no easy task, not even in Canada, for even the present distribution is only roughly known. Still, taking account of the following factors will at least guide the projection in the right direction: general government policies on distribution of income, rate of growth, occupational differences, degree of urbanization (for propensities to consume are different between town and country), and wage policies. Since consumption is based only on disposable income, account must be taken of government taxation policies, both present and foreseen - the latter to the extent that budgetary secrecy makes this possible.

The second part of the projection of income changes correlates such changes to the consumption of the various categories of goods. These correlations or invariances or income elasticities of demand are obtained, first, by surveys of family budget expenditures, that is, by cross-section

comparisons of consumption patterns; secondly, by inter-country comparisons on the assumption that as one's country develops, its future consumption patterns will resemble the present patterns of a country or countries at present in the lead; and thirdly, by time series of changes in consumption and income taken together to draw conclusions concerning the invariances existing between them. Care must be taken here to ensure that the change in consumption is related to a change in income and not to some other factor such as a change in taste. Here again inter-country comparisons may be used.

The third part of the projection of the effect of income changes on consumption projects the effect of the probable changes in the parameters other than income that were assumed invariant in the second part. First to be considered here is the effect of forecast changes in government policies such as changes in family allowances, subsidies, unemployment insurance and taxes, and controls over imports and prices. All these will affect disposable income and hence consumption. Anything the government does to decrease inequalities of income will increase consumption because of the higher propensity to consume of the less well-to-do. The second major cause for a change in the parameters is a change in tastes. Such changes are obviously very hard to forecast but at least it is known that rapidly rising incomes are more likely to cause changes in taste than slowly rising or stagnant incomes. Finally, changes in relative prices will most likely affect the parameters. For Canada this should not, however, be much of a problem; it is generally only in the underdeveloped countries that rapid changes in relative prices take place. An example is the rapid relative and absolute drop in the cost of power with the advent of electricity.

(b) Projecting the Growth of Governmental Services

Projection of the demand for governmental services at all levels can be included in the projection of the demand for consumer goods and services. But the method of invariances is of lesser use, for in governmental services there is no necessary relation between demand and supply: what these services will be is decided by the governments.

Yet, by subdividing governmental services into categories, useful projections can be made. In the first place, public administration can be projected on past trends and, by the use of invariances, on the rate of population increase and the rate of increase of income per capita. Secondly, government investment in overhead or social capital is an increasing function of industrial and agricultural development and to a lesser extent is a function of the rate of increase in population and income. Lastly, public welfare expenditures are an increasing function of the rate of increase of income per capita, a little less a function of the rate of the growth of manufacturing. The projection can also be guided by intercountry comparisons and through study of the social philosophy of the governing parties at federal and provincial levels. The simplest approach is to use the government budgets for the next five years - if they exist. If they do not, and in Canada they do not, much information can still be gleaned from the yearly budgets which reveal how little of governmental spending is really subject to discretionary reduction in any given year. Usually, a first approximation is that governmental expenditures will not decrease.

On the other side of the ledger, future public revenue is estimated by projecting GNP in relation to the tax structure. Should estimated revenue be less than estimated expenditures, the projector informs his government which then has to choose between reducing expenditures or increasing taxes or doing a bit of both.

(c) Projecting the Replacement of Imports

Simply stated, the projection of the replacement of imports hinges on whether it is better to replace the import of "A" by producing it domestically or whether it is better to favour the export of "B" and import "A" in exchange. The projection, then, depends on calculating the comparative advantages of the two courses, taking note of the following potential difficulties:

- (i) Factors of production could produce "A" but are not suitable for producing "B".
- (ii) Increasing the export of "B" may lead to a decline in its price. If the price elasticity of demand is less than one, increasing exports actually worsens the foreign exchange position. A main supplier of certain commodities, such as Canada, must never lose sight of this.
- (iii) The cost of producing a good may be a decreasing function of the quantity produced and, therefore, of the size of the market. Can enough of "A" be produced to make it worth-while? This criterion is relevant to Canada, whose average production run for domestic consumption is a tenth of the American.
- (iv) The cost of production may also be a function of the length of time the industry has been established: the infant industry argument. But the argument must be carefully assessed: some of Canada's infants are all of eighty years old.
- (v) Cyclical fluctuations in the terms of trade, both short-run and long-run, may completely vitiate calculations based on present prices.
- (vi) Account must be taken of the present prices of the factors of production as well as of the institutional factors, such as labour unions, that may hinder the adjustment of prices.
- (vii) The supply of factors of production will change with development -

labour will acquire new skills, for example.

(viii) Skills and ability of labour and management also depend on overhead facilities which are themselves another increasing function of development.

(ix) Some goods must be processed near raw materials because of the bulk and weight of raw materials. Others, such as beer, must be processed near the consumer. Still others are tied neither to productive factors nor to consumers; for example, textiles, soap, matches.

(d) Projecting Domestic Production

Projections of domestic production are directly based on the demand projections already described. The production projection is broken down into two sections, production for export (based directly on the exports estimates completed in the overall projection) and production for the domestic market. To determine how much must be produced by each sector for the domestic market, it is necessary to examine domestic demand and the projection of import substitution.

Agricultural production.--To determine what measures and investment are required to attain the possible or desired rate of growth, it is necessary to start with a detailed study of the agricultural situation. This will include "a detailed survey of the main commodities it is desired to produce, and, at the same time, an analysis by agricultural areas, besides general studies of an economic and social character."⁸ It is especially important to assess increases in labour productivity for this will indicate not only how much more the farms can produce but also how many men the farms can release to the factories. Because much of Canadian agriculture long ago reached a high state of efficiency, it might be thought that future transformation would be slight. However, by no means all of Canadian agriculture is as well off as the Western

8. U.N., An Introduction to the Technique of Programming, pp. 39-40.

wheat growers in the good years. Much of the farming in Central Canada pays a low return and there seems to be a point where the increasing prosperity of city dwellers finally draws the farmers off the land. This happened, for example, in 1965. Until food prices rise substantially and enough of the increase trickles back to the primary producers, projections should estimate that the rate of farm abandonment will increase in years of high growth for the economy generally.

Manufactured consumer goods.—With the proportion of the demand for the principal goods that must come from domestic production already determined (page 200), the main task now is to calculate how much investment is needed in each sector. The internal structural transformations required by this production can be calculated with input-output matrices or by inter-country comparisons. Again, Canada would use the United States as its model of the future. The use of partial capital coefficients, that is, specific marginal capital output ratios (MKOR), determines the amount of investment required in each industrial sector. This is dealt with under capital goods and intermediate products below.

Services.—As production becomes more complex, as more and more stages are added, commercial activities expand more than proportionately to the growth of GNP. Services can then be estimated to grow slightly faster than GNP.

Capital goods and intermediate products.—Three methods are used to project the requirements for capital goods and intermediate products and their domestic production. They are: (1) marginal capital output ratios (MKOR); (2) surveys of investment intentions; (3) input output model.

1. MKOR's.—Each industrial sector has its own MKOR called the specific MKOR or partial capital coefficient. To estimate future specific MKOR's

the forecaster starts with his own country's specific MKOR's, based on economic surveys, statistics of past production, and technical studies. This first method has been summarized as consisting "in adjusting the historic coefficient for the sector to the data obtained on the degree of utilization of installed capital in the industry concerned."⁹ If the data do not exist, recourse may be had, again, to intercountry comparisons, with allowances made for differences in factors of production and structures of demand, for these may lead to different relative prices of the factors of production and require different techniques of production. Sector contents may vary between countries; for example, in France transportation services required by the textile industry are included in the MKOR of the textile industry. This procedure may not suit the Canadian industrial structure. Hence the MKOR of the French and Canadian textile industries would be different even though the production functions of the two industries might otherwise be identical in every respect.

Another factor standing in the way of a bald intercountry comparison is that the full consequences of the increased growth of one industry may be felt elsewhere; for example, increased capital devoted to Canadian commuter trains may lessen the capital required in highways. Finally, in using the intercountry comparison method one must take account of institutional differences.

When using the past MKOR of a country as a guide to the future, one must allow for expected changes as growth occurs; for example, the South Saskatchewan River Dam undoubtedly changed the MKOR of the surrounding farmers who now irrigate their fields.

The volume of capital goods required is obtained through the capital-

9. Ibid., p. 40.

output ratio method by multiplying the increase in goods required in each sector by the specific AKOR's and adding to this the depreciation to capital equipment during the period. The operation is complete when one has calculated the amount of new capital required by the capital goods industry itself. This calculation involves an independent estimate of the percentage increase in capacity required in each capital goods industry. The final result is the amount of capital goods that must be produced at home or imported.

It is important to realize that these specific MKOR's will be more accurate than the overall MKOR calculated earlier in the overall projection. This is so for three reasons. First, each industrial (and agricultural) sector is examined separately and, therefore, in more detail. Secondly, account is taken of the relative growth in each sector, as well as thirdly, of the utilization of existing capacity in each sector. Therefore, as soon as the specific MKOR's have been calculated, their weighted average must be taken and used as a corrected overall MKOR to adjust the overall projection.

2. Surveys of investment intentions.---This method simply involves asking private entrepreneurs how much they intend to spend during the period; thus the entrepreneurs do the projecting. In Canada these surveys serve as a background for governmental anti-cyclical budget expenditures - a type of informal planning.

It is in short-term projecting especially that the method is of use. Adjustments in the estimated investment intentions have to be made to allow for changes caused by government policy. The longer the period, the more the adjustments.

These surveys can more easily be carried out in advanced countries where business planning is more formal. Since in these countries growth

is already occurring, growth may be expected to continue and unless business conditions turn unexpectedly downward in the course of the year, the projected business investments are likely to be realized. The needs are easier to forecast and unforeseen changes are less probable. Usually good co-operation exists between business and the governmental statistical agency, like the Dominion Bureau of Statistics.

In the advanced countries surveys not only are useful as a check on the projections of investments obtained by other methods, but, in the short-run (up to a year), are likely to give better results than estimates given by an econometric model which has investments as an endogenous or dependent variable. Finally, it should be noted that surveys add flexibility to the work of projection for investment intentions can be obtained by surveys in some industrial sectors while other methods are used in the rest.

2. Input-Output model.--This model is simply a picture of the relations in the economy and is particularly valuable for centrally-planned economies where, moreover, more of the required information is to hand. The USSR's old system of material balances is a rudimentary input-output model; more precisely, it is the elementary first step of an input-output model, whose purpose is at least to ensure that the supply and demand of scarce resources is in balance. It shows how much is produced but not how it is produced.

The full input-output model, on the other hand, is a form of general equilibrium analysis which shows the flow of goods and services from one sector to another of the economy according to cost structure requirements. The method reveals inter-industry relations: the way and extent to which changes in output of final goods depend on changes in output of intermediate goods and input of primary resources.

In the MKOR and survey of investment intentions methods for estimating the supply of capital equipment, capital is treated as a final good, like consumer goods, exports, and governmental services. In the input-output model, however, capital goods are treated as input, like labour services, for both of which input coefficients are obtained. Thus the input-output methods can be used to find the productivity of both capital and labour, that is the amount of product per unit of capital and per unit of labour. The flow of goods depends on the flow of inputs and the stock of capital acquired in previous periods.

Like everything else, the input-output method has its limitations. One is the fixed input coefficients of the matrix inversion type of model; the other is the necessity of aggregating all the productive activities of a nation into a definite number of sectors: too few sectors will reveal little about the workings of the economy; too many will be difficult to manage unless the model can be tested as part of a computerized operation.

The iterative method type of input-output models gets around the fixed input coefficient problem by simply using variable coefficients, but while this entails less mathematical work for any particular result, the iterative method does not allow the ease of calculation permitted by the fixed coefficient method once the values of the matrix inversion have been worked out.



CHAPTER VI

ECONOMIC PROJECTIONS AND POLICY IMPLICATIONS

1. The Potential Growth Rate

Taken by themselves no policy implications are to be found in the population projections (Table 1 of Chapter IV).¹ Most Canadians probably take pride in seeing their population grow at a faster rate than in the United States but far fewer Canadians would wish to see their population growing - especially through massive immigration - if this should seem to lead to large-scale unemployment.

However, when high-level employment is assumed - and this assumption is made by all the projectors except for Brown in his PR's-3F and 3C - then, in Canada, usually, the greater the rate of population increase the greater the output per capita. This is made plain in columns (a) and (b) of Table IX: with net immigration at 75,000 a year output per capital increases more quickly than with net immigration at 50,000 a year. A country such as Canada with a sparse population spread over immense distances cannot but profit from having more people to share the overhead costs ... provided they are employed. This proviso is important: even if the birth rate were to increase then, ceteris paribus, per capita income would drop for babies consume; they do not produce; they are not employed.

Of more direct interest to policy-makers is Table II - labour force population. As column (f) makes plain - indeed all the columns do so except for Caves and Holton's - the labour force population has been increasing more rapidly than total population since 1963 and will continue

1. Throughout this chapter all references to tables are to those in Chapter IV above.

to do so until 1970. This is a reversal of the 1955-63 trend and is a consequence of the coming to age of the war and post-war babies, of the recent and continuing decrease in the birth rate and of the recent and continuing increase in net immigration. This has relevance to the Economic Council's statement that civilian employment will have to increase at a much faster rate from 1963 to 1970 than in the previous seven years.²

But even more relevant to the increase in employment are Table III - labour participation rates - and Table IV - the civilian labour force - for Table III multiplied by Table II gives us Table IV and Table IV multiplied by Table V - employment ratio - gives us Table VI - total civilian employment.

These tables taken as a whole reveal that it is indeed true that nothing succeeds like success: high-level employment is fundamental to prosperity and this prosperity draws even more people into the labour force (that is, increases the labour participation rate) and draws people from low-income occupations (for example, the marginal farms) into higher-income jobs.

This increases GNP even more, as Table VII reveals: for the year following publication of its First Annual Review (1965) the Economic Council predicted a GNP 1.111 billion dollars lower than the figure actually achieved; that is, a shortfall of almost 2.6 per cent. If higher level employment is maintained - (97 per cent or better), then the economy has been permanently shifted to a higher growth path: the economy's potential has been permanently increased. The benefits are immediately apparent: a GNP 2.073 billion dollars higher in 1970 than even the high figure predicted by the Economic Council. Not only would

2. ECC. First Annual Review, pp. 40-1.

this mean that output per person employed (Table VIII) would be \$228 higher in 1970 than predicted by the Council (more than 3 per cent) but per capita income would be \$140 or over 5 per cent higher than the Council's prediction.

But the stress is on the "if high-level employment is maintained" and this high-level will not be maintained unless the economy is very nicely balanced indeed.

In the first place - and this has hardly been considered, for the analysis has been exclusively in real terms - continued inflation can so distort the price structure as to price some goods and services out of the market and thus force cut-backs and lay-offs in one or more sectors. If readjustments quickly occur so that the displaced workers are re-absorbed before aggregate demand is affected, no harm is done and the boom can continue unabated. But aggregate demand may be affected to such an extent that cut-backs and lay-offs occur in the sectors supplying the sectors primarily affected. Such cumulative effects will force a recession, a down-turn in aggregate demand and employment or at least a decline in the rate of growth. In any event, unemployment will grow and the economy will be forced back at least as far down as the potential growth ceiling assumed by the Economic Council, and probably below it.

Now, the Economic Council did not select its potential growth ceiling idly. This is made especially plain in its Second Annual Review in Chapter 4, "Education and Economic Growth."³ The Council obviously considers that a GNP growth rate of 5.5 per cent a year is all that can be maintained without unbalancing inflation and job shifts greater than

3. ECC, Second Annual Review: Towards Sustained and Balanced Economic Growth (Ottawa: Queen's Printer, Dec. 1965), pp. 71-95.

the labour force with its present level of education can withstand.

The prediction in column (i) of Table VII that GNP will grow at a faster rate is more an optimistic intuition than anything else but which at least has the advantage of being made in July, 1966, almost two years closer to 1970 than were the Council's planners when preparing the First Annual Review.

What is certain, however, is that a major implication for policy of all the projections, and the present study's especially, is that governments at all levels must exert great energy to further the education of the labour force, both present and future.

2. The Foreign Sector

Apart from the distortions that can be caused by inflation and an insufficiently mobile labour force, there is another major field where government policy must be more active than in the past: the foreign sector.

The importance of this sector to Canada is such that a separate study would be required to make a proper assessment. Though no tables are included in the present study on the foreign sector, Chapter II, section 8, does give a fair idea of the trends, especially the Economic Council's projection and Brown's PR's-1 and 2.

It need only be noted that the current account deficit, after reaching a peak of \$1,504 million in 1959, sank to a low of \$433 million in 1964, only to rise again to \$1,136 million in 1965 (all in current dollars)⁴. Quite apart from the question of foreign ownership of Canadian industry which results from the balancing movement inward on capital account, the government should determine whether this foreign

4. DBS. Quarterly Estimates of the Canadian Balance of International Payments: First Quarter, 1966 (Ottawa, Queen's Printer, July 1966), p. 19.

capital is really required as much as it may appear to be at first sight. After all, as has been noted on page 188, some economists claim that the foreign decision to invest in Canada takes place first, the current account deficit results. In other words, the capital account surplus causes the current account deficit, not the reverse. Other explanations are possible, of course. But probably the least that can be said is that not all foreign investment in Canada is necessarily in Canada's interest.

But regardless of how Canada's foreign indebtedness grew - and whether it was necessary for Canada's economic growth - the fact is that it exists and Canada now requires a trade surplus of over a billion dollars a year in current dollars just to ensure that foreign investment ceases to grow. Indeed, even a billion current dollars is already too little to pay the interest and dividends on past borrowings and investments as well as the other deficit items on current account and to permit the total repatriation of annual profits,⁵ for unless these profits are repatriated foreign investments will continue to grow as will the yearly drain in dividends.

This is a problem the government must consider - and not only when the United States Administration lays down guide-lines.

3. Below the Aggregates

Undoubtedly a great deal of the value of the Caves and Holton study stems from their method of detailed analysis, especially their regional

5. Ibid. In 1965 net payments abroad of interest and dividends amounted to \$753 million. If the merchandise trade surplus had been \$1,237 million (instead of \$101 million) the current account would have been in balance and the net payments abroad of interest and dividends, as well as other deficit items in the current account, would have been settled without recourse to foreign borrowing on capital account. However, nothing would have been left over for the repatriation of foreign investments. Thus, in 1965 Canada

analysis. Policy, after all, cannot always, or even mostly, deal with the broad aggregates but must get down to bread and butter issues. Thus, eight years later one has no difficulty seeing the truth of this prescription for agricultural policy:

The major adjustments over the next decade require finding a means for further increasing the size of farms by combining units, particularly in the more productive areas, and dealing with, or comfortably neglecting, the large areas of low-income agriculture, particularly in the province of Quebec.⁶

Judging by the unrest evidenced by the voting pattern of rural Quebec since June 1962, it would appear that the policy option preferred has been one of "comfortably neglecting".

Having previously determined that the prairies will be able to meet the 1970 demand for wheat and feed grain (see page 64 above, Caves and Holton note the importance of public policy in determining in what parts of Canada livestock will be raised - the Feed Freight Assistance Act is all important. They conclude that it is more economic to feed livestock where the grain is produced and ship the dressed meat. However, they accept that "unemployment or underemployment in the farming areas of some parts of eastern Canada may warrant doing the feeding in considerable part in the East until readjustments can be made".⁷ Showing good awareness of the political - and social - realities of Canada, the

5. (cont'd.) required a merchandise trade surplus of \$1,237 million just to ensure that foreign investment ceased growing. In 1964 the amount necessary was \$1,133 million, in 1963 \$1,045 million. The required trade surplus is growing at a rate of 10 per cent a year. (All dollars used in the above note are current dollars).

6. Caves and Holton, p. 461.

7. Ibid., p. 462.

authors base their 1970 regional livestock production forecast on there being no change in feed freight assistance.

In their projection of Canada's population, Caves and Holton expect a larger proportionate increase of school age children and college age people than of the population as a whole. From this they draw the conclusion "that if the Canadian government seriously pursues a high employment policy, one of the most commendable means of maintaining employment expenditures in times of recession would be to build more school facilities".⁸ Provincial governments and local school boards have, of course, been doing just this.

4. A Policy on Projections

Projections, then, are useful guides to policy by both governments and business. If they are not so used they become exercises in might be - might be but probably won't because there is no automatic tendency for an economy to stay on any projected growth path.

But government policy is also required on projections themselves. The Economic Council is useful for it serves both to popularize economic concepts and to draw attention to problem areas in the economy. The Second Annual Review, for example, stressed increased education at all levels as essential to Canada achieving its growth potential. But what the Council did not do in its second review was to bring the first year's projections up to date. Moreover, as has been noted in Chapter IV, much of the Council's projections were noncomparable with others because of the unusual use of GDP rather than the universally used GNP.

It is not suggested that the Council change the general form of its annual reviews. They are eminently suitable for the informed public.

8. Ibid., p. 278.

But it is suggested that the Council include an appendix in each review containing moving five-year projections of the economy. These projections could well be presented in the form of the actual and estimated column of the nine tables in Chapter IV, with the addition of tables dealing with the foreign sector and allocation of output. Each table should include comments explaining the changes from the previous year's projection as well as what might be done to forestall any unfavourable developments that are foreseen.

In this way those who take a more detailed and active interest in the economy would be able to see at a glance what the economists with special competence in the matter have to say about the future and what they recommend to modify unfavourable trends. Since the tables would be based directly on DBS statistics, which are kept up to date and revised by DBS in quarterly, monthly, weekly, and even daily publications, the informed public would be able to keep in touch on a continuing basis with economic developments and assess these in the light of the predictions prepared by the Economic Council. Thus the public would achieve a better understanding of the economic growth process and of the effect that a great variety of policies, both private and public, have in realizing one of the nation's foremost objectives, that of continuing economic growth at a rate in line with the country's expanding productive capacity and with society's choice between work and leisure.

APPENDIX "A"

ABBREVIATIONS

APS	- Average propensity to save out of GNP; $S/Y = s$
CJEPS	- Canadian Journal of Economics and Political Science
DBS	- Dominion Bureau of Statistics
ECC	- Economic Council of Canada
GDP	- Gross Domestic Product
GNP	- Gross National Product (or Output); Y
I	- Gross National Investment
K	- Real capital
k	- marginal capital output ratio (MKOR); $\frac{\Delta K}{\Delta Y}$
L	- Labour
MKOR	- marginal capital output ratio (k); $\frac{\Delta K}{\Delta Y}$
MP_K	- marginal product of capital
MP_L	- marginal product of labour
N	- employment
OECD	- Organization for Economic Co-operation and Development
P.A.	- per annum
RCCEP	- Royal Commission on Canada's Economic Prospects
RGHS	- Royal Commission on Health Services
S	- National Savings
s	- average propensity to save; S/Y
SS	- Staff Study (of ECC)
Y	- Gross National Product; GNP
Δ	- difference or change (usually increase; (Greek letter delta))
'	- rate of change, as superscript; e.g. $\dot{Y}$

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