STAFF STUDY No. 2

Potential Output 1946 to 1970

by B. J. Drabble

prepared for the Economic Council of Canada

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POTENTIAL OUTPUT, 1946 TO 1970

I - INTRODUCTION

The purpose of this study has been to produce an estimate of the potential level of output in the Canadian economy for the period 1946 to 1963 and to project the growth of potential output to 1970.[1/] The estimates contained in this study are intended to provide:

(1) an assessment of the past performance of the economy in relation to potential;

(2) a measure of the gap between present and potential levels of output; and

(3) an indication of the growth in output, employment and productivity that will be required in order to achieve potential by 1970.

The potential output of a national economy may be defined as the optimum level of output which the economy can achieve over a sustained period of time "without running into serious instability of employment, output or prices".[2/] Thus, it is quite possible, on the basis of this definition, for an economy to operate above its potential level of operation for limited periods of time. However, if the calculations of potential are reasonable, a level of operation higher than potential implies that it cannot be maintained for long without the development of instabilities (e.g., speculative excesses, bottlenecks, cost and price distortions) leading to subsequent corrections and lower levels of output.

For many years the unemployment rate was accepted as the best indicator of the general level of resource utilization in a national economy. This is to say, the fluctuation in unemployment around some minimum working level considered to be the lowest rate compatible with optimum economic performance was generally regarded as the basic criterion for judging the current performance of the economy. More recently, it has come to be recognized that while the unemployment rate remains a reasonably satisfactory

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1/ Throughout this study, the term "output" is used as a convenient abbreviation for the volume of goods and services produced, as measured either by real Gross National Product or by real Gross Domestic Product.

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

way of assessing whether the level of economic activity at any given time may be too low (or even too high), it does not provide a comprehensive and accurate measure of the degree of slack or excess that may exist. The reasons for this are quite simple. Labour is only one factor of production, although the most important one, and the unemployment rate is an imperfect measure of the degree of utilization of this factor. For example, in periods of slack it does not measure the under-utilization of labour represented by those who are still employed but are working on short time or have taken jobs less productive than those which they held formerly. Again, in any period of slack, capital as well as labour is generally under-employed and is being used at less than its optimum or most efficient rate. Consequently, even those remaining on a full-time basis in the same jobs may be employed less productively than formerly as a result of reduced production. In other words, in a period of slack economic conditions, the margin by which unemployment exceeds minimum or "potential" unemployment represents only one part -- albeit a very important part -- of the gap between the actual level of activity and potential output. An equally important element in this gap is that which is reflected in the short-fall below potential of the productivity of those employed. In effect, this productivity gap is the measure of (1) the additional output that could be achieved if the other factors of production — primarily capital -- were also fully employed, and (2) the further additional output that would result from the more efficient utilization of both labour and capital at a potential level of operation.[1/]

Thus, one purpose of constructing estimates of potential output for an economy is to produce a more refined measure for assessing past or current economic performance than is possible solely by study of the degree of labour force utilization. When considering, also, the implications for future growth of a return to potential by an economy which is emerging from a prolonged period of below-potential operation, it becomes essential to have a reasonably accurate measure of the current gap. When we postulate in the present study the return of the economy to its potential level of performance by 1970, the rate of growth that is required is one which will be high enough: (1) to allow for the further growth in supply factors over this period, and (2) to eliminate the gap between actual and potential output which existed at the starting point of the projection (1963). Obviously, failure to make adequate allowance for those elements other than the short-fall in employment would lead to under-estimation of the

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[1/] See Arthur F. Burns, "A Second Look at the Council's Economic Theory", The Morgan Guaranty Survey, August, 1961, p.13.

current gap and hence to under-estimation also of the growth rate necessary to bring the economy up to its potential level of output by 1970.

While, the notion of a potential level of output is not a particularly difficult one to define or to comprehend, its translation into a practical statistical measure for an economy is a much more difficult problem. Inevitably, a great many working assumptions have to be made or are left implicit in the calculation. In recent years, a number of methods have been used to estimate potential output in various countries, more especially in the United States. The methods of approach have varied according to the purpose of the analysis, and in particular, according to the time period under consideration -- whether it is long or short, and whether the estimate of potential is intended solely as a measure of past performance, or is intended to project the growth path of the economy into the future. In terms of estimating procedure, differences often arise from the extent to which the various supply factors have been calculated explicitly or left implicit in some more aggregative treatment. For example, in some calculations of potential for the past, rates of growth in output per person employed -- or even in total output -- are extrapolated from trend lines drawn between points in time, at which the levels of output and employment are deemed compatible with a "potential" level of operation.[1/] In such calculations, many of the individual variables affecting the growth rate of the potential labour supply and productivity are left implicit in the over-all growth path of potential productivity or output, although it is usually necessary to define the level of unemployment appropriate to potential output, in order to select points in time for trend line calculations and extrapolation. On the other hand, one of the more elaborate calculations of potential in the United States, using the production function method, makes explicit estimates, not only of the potential labour input on a man-hour basis, but also of capital input as measured by the stock of capital, with explicit adjustment to allow for the contribution of technological change.[2/]

Falling between these extremes is a recent British study which makes a detailed calculation of the potential labour supply and applies this to a smoothed trend of

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1/ See, for example, Edward F. Denison, "The Sources of Economic Growth in the United States and the Alternatives Before Us", Supplementary Paper No. 13, Committee for Economic Development, 1962, especially Ch. 3; and the United States Council of Economic Advisers Annual Report, 1962.

2/ See James W. Knowles, op. cit.

productivity (output per man) for the whole economy.[1] In this case the contribution of capital, technological change and other determinants of productivity growth are thus left implicit. Another interesting method attempts to estimate potential GNP in the United States by relating directly the degree of labour force utilization, man-hour productivity and output in a simplified production function. This method, however, was developed primarily to estimate potential on a short-term basis.[2]

These various methods share one major implicit assumption. Since potential output is essentially a supply concept and is a calculation derived from factor inputs, it is assumed that the appropriate level and pattern of aggregate demand can be generated. Moreover, it is further assumed that the composition of the required level of demand will not be inconsistent with the assumptions that underlie the way in which the various inputs are combined. For example, in periods of slack there is the question of what level of productivity is assumed for those persons unemployed who would be at work at a potential level of operation. Since the level of productivity varies widely between industries, important assumptions about the composition of output -- and hence of demand -- are unavoidable in these calculations although they are normally left implicit.

In our own calculations too, the estimate of potential assumes an appropriate level of aggregate demand but we have departed from the general practice by making certain assumptions with regard to the composition of output at potential quite explicit. Our reasons for so doing are discussed below. But first, it may be useful (1) to review some of the working assumptions and general principles which underlie most of the attempts to construct estimates of potential output and which we have followed in the present study, and (2) to examine some of the special problems with which we were confronted in attempting a calculation of this type for the Canadian economy at the present time.

Reference has already been made to the fact that one or two studies have made

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1/ W.H. Godley and J.R. Shepherd, "Long-Term Growth and Short-Term Policy--the Productivity Potential of the British Economy and Fluctuations in the Pressure of Demand for Labour, 1951 to 1962", National Institute of Economic and Social Research Economic Review, August, 1964.

2/ See Arthur J. Okun, "Potential GNP: Its Measurement and Significance", published in papers and proceedings of the American Statistical Association, 1962.

explicit calculations for the productivity of capital as well as of labour, while others have used the simpler over-all measures of productivity -- output per man or per man-hour -- which measure the combined effects of all factor inputs. Our preference has been for the latter approach, partly on the basis of considerations of time and statistical availabilities, and partly for the reason that future levels of capital investment consistent with the attainment of potential by 1970 were to be studied elsewhere.[1/]

In projecting the growth rate of over-all measures of productivity, it is generally assumed that changes at potential are likely to be relatively small over periods as short as that with which we are concerned in the present study. Empirical studies drawing from U.S. experience suggest that this is so because most of the factors affecting potential productivity are by their nature long-term in their effects. This is true, except in very unusual circumstances, of such factors as technological change, economies of scale, and the levels of education and skill of the labour force. All these may contribute significantly, of course, to the over-all rate of productivity growth -- but acceleration (or a slowing) in the contribution of these factors tends to be gradual. The same appears to be generally true of changes in the size of the capital stock. Thus, it is generally held that the fairly sharp variations in productivity growth over the short-term are primarily related to changes in the level of resource utilization in the economy, whether these changes arise from the variations of the business cycle[2/] or from more persistent underlying movements towards or away from potential levels of activity.

Ideally, therefore, for our purposes one would like to have had either a sufficiently long period of observations to provide a basis for studying the influence of long-term forces on productivity growth or, failing that, at least a level of economic activity that remained close to potential throughout the more recent years. Unfortunately, neither of these conditions was met. The statistical basis for a really long-run historical analysis in Canada is much less developed than in the United States. Given the highly abnormal character of the whole period from 1930 to 1945 as a result of the

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1/ See Derek A. White, "Business Investment to 1970", Staff Study No. 5, Economic Council of Canada.

2/ See, for example, "Short-Run Productivity Behaviour in U.S. Manufacturing" by Thomas A. Wilson and Otto Eckstein, Review of Economics and Statistics, Harvard University Press, February, 1964.

dislocations produced by depression and war, any longer term analysis, to be meaningful, must be extended back to the 1920's. While some estimates extending back to 1928 were calculated and are contained in Appendix B, it was not considered advisable, in view of the data deficiencies for this period, to base our projections on these findings. Rather they were developed in order to provide some cross-checks and perspective on our main analysis. Consequently, in all essential respects, this analysis was restricted to the post-war period from 1946 to 1963. Over the first ten years of this period the economy was, on the average, operating close to its potential level. But such has clearly not been the case in any more recent year. Thus, the problem was to produce an estimate of the potential productivity growth rate for a period of 24 years -- that is, from 1946 to 1970 -- with only ten years at the start of the period which could provide reasonably good observation points of economic performance at near-potential levels of output.

Closer examination of these ten years, moreover, revealed that in one important respect, at least, the over-all productivity performance of the Canadian economy was highly abnormal. This abnormality arose from special factors promoting an extraordinarily rapid advance in productivity in Canadian agriculture in these ten years. At the beginning of this period output, employment and output per person employed in agriculture were not very different from their levels in the late 1920's. During the next ten years, as a consequence of extensive farm mechanization and a strong demand for labour from other sectors of the economy, a rising level of agricultural output was accompanied by a reduction of about one third in the farm work force. Moreover, the effects on the productivity performance of the whole economy of this very rapid gain in farm productivity were reinforced by a "shift" effect, as the workers displaced from a sector of the economy where their absolute level of productivity was relatively low moved to other sectors where it was on average much higher.[1/] Both the very high rate of increase in farm productivity, and the relative importance to the total economy of the shift effect during this period, were quite obviously not of a sustainable

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1/ For some estimates of the contribution of the shift out of agriculture to over-all rates of productivity growth in Canada in comparison to its contribution to growth in other countries in the 1950's, see A. Maddison, "Economic Growth in the West", The Twentieth Century Fund, New York, 1964, Table 11-7, p.61.

character and would have diminished even if the economy as a whole had maintained a potential level of operation in the period after 1956.[1/] It was, therefore, decided that the farm sector should be treated separately, by construction of estimates of output, employment and output per person employed for agriculture that were compatible with a potential level of operation in the economy as a whole.

Having accepted the need to depart from the methods used in similar studies for other countries, it seemed worthwhile to deal in a similar fashion with a second problem area, namely public administration and community services. In this sector, employment throughout the period was increasing more rapidly than in the rest of the economy (even with agriculture excluded) and the absolute level of productivity was low. In addition, as a result of the conceptual problems associated with the measurement of output in this area, the changes over time in productivity show no clear trend and are essentially meaningless. Yet, as this sector's employment grows in relative importance, its impact on over-all measures of productivity increases. It therefore seemed desirable to attempt to isolate this sector also in our calculations, by making assumptions as to the appropriate levels of output and employment under conditions of potential operation in the rest of the economy.

The remaining sector of the economy, which will be referred to henceforth as the commercial nonagricultural economy, and which accounted for roughly 80 per cent of total output and 70 per cent of total employment in 1963,[2/] was then treated in the conventional way. After deducting estimates of agricultural and public service employment that had previously been calculated,[3/] an estimate of potential employment on a man-hours basis was obtained for the commercial nonfarm economy. This was then combined with a trend of man-hour productivity in order to derive the estimate of potential output for this sector. The selection of this productivity trend still left room for some

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[1/] The shift effect, of course, would have diminished even more quickly if the high rate of productivity increase in agriculture had been maintained, since the ratio of those employed in agriculture to total employment and the productivity differential itself would have diminished that much faster.

[2/] As defined for the purposes of this study, the commercial nonagricultural economy includes the fishing, trapping, forestry, mining, manufacturing, construction, trade, transportation, communication and storage industries and all financial, personal, business and recreation services, whether owned privately or by governments.

[3/] A detailed description of the procedures followed in the calculation of an appropriate level of employment for these two sectors is given in the next section of the paper.

questions of judgment in obtaining a good "fit" but the possibility of serious error was very much less than would have been the case had a more aggregative approach been attempted. It is true that the inclusion of specific output projections to 1970 for agriculture and public services involved implicit assumptions about the pattern of demand that would be compatible with our calculations of potential. However, all the calculations of potential carry some such assumptions implicitly.

As noted earlier, there is always a problem of what level of productivity should be applied to those unemployed who would have been at work at a potential level of output. In this study, we have made the assumption more explicit by (in effect) applying the average productivity level of the commercial nonfarm sector[1/] -- an assumption which seems to us on balance to be more reasonable than the more common practice of applying to the unemployed the average productivity level of the whole economy.[2/] In the author's opinion, therefore, whatever the loss in purity or clarity of concept, the resulting estimates of total potential output for the period 1946-70 are a reasonably realistic and practical measure. We also feel that the results can be used with more confidence as a guide-line to potential growth in the near future than those which any of the more conventional methods would have yielded, given the previously mentioned problems with which we were confronted.

One useful by-product of the approach adopted in this study is a calculation of a series giving potential output for the nonagricultural economy alone. In the analysis of actual economic performance in relation to potential for past years, such a series has useful application since the sharp fluctuations in Canadian farm output introduce a sizeable element of variation in total output that has little connection with unemployment or the general level of resource utilization in the economy. This series permits a more meaningful comparison of the results of this study with those that have been made for the United States economy in the post-war period,[3/] such as we have

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1/ Since the calculating procedure was to assume that, in periods of slack, farm employment would be slightly higher and public service employment unchanged, nearly all of the short-fall in employment in effect was allocated to the commercial nonfarm sector.

2/ Of course, for a country in which the farm sector is relatively less important, such as the United States or Britain, the difference between these methods would be appreciably less than is the case in Canada in the post-war period.

3/ The smaller ratio of agricultural output to total output in the United States and its lesser volatility greatly reduce the significance of this problem for potential analysis in the United States.

undertaken in Appendix A. Another useful sub-aggregation of potential output is the one that may be derived for the total commercial economy, particularly with regard to the measures of productivity. Since the government and community services sector is one in which the measures of output -- and hence of productivity -- present serious conceptual and practical difficulties in all countries, including Canada, a framework of analysis which allows this sector to be excluded can also be useful, either for purposes of longer term analysis or for international comparison.

At the same time, it would not be proper to conclude these introductory comments without some words of caution. The methods of procedure adopted in this study were much influenced by the specific purposes for which the measure of potential output was intended, as well as by the availability of statistical data and limitations of time. With regard to the calculation of potential labour supply, the study has been able to draw upon much valuable new material which has been prepared for the use of the Economic Council. This includes new projections of population and labour force to 1970,[1/] new estimates of average hours worked by the employed labour force during the post-war period, and a calculation of the rate of unemployment which would be appropriate for use in the present context.[2/] All this new work greatly facilitated our own task. It is in the area of productivity that we are most acutely aware of the need for much additional investigation and analysis, especially concerning the contribution to past productivity growth in Canada of such factors as capital formation, technological change, education and economies of scale. The present gaps in our knowledge of the role played by these factors make it inadvisable to assume that our projection of the potential productivity growth path would be valid over any significantly longer period of time. In fact, even the projection to 1970 is not intended to be more than a provisional working assumption, that may well have to be revised in the light of subsequent analysis.

There are two features of the results in particular that may cause some concern. One is the indication of a subsidence in the rate of productivity growth for the total economy at potential after the mid-1950's (see Table 16, p. 44). The crucial question here is whether or not it would have been more realistic to have allowed for

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1/ See Frank T. Denton, Yoshiko Kasahara and Sylvia Ostry, "Population and Labour Force Projections to 1970", Staff Study No. 1, Economic Council of Canada.

2/ See Frank T. Denton and Sylvia Ostry, "An Analysis of Post-War Employment", Staff Study No. 3, Economic Council of Canada.

some acceleration in the productivity trend at potential of the commercial non-agriculture economy over the period 1946-70.[1] In the absence of observations of near potential operation since 1956, it is impossible to be sure whether or not this would have been an appropriate assumption. In the event we assume a constant rate of growth in commercial nonfarm productivity over the whole period with the result that the over-all growth path of potential productivity in the calculations is dominated by the observed trend in the two isolated sectors -- notably, the declining contribution to over-all growth from agriculture and the increasing proportion of employment in public and community services where productivity growth cannot be measured by present statistical methods. In Appendix B we have attempted to set these estimated trends of productivity growth at potential in a longer term context; this analysis suggests that our estimates of the growth rate for the total economy over the period from 1956 to 1970 is fairly close to the long-term trend, while in the commercial sectors of the economy the rates are slightly faster. In other words, analysis of longer term productivity trends tends to support the conclusion, implicit in our calculation of potential, that the relatively high rate of productivity growth in the early post-war period contained elements that were of a short-term character and not sustainable. Nevertheless, pending further study of the underlying causes of long-term growth in the Canadian economy, a measure of uncertainty must still remain as to the precise relationship which is appropriate between the longer term growth rates and those which have been calculated for the potential growth path from 1956 to 1970. Our assumption that the underlying rate of productivity growth at potential in the immediate future will not be very different from that indicated by the experience of the past 35 years, may prove to be too conservative, but it has seemed the most appropriate assumption provisionally.

The second feature of these results which may cause concern is the relatively low rate of growth in productivity at potential in comparison with actual productivity performance under sustained high employment conditions in a number of other industrial countries in recent years. It should be noted, however, that the indicated rate of increase in output per man at potential for Canada of 1.9 per cent over the period 1956-70 corresponds fairly closely to similar estimates which have been made for the United States economy at potential levels of operation.[2] The difference in the growth performance of both North American economies and those of European countries in

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[1] For example, in the British study by Messrs. Godley and Shepherd, op. cit., the long-term productivity trend which fitted the actual figures best over the period 1951-62, was one which showed a slow but steady acceleration.

[2] It is, in fact, slightly higher than the rate for the United States over this period estimated by Edward F. Denison,(op. cit., Chapter 23).

the post-war period is a subject which has been receiving increasing attention in recent years,[1] but there are still many factors which may account for the difference requiring further examination.[2] In the meantime, past Canadian experience must be considered as a much more reliable guide to projections of the productive capabilities of the Canadian economy in the immediate future than the current productivity performance of economies overseas.

In the section which immediately follows, there is a step-by-step summary of the statistical procedures adopted in making the various calculations that went into our estimates of potential output. The third section of this paper contains a summary analysis of the results, and the fourth and final section contains the basic statistical tables together with notes on certain details regarding source material. Appendix A contains a brief analysis comparing our estimates of potential for Canada with two of the better known potential calculations for the United States. Appendix B contains a brief statistical analysis of longer term growth trends for the period 1928-70.

1/ Apart from the volume by A. Maddison and a forthcoming paper by E. F. Denison, referred to elsewhere, a comprehensive comparative analysis of economic growth in Europe and North America is contained in Part 2 of the Economic Survey of Europe, "Some Factors in Economic Growth in Europe during the 1950's," Secretariat of the Economic Commission for Europe, United Nations, Geneva, 1964.

2/ To cite a few examples: the growing importance of part-time workers in the North American labour force, relative levels of technological development, qualitative differences in factor inputs, and last but by no means least, differences in statistical procedures and conventions in the measurement of both inputs and output.

II - METHODS OF CALCULATING POTENTIAL EMPLOYMENT, PRODUCTIVITY AND OUTPUT

1. Calculation of Total Potential Employment

The first step in the calculation of the potential labour supply was to obtain an appropriate estimate of the labour force population -- that is, the noninstitutional population fourteen years of age and over. For the period 1946 to 1963 the annual averages of the estimates prepared for use in the Labour Force Survey were used without any modification, other than the addition of the number in the Armed Forces. It could, of course, be argued that under conditions of continuously high levels of employment, net immigration might well have been higher than was actually the case in the more recent years. But however reasonable such an assumption might have been, it would have introduced an element of unreality into the estimates of potential for all subsequent years. In the calculation of potential, if it is to have any meaningful application, only those losses in periods of slack which are recoverable at some later date should properly be allowed for. For the period 1964 to 1970, the estimates of the civilian noninstitutional population fourteen years of age and over were those calculated in another staff study.[1/] These projections assumed high levels of output and employment throughout the period and were therefore acceptable without modification for the purpose of the present study. To these estimates, the projected number in the Armed Forces was added in order to obtain estimates of the total noninstitutional population fourteen years of age and over for the years ahead to 1970.[2/]

In order to derive estimates of the labour force suitable for use in the calculation of potential, consideration had to be given to the relationship between the over-all level of activity in the economy and labour force participation rates.[3/] The record of the post-war period suggests that there are certain fringe groups (mainly teenagers and older workers) whose participation in the labour force is affected by

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1/ Frank T. Denton, Yoshiko Kasahara and Sylvia Ostry, op. cit., Staff Study No. 1 Economic Council of Canada.

2/ This projection (see Table 23) was not intended to be and should not be construed as being a carefully calculated or "target" estimate of the size of the Armed Forces for the period ahead to 1970. For the purposes of this study, fine precision was not necessary in this projection.

3/ That is, the proportion of the noninstitutional population 14 years of age and over who are in the labour force, which is defined as those persons who are either employed, or are unemployed but actively looking for work.

business cycle fluctuations; that is to say, the participation rates of these groups rise slightly during periods of cyclical expansion and fall during periods of contraction. What is much less clear from the empirical evidence is whether participation rates of certain groups are affected by periods of more persistent unemployment, such as that which has existed since early 1957. It would seem to be a plausible assumption, and one or two studies in the United States have adduced interesting evidence that there is a statistically significant relationship between changes in the labour force and the demand for manpower in that country.[1/] But, while this is an area deserving further study in Canada, we have not been able to find sufficient evidence from Canadian data, at this time, to warrant making any special adjustments to post-war labour force participation rates on this account. To allow for the slight cyclical variations, however, a five-year moving average was run through the participation rate of the total labour force (i.e., including the Armed Forces) for the period 1946 to 1963. This fairly crude device was not altogether satisfactory[2/] but it seemed to work as well as one or two alternative, more refined, methods which were tried. In any event, the resulting "adjusted" series for the total labour force differed only very slightly from the actual series in almost all years, as Table 1 indicates.

Table 1

Total Labour Force

(Actual as percentage of "adjusted" series)

1946	100.0	1952	100.2	1958	100.0
1947	100.0	1953	100.0	1959	99.6
1948	100.1	1954	99.5	1960	100.4
1949	100.1	1955	99.4	1961	100.3
1950	99.5	1956	100.1	1962	99.9
1951	99.9	1957	100.7	1963	100.0

Source: Table 23.

For the period 1964 to 1970, the estimates of the civilian labour force used in the calculation of potential were taken from the previously mentioned Staff Study (see Table 23).

Estimates of potential total civilian employment were then obtained by

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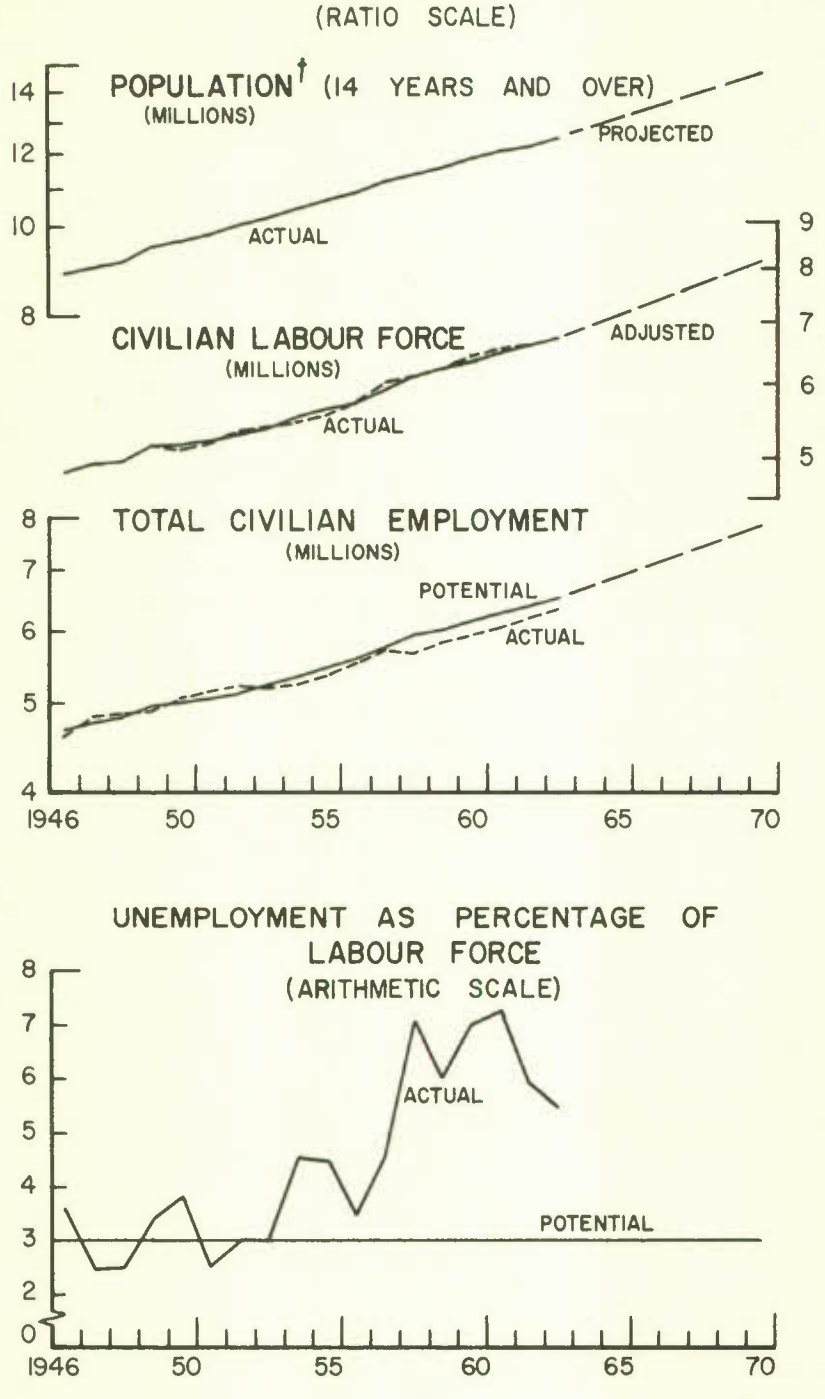
1/ See, for example, Alfred Tella, "The Relation of Labour Force to Employment", Industrial and Labour Relations Review, April 1964.

2/ There is some suggestion of a lagged relationship between labour force participation rates and the business cycle at both peaks and troughs.

CHART I

LABOUR SUPPLY



†Noninstitutional population plus the Armed Forces

Source: Table 23

deducting from the "adjusted" civilian labour force the number of unemployed at a potential level of output. For all years from 1946 to 1970, the minimum or "potential" rate of unemployment was assumed to be 3 per cent of the "adjusted" civilian labour force. The reasons underlying this most important assumption are indicated in Staff Study No. 3.[1/] The resulting estimates of potential civilian employment are compared with the actual series in Chart 1 and in Table 2. It will be noted that between 1946 and 1963, there were four years (1947, 1948, 1951 and 1952) in which actual employment was higher than the potential estimate. This is due primarily to unemployment being below the assumed "potential" rate, except in 1952 when the difference is due to the statistical adjustment to the labour force participation rate.

Table 2

Total Civilian Employment

(Actual as percentage of potential)

1946	99.4	1952	100.2	1958	95.8
1947	100.6	1953	100.0	1959	96.5
1948	100.8	1954	97.9	1960	96.3
1949	99.8	1955	97.9	1961	96.0
1950	98.6	1956	99.7	1962	96.9
1951	100.3	1957	99.0	1963	97.4

Source: Table 23

Potential estimates of total labour force and total employment were obtained by adding in the actual or projected number in the Armed Forces. This adjustment was necessary because the output statistics used in subsequent productivity analysis include in public administration an estimate of the output of the Armed Forces.

2. Calculation of Output, Employment and Productivity at Potential in the Agricultural Sector

Having decided, for reasons already discussed in Section I, to make separate estimates for the agricultural sector, it became necessary to decide on an appropriate method. After experimentation with various techniques, it was decided to make direct estimates of output and employment in the agricultural sector at potential and to obtain productivity residually. Annual variations in farm output are wide, reflecting primarily the degree of dependence on such random and exogenous factors as weather conditions, especially in the major grain-producing regions of the country. Obviously, there would

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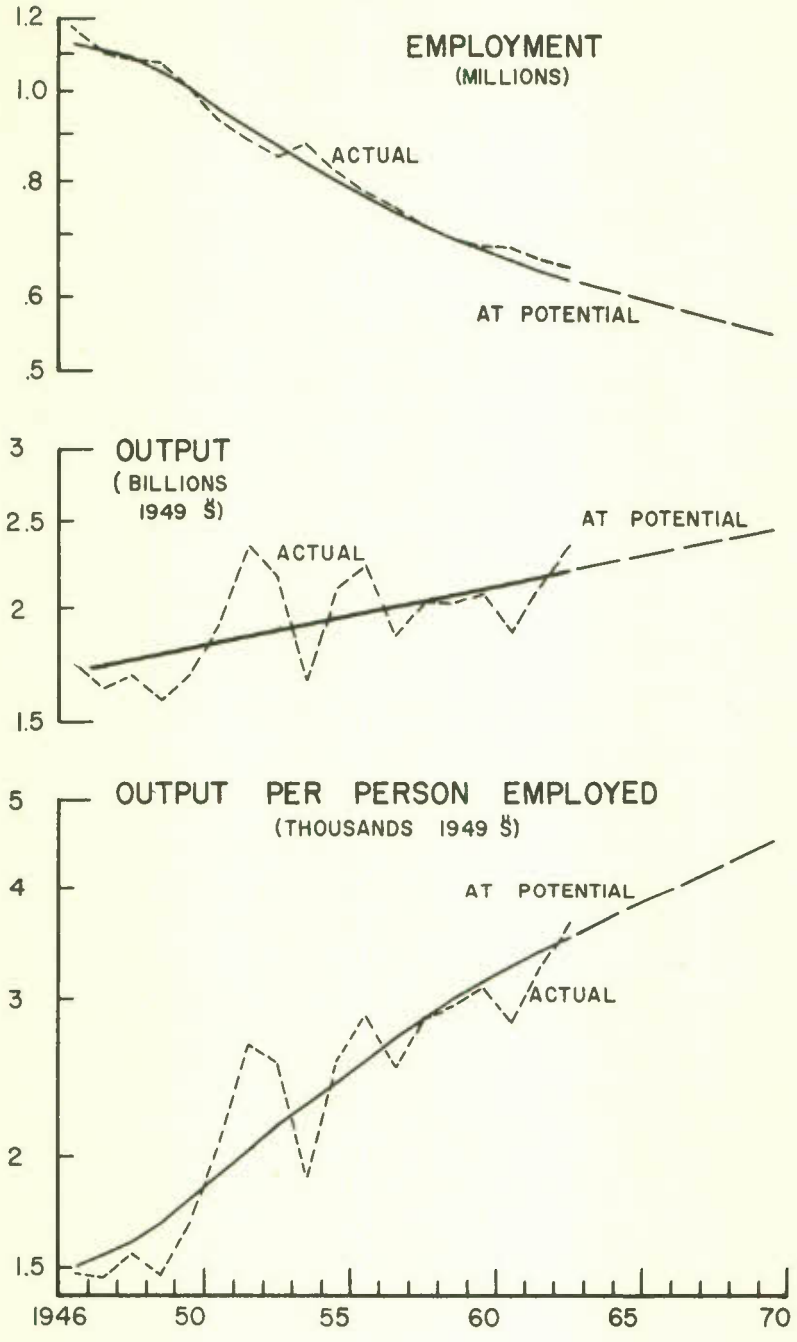
1/ Frank T. Denton and Sylvia Ostry, op. cit.

CHART 2

AGRICULTURE

(RATIO SCALE)



Source: Table 30

be little merit in calculating a theoretical potential level of farm output that assumed an optimum combination of chance factors. Rather, it seemed much more reasonable to use the concept of "normal" output by fitting a straight-line logarithmic trend to a seven-year moving average of actual farm output in the post-war period.

In a series which displayed marked irregularities even after this smoothing procedure, this assumption of a constant rate of growth may seem somewhat arbitrary, especially since the indicated rate of 1½ per cent per annum was appreciably higher than long-term rates of growth in Canadian farm output (less than 1 per cent).[1/] However, we suggest that it seemed reasonable on the following grounds. First, the selected trend rate of growth conformed much better to the whole of the actual post-war experience than did any significantly lower constant rate. Secondly, a fitted curve produced less expansion during the 1960's than could be regarded as reasonable, in the light of independent studies of the probable course of farm output in the sort of environment implied by the attainment of economic potential by 1970.[2/] In this regard, too, our straight-line log trend produced a much more acceptable result. The resulting series of farm output "at potential" is compared with actual output in Table 3 and in Chart 2. Inevitably, in years of unusually favourable crop conditions such as 1952, 1953, 1956 and 1963, actual farm output is well above its trend at potential. In the context of potential output analysis, however, the wide yearly fluctuations in grain harvests have no immediate relevance to the level of employment or to the general level of resource utilization in the economy, because they do not come about as a result of corresponding changes in the volume of factor inputs. Indeed, a great advantage of treating the farm sector separately is to be able to isolate the effect of these fluctuations upon aggregate measures of output and productivity.

Table 3

Agricultural Output

(Actual as a percentage of level at potential)

1946	102.0	1952	126.9	1958	100.1
1947	94.5	1953	114.5	1959	98.6
1948	96.1	1954	86.4	1960	99.4
1949	89.2	1955	107.8	1961	88.7
1950	93.3	1956	113.9	1962	99.0
1951	104.7	1957	93.0	1963	106.9

Source: Table 30.

1/ All references to output in this and subsequent sections refer to the real Domestic Product measure (see Statistical Note, Section IV).

2/ See John Dawson, "Changes in Agriculture to 1970", Staff Study No. 11, Economic Council of Canada.

In so far as the calculations of agricultural employment at potential were concerned, the above assumptions regarding output implied little change from actual experience. As the empirical evidence makes clear, the sharp fluctuations in output around our trend-line had no discernible effect on year-to-year changes in employment (see Chart 2). This, of course, is consistent with the reasoning underlying our output calculations -- namely, that the fluctuations reflected random chance factors rather than variations in factor inputs. The trend of agricultural employment, on the other hand, is determined to an important extent by such factors as variations in the input of capital in the farm sector and the general level of employment in the rest of the economy. Thus, in the early post-war period, the substantial reduction in the size of the farm work force was associated with extensive farm mechanization. However, in Canada, as in most countries, employment in the agricultural sector contains an element of disguised unemployment that tends to increase during periods of high unemployment in the economy generally, especially when the period is prolonged.[1/] This inverse relationship was most dramatically demonstrated by the high levels of farm employment during the depression years of the 1930's. In the early post-war period, following demobilization, a substantial element of this disguised unemployment still persisted in the farm sector and probably explains in part the rapidity of the subsequent decline in employment.

Since the period from 1946 to 1956 was on the average one of near potential performance in the rest of the economy, the procedure followed to obtain a level of farm employment consistent with potential in these years was simply to pass a smoothed trend-line through the actual employment data. This line had the characteristics of a curve which declined most sharply in the period from 1949 to 1952 with some tapering of the rate of decline at the beginning and end of the period. It may be noted that this pattern mirrors the rising curve of capital inputs during the same period.[2/] Comparing actual employment with the resulting trend series at potential over the period from 1946 to 1956, the actual level was significantly above trend in 1946, 1949, 1954 and 1955 -- all years in which there was some short-term weakness in employment in the economy as a whole. On the other hand, the actual level was slightly below trend in the years 1951 to 1953, a period when labour demand in the economy was very strong.

1/ See A. Maddison, op. cit., p.59-60

2/ See John Dawson, op. cit., Staff Study No. 11, Economic Council of Canada.

For the period from 1956 to 1963, however, the question arose as to how much the diminishing rate of decline in farm employment was a result of higher levels of unemployment in the economy. Our solution inevitably had to rest on judgment, which attempted to weigh the underlying considerations. As investment in new equipment slackened after 1956 and as the residue of disguised unemployment from the 1930's disappeared, some further diminution of the rate of decline in farm employment could have been expected to occur even under conditions of sustained high employment. The impact of further mechanization of Western agriculture on employment after the mid-1950's was bound to diminish and further declines in total farm employment to become increasingly dependent upon the reduction in the number of small, submarginal farms in Eastern regions. While the speed of this reduction cannot be dissociated from the general level of economic activity, this process is, by its nature, bound to be gradual, even at high levels of over-all activity. Consequently, it was assumed that the underlying trend in farm employment compatible with a potential level of over-all activity should still reflect a diminishing rate of decline after 1956. The trend, however, was permitted to decline a little more rapidly than the actual level so that by 1963 the actual level was about 2½ per cent above the estimated level at potential. The comparison of the two series for the whole period may be seen in Chart 2 and in Table 4.

Table 4

Employment in Agriculture

(Actual as a percentage of level at potential)

1946	103.4	1952	97.4	1958	99.9
1947	99.6	1953	98.6	1959	100.3
1948	99.5	1954	105.1	1960	100.7
1949	101.6	1955	102.0	1961	103.2
1950	100.3	1956	100.8	1962	102.4
1951	97.4	1957	100.5	1963	102.6

Source: Table 30.

The projection of farm employment at potential to 1970 was made after examination of independent assessments made in another staff study of the Economic Council which suggested a level of employment at that date of about 540 thousand, assuming the economy to be at potential.[1/] This level was consistent with a constant rate of

1/ See John Dawson, op. cit., Staff Study No. 11, Economic Council of Canada.

decline of 2 per cent per annum from our estimate of the level at potential in 1963, a rate which corresponded closely with the rate of decline at the end of our trend-curve to 1963. It was, therefore, adopted without modification.

The resulting series of output per person employed in agriculture at potential, which was obtained residually from these calculations, is, of course, dominated by the varying rate of decline in employment (since output at potential was assumed to be on a constant rate of growth trend). The series rises most rapidly in the 1949-52 period, when it reaches a maximum rate of close to 7 per cent per annum, then slowly drops back to about 3½ per cent per annum in the projected period 1963 to 1970.[1/] The comparison of the actual series of output per person employed in agriculture with our calculation at potential is, of course, dominated by the wide fluctuations in the actual series of farm output (see Chart 2).

3. Calculation of Output, Employment and Productivity at Potential in Public Administration and Community Services

For the purposes of this study the group of services included under this heading follows closely the conventional Standard Industrial Classification (SIC) definitions. The category "public administration" comprises the services at all levels of government and includes defence. The post office, which is included as part of the communication industry by the SIC, has in this study been included with public administration. "Community services" include, as under the SIC, education, health and welfare services, which are very largely government-operated, and several smaller categories, such as religion and the creative arts, which are in the private sector.

Having decided, for reasons already mentioned in Section I, to treat this sector apart from the rest of the nonagricultural economy, it had next to be decided how employment and output in this sector should be treated in the calculations of potential output for past years. More especially in the period after 1956, when the economy at large fell appreciably below its potential level of performance, should output and employment in this sector be adjusted upwards on the assumption that here, as elsewhere, actual performance fell short of potential levels? The examination of the record for this period did not point conclusively in one direction or the other. In the case of public administration, output and employment at the federal level grew less rapidly than

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[1/] This would still be appreciably higher than the long-term rate of about 2½ per cent per annum indicated by our estimates in Appendix B.

in 1946-56, but this was mainly a reflection of changes in the defence component which obviously must be regarded as being exogenously determined; at the provincial and municipal levels, output and employment grew more rapidly in 1956-63 than in the preceding ten years when the economy was running close to its potential level. In the case of community services, output and, more especially, employment also grew more rapidly after 1956 than in the earlier period (see Chart 3).

It could, of course, be reasoned that any or all of these sectors might have increased still more rapidly had government revenues been more buoyant, as they would have been if the economy had stayed closer to its potential level of output. On the other hand, the rate of growth of these public services after 1956 was accompanied by a quite substantial swing from surplus to deficit in the combined accounts of the three levels of government. Under conditions of a sustained high level of economic performance, it is reasonable to suppose that this swing would not have taken place; furthermore tax levels might have been lower, or fewer persons might have been available for employment in community services, etc. It is, therefore, by no means certain that the growth in these services would, in fact, have been any greater under conditions of potential economic operation than that which was actually achieved. Consequently, after due consideration it was decided that it would be reasonable for purposes of calculating past economic potential to use the actual levels of output and employment (including the number in the Armed Forces) in public administration and community services without modification for the entire period from 1946 to 1963.[1/]

In order to project to 1970 estimates of output in public administration and community services at potential, projections were first made for the two major component groups (see Chart 3). These projections were not simple extrapolations: adjustments were made in the light of independent studies of the demand for public services at potential, and the figures finally adopted were consistent with the demand estimates postulated in the First Annual Review[2/] of the Economic Council of Canada. Briefly, in the case of public administration it was assumed that, excluding defence, the combined output at all levels of government would rise at a slightly faster rate than the average for the 1946-63 period as a whole, while the defence component would remain stable.

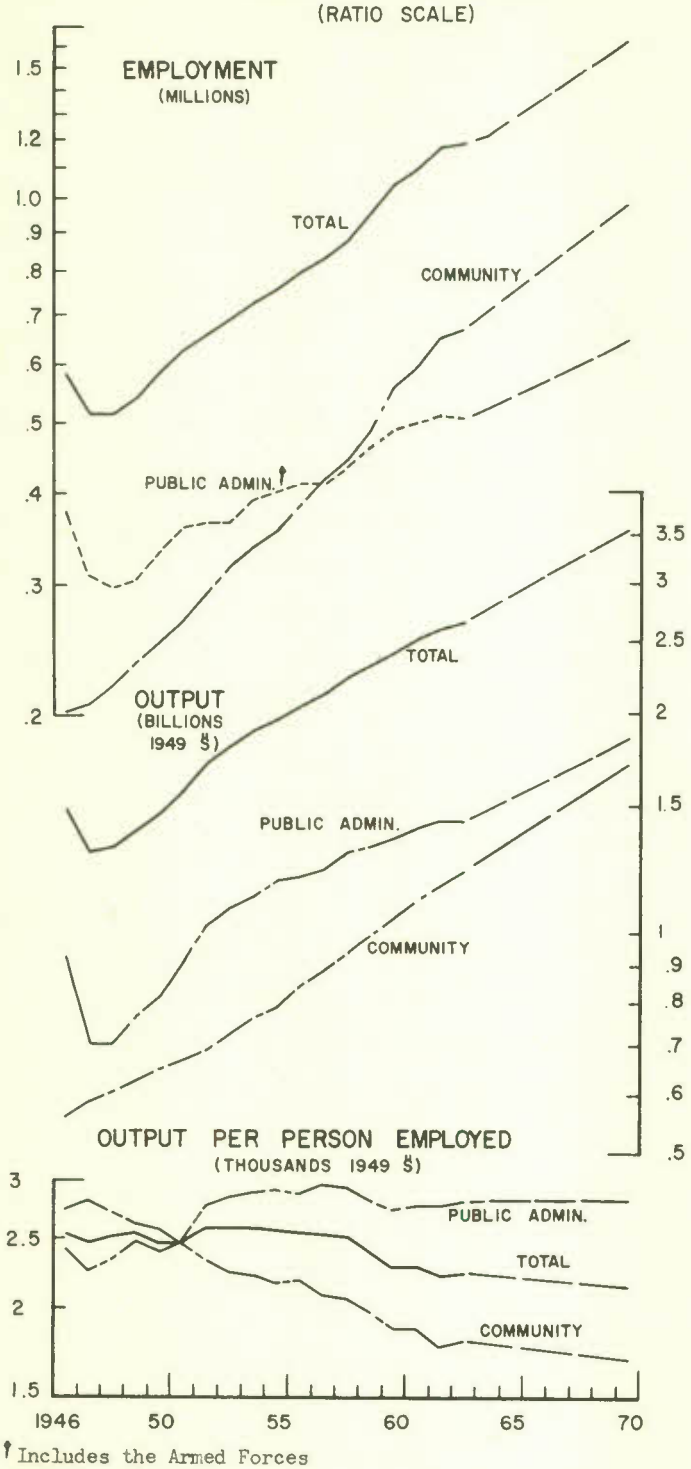
1/ For a description of the methods of estimating output (GDP) of these services, see "Indexes of Real Domestic Product by Industry of Origin, 1935-61," Dominion Bureau of Statistics, 1963, pp.119-121

2/ Economic Goals for Canada to 1970, First Annual Review, 1964, Chapter Seven.

CHART 3

PUBLIC ADMINISTRATION AND COMMUNITY SERVICES

(RATIO SCALE)



† Includes the Armed Forces

Source: Table 26

The output of community services was assumed to rise at a rate which was more rapid than in the first 10 post-war years, but was slightly slower than in the 1956-63 period.

At this stage, in order to obtain a compatible set of projections for employment in public administration and community services to 1970, consideration had to be given to the projection of output per person employed. As in the case of output, the projection of productivity for this sector was made separately for the two major component groups. The DBS estimates of output of the public administration sector are based upon estimates of labour inputs implying constant productivity. This procedure is followed because of the conceptual and practical problems in determining the output of this sector in any more direct fashion. However, because this procedure is followed separately for each component, shifts in their relative importance (e.g., between defence and civil administration or between levels of government) can and do produce variations in output per person employed at the aggregate level, as may be seen in Chart 3.[1/] Nevertheless, since no underlying trend was discernible from the variations in recent years, a constant level of output per worker in public administration, based on the average of the past seven years, was projected to 1970.

Output per person employed in community services presented a much more difficult problem. In this sector, output for individual components is again usually derived from various employment measures.[2/] In the resulting aggregate, using labour force employment estimates, output per person employed in community services has declined quite sharply over the post-war period. No one single factor can explain this seemingly anomalous development. Such developments as the increase in the number of part-time workers, the increase in the ratio of less skilled workers to professional employees in certain areas (for example, in hospitals), and changes in the "mix" of individual services, suggest some partial explanations. In addition, it has to be recognized that the official measures of output in this area are inevitably less reliable than in most other

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1/ An additional cause of discrepancy arises from the fact that the measures of employment which are used in calculating the labour inputs for the component indexes of output are obtained from sources other than the Labour Force Survey; in total, therefore, they may not be wholly consistent with the labour force measure of employment for this sector which has been used in all calculations of employment for this study (See Statistical Note, Section IV).

2/ As in the case of public administration, these measures may not be consistent with data obtained from the Labour Force Survey.

sectors of the economy, while the unofficial estimates of employment derived from the Labour Force Survey which were used in this study are also subject to a rather wide margin of error.[1/]

Given these uncertainties and the inability to explain satisfactorily the past productivity record in community services, it was necessary to adopt somewhat arbitrary procedures in order to make a projection to 1970. It seemed advisable, in the first place, to assume that output per man, on the basis of the output and employment measures used in this study, would continue to decline. However, it was observed that some evidence of moderation in the rate was suggested by the figures for the more recent years. It was assumed that under conditions of a return to potential levels of output, this slower rate of decline would continue and that in the projection to 1970, 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.

The resulting projections of employment for public administration and community services were obtained residually from these projections of output and output per person employed. They indicated that the rate of increase in civilian employment (that is, excluding the Armed Forces) would be more rapid than in the 1946-56 period but slightly slower than in the 1956-63 period.

4. Calculation of Potential Output, Employment and Productivity in the Commercial Nonagricultural Economy [2/]

(a) Potential Employment -- Total

Potential employment in the commercial nonagricultural economy was obtained as a residual by deducting from total potential employment the above estimates of employment

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1/ While the difficulties of output and productivity measurement in this sector are common to all countries, the Canadian statistics appear to produce more "drag" on aggregate measures than they do in other countries. This point is illustrated in Maddison, op. cit. Table II-10, p.64. The much lower productivity growth in Canada than in other countries for the services sector indicated by this comparison for the period 1950-60 may be largely explained by the decline in productivity in Canada over this period in the community services sector. Bearing in mind the importance of this sector as a source of employment growth in the future -- especially for skilled and professional manpower -- the problems of statistical measurement of this sector, both of factor inputs and of output, deserve wider study in this country than they have received in the past.

2/ It should be noted that the definition of the commercial nonagricultural sector for the purposes of this study is less rigorous than that used in Dominion Bureau of Statistics classification (e.g., in "Indexes of Real Domestic Product by Industry of Origin"). In this study it is used to include all nonfarm sectors other than public administration and community services. The Dominion Bureau of Statistics practice, including that followed in a recent productivity study relating to this sector, excludes certain other small categories, the most important of which is domestic service.

at potential in agriculture and in public administration and community services (see Table 24). It should perhaps be noted that since the calculation of employment at potential in agriculture differed only slightly from the actual level in most years, and since employment in public and community services was taken as given, most of the deviation in total employment from potential in past years is implicitly allocated to the commercial nonfarm economy in this study. The comparison of the derived estimates of potential employment with the actual series is made in Table 5.

Table 5

Employment in the Commercial Nonagricultural Economy

(Actual as percentage of Potential)

1946	97.9	1952	100.0	1958	94.5
1947	101.0	1953	100.3	1959	95.3
1948	101.3	1954	96.1	1960	94.8
1949	99.2	1955	96.8	1961	94.1
1950	97.9	1956	99.4	1962	95.5
1951	101.2	1957	98.6	1963	96.1

Source: Tables 23 and 24

(b) Potential Employment -- Paid Workers

In order to obtain a more refined measure of the potential labour input for the commercial nonfarm economy, it was decided to use a calculation relating to paid-worker employment only -- that is, after excluding those persons who are either self-employed or unpaid family workers. This procedure was followed in the forthcoming Dominion Bureau of Statistics study of productivity in this sector of the economy[1/] and there are sound reasons for doing so. As Denison,[2/] among others, has noted, the self-employed and unpaid family workers group in the nonagricultural labour force consists of a hard core of highly productive and skilled persons and a much larger group of workers whose productivity level is much below the average of paid workers: it is, in other words, an area which, like agriculture, contains elements of disguised unemployment. Consequently, under conditions of sustained high levels of employment, many members of

1/ "Indexes of Output per Man and per Man-Hour in Canada — Commercial Nonagricultural Economy, 1947-1963", Dominion Bureau of Statistics, forthcoming. An advance release of the results of this study appeared in the Dominion Bureau of Statistics Daily Bulletin, Nov. 18, 1964.

2/ Edward F. Denison, "Improved Allocation of Labour as a Source of Higher European Growth Rates", to be published in a forthcoming volume by Brown University Press.

this larger fringe group are likely to be attracted into more productive, paid employment. Similarly, when the economy is experiencing persistently high levels of unemployment, this fringe group may increase in number, as people who are unable to obtain regular paid employment undertake odd jobs as self-employed workers, or work without pay in small businesses owned by other members of the family. A brief look at the Canadian historical experience provides interesting support for this thesis.

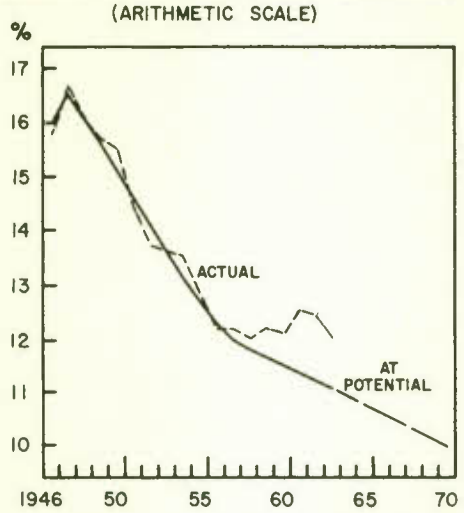
In the period immediately prior to World War II, at the end of the depression, nonfarm workers other than paid employees accounted for almost 25 per cent of the total number of those employed in nonagricultural occupations. Under the intensive labour demands of the war-time economy this proportion fell to only 11 per cent by 1945. Immediately following the war this ratio increased sharply -- for the commercial nonfarm economy alone, it reached a high of nearly 17 per cent in 1947. Then as the economy remained close to its potential level of operation between 1947 and 1956, the proportion of workers other than paid employees fell steadily to about 12 per cent. After 1956, as the economy dropped away from its potential and the level of unemployment increased, this trend was arrested and was even reversed for a time. Although the ratio began to decline again after 1961, it was still as high in 1963 as in 1956 (see Chart 4).

It would, of course, have been perfectly feasible to have allowed implicitly for this element of under-employment in calculating a trend of potential productivity for total employment in the commercial nonfarm economy. However, some experimentation with the alternatives and study of DBS results with its own productivity analysis led to a decision in favour of making an explicit assumption about the ratio of workers other than paid employees which would be consistent with a potential level of operation in the economy at large, and then to deduct this group from total potential employment in the commercial nonfarm sector. The actual procedure was to draw a smooth trend through the actual ratio for the period 1947-56 and project a further decline, though at an appreciably slower rate, over the remainder of the period to 1970, (see Chart 4). The projected ratio at potential in 1970 is 10 per cent of total potential commercial nonfarm employment. The use of this ratio in conjunction with the estimates of potential employment produced a series which indicated that, in moving to potential by 1970, the number of workers other than paid employees would increase only slightly from the actual level in 1963. In other words, virtually all the growth in commercial nonfarm employment in moving to potential by 1970 would be in paid workers.

CHART 4

RATIO OF SELF-EMPLOYED, UNPAID WORKERS, ETC.: COMMERCIAL NON-FARM ECONOMY

(ARITHMETIC SCALE)

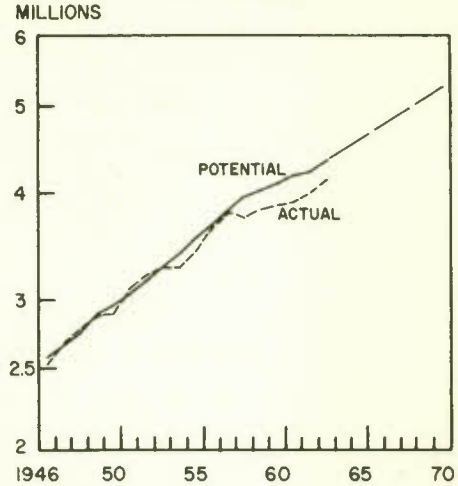


Source: Table 25

CHART 5

EMPLOYMENT OF PAID WORKERS: COMMERCIAL NON-FARM ECONOMY

(RATIO SCALE)



Source: Table 28

The above estimates of workers other than paid employees at potential were then deducted from total potential employment in the commercial nonagricultural economy in order to obtain a series of potential paid-worker employment. This series is compared with the actual series in Table 6 and in Chart 5.

Table 6

Employment of Paid Workers in the Commercial Nonagricultural Economy

(Actual as percentage of potential)

1946	98.1	1952	101.4	1958	94.2
1947	100.8	1953	100.2	1959	94.8
1948	101.3	1954	95.6	1960	94.2
1949	99.0	1955	96.7	1961	92.8
1950	97.4	1956	99.5	1962	94.3
1951	101.4	1957	98.4	1963	95.0

Source: Table 24

(c) Potential Man-Hours Input of Paid Workers

In order to calculate estimates of the annual average of man-hours worked per paid worker at potential, use was made of estimates prepared for the previously mentioned DBS productivity study of the average hours worked by paid employees in the

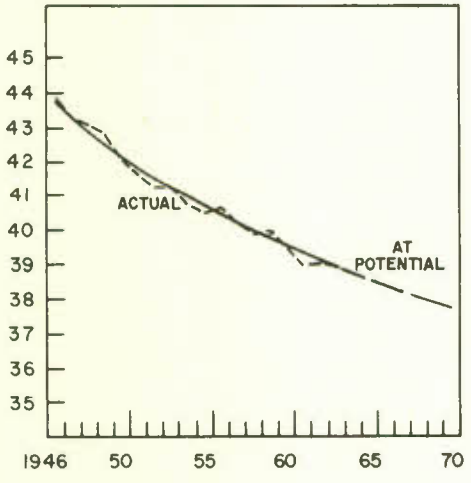
commercial nonagricultural economy for the period 1947 to 1963.[1/] A trend was fitted to this series to obtain a series of hours worked at potential. As may be seen in Chart 6, the trend giving the best fit was one that declined at a diminishing rate over the post-war period. This was evident without making any allowance for the possibility that in the period after 1956 the average length of the work-week may have been shorter than would have been the case had a potential level of operation in the economy been maintained. It is possible that the rate of decline under these circumstances would have slowed down still more abruptly, but empirically this was not possible to demonstrate.

Thus, the main effect of using a smoothed trend line was to remove short-term variations associated with the business cycle, and in only one year (1961) was the deviation of actual from potential greater than 1 per cent. Because of the stability of the actual series around trend throughout the post-war period, the projection of the hours trend at potential to 1970 followed closely the trend suggested by a mathematical fit of the 1947-63 data. While declining a little more slowly than in the preceding

CHART 6

AVERAGE HOURS WORKED PER WEEK: COMMERCIAL NON-FARM ECONOMY

(ARITHMETIC SCALE)

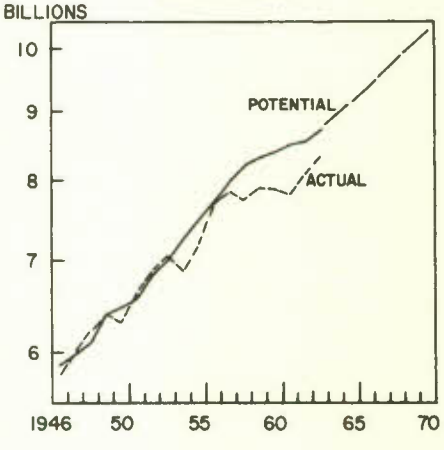


Source: Table 28

CHART 7

MAN-HOURS OF PAID WORKERS: COMMERCIAL NON-FARM ECONOMY

(RATIO SCALE)



Source: Table 28

[1/] These estimates reflect changes arising from the increase in the number of voluntary part-time workers, as well as from changes in the length of the regular work week of those who work full-time or would have worked full time, had work been available.

seven years, the projected trend is consistent with the view that no appreciably higher level of average hours worked would have prevailed in 1963 under potential conditions. As previously suggested, any alternative assumption would have involved arbitrary adjustments which the evidence could not readily justify.

Having obtained a trend series of average hours worked per week and converted this into its annual equivalent, it was then combined with the previously described series of the potential number of paid workers employed in order to arrive at an estimate of the potential man-hour input of paid workers in the commercial nonagricultural economy. The Actual series of man-hour inputs is compared with the potential estimate in Table 7 and in Chart 7.

Table 7

Annual Man-Hours Input of Paid Workers

in the Commercial Nonagricultural Economy

(Actual as percentage of potential)

1946	98.3	1952	100.7	1958	94.0
1947	100.7	1953	100.2	1959	95.0
1948	102.0	1954	94.9	1960	93.9
1949	99.9	1955	96.1	1961	91.9
1950	97.3	1956	99.9	1962	94.3
1951	101.1	1957	98.4	1963	94.9

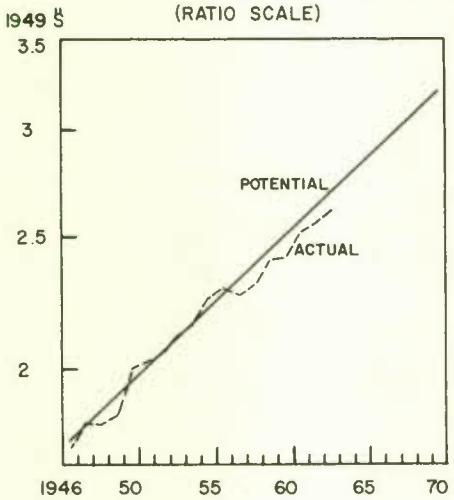
Source: Table 28

(d) Potential Man-Hour Productivity of Paid Workers

CHART 8

OUTPUT PER MAN-HOUR OF PAID WORKERS: COMMERCIAL NON-FARM ECONOMY

(RATIO SCALE)



Source: Table 28

The series of actual observations of man-hour productivity of paid workers in the commercial nonagricultural economy revealed a fairly steady rate of growth over the whole of the post-war period, except for a sharp break between 1956 and 1957 (see Chart 8). Over the entire period from 1946 to 1963, the actual rate

of growth was 2.4 per cent per annum.[1/]

The estimation of the trend of man-hour productivity at potential in the commercial nonagricultural economy is one of the most important calculations in this study, in view of the important consequences which it has for the over-all estimates of potential and hence for the analysis in the First Annual Review as well. As was noted in Section I, past experience has been used as the basic guide for the projection of this estimate to 1970, primarily the experience of the post-war period, but supplemented by some cross-checking against the longer term experience (see Appendix B). The problem, as noted earlier, in this approach is that changes in man-hour productivity do not occur evenly over time, but slow down or accelerate in response to changes in the intensity of resource utilization in the economy, associated with the changing pressures of demand. In the post-war period the economy has had a varied actual experience in relation to potential with considerable demand pressure during the earlier period and an appreciable amount of slack in relation to potential since the mid-1950's. Consequently, the post-war experience of productivity growth for Canada in the commercial nonagricultural economy reflects a mixture of underlying long-term increases and shorter term variations about this trend associated with the changing tempo of demand. In these circumstances, the absence of an observation point of near-potential activity later than 1956 inevitably adds uncertainty as to the appropriate growth path at potential to 1970. For example, it is possible that a gently curving trend, which allowed for slight acceleration in productivity growth over the period, would have been more

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1/ It is of interest to note that, in the United States, the annual average percentage increase in output per man-hour for almost exactly the same area of the economy ("private nonagricultural industries") over the period 1947-63 was also 2.4 per cent (Manpower Report of the President, March 1964, Table 10, p.49).

In the Dominion Bureau of Statistics productivity analysis of the Canadian commercial nonfarm economy, 1947 to 1963, the growth rate of man-hour productivity is estimated to be 3.0 per cent. This higher rate results partly from certain differences in the industrial coverage and also from a number of additional refinements which were incorporated in the DBS measures of employment. Together these differences in definition and procedure had the effect of reducing the rate of growth in employment nearly 0.5 per cent per annum in comparison with the unadjusted labour force data used in this study, while leaving the rate of output growth almost unchanged. Because of the necessity of staying with a consistent and integrated set of labour force data, it was not possible to undertake similar adjustments to the employment data in this study. We are satisfied that for the purposes of our potential calculation the differences are not of crucial importance, because as long as one accepts the growth in total employment as measured by the Labour Force Survey a reduction in the growth of employment in one sector would have to be matched by a corresponding increase in employment growth elsewhere. However, we would also emphasize that for purposes of actual productivity measurement, the DBS estimates are the more refined series.

appropriate then the straight-line log trend (implying a constant rate of growth) which was finally adopted. Until it is possible to examine actual data with the economy once again operating at near-potential levels of output, a degree of uncertainty must remain with regard to this estimate. However, the realistic alternatives are considered likely to lie within one or two tenths of one per cent of the rate adopted, which was 2.5 per cent per annum. This rate was settled upon after various test procedures for fitting straight-line log trends to the first 10 years of the post-war period had indicated rates of growth which clustered around 2.5 to 2.6 per cent per annum.

A comparison of the actual growth of output per man-hour with the calculated potential trend can be seen in Chart 8, while a comparison of the estimates year by year is given in Table 8. On the basis of these comparisons it will be seen that in the period from 1946 to 1956, when resources were at close to an optimum level of utilization, actual output per man-hour was very close to the calculated potential level, whereas in the last seven years of under-employed resources, the actual growth trend of productivity has remained 2 to 3 per cent below potential.

Table 8

Man-Hour Productivity of Paid Workers

in the Commercial Nonagricultural Economy

(Actual as percentage of potential)

1946	98.8	1952	100.0	1958	97.3
1947	100.6	1953	100.2	1959	98.3
1948	98.4	1954	100.0	1960	96.9
1949	97.3	1955	101.9	1961	97.9
1950	102.5	1956	101.1	1962	97.5
1951	101.3	1957	97.7	1963	97.1

Source: Table 28

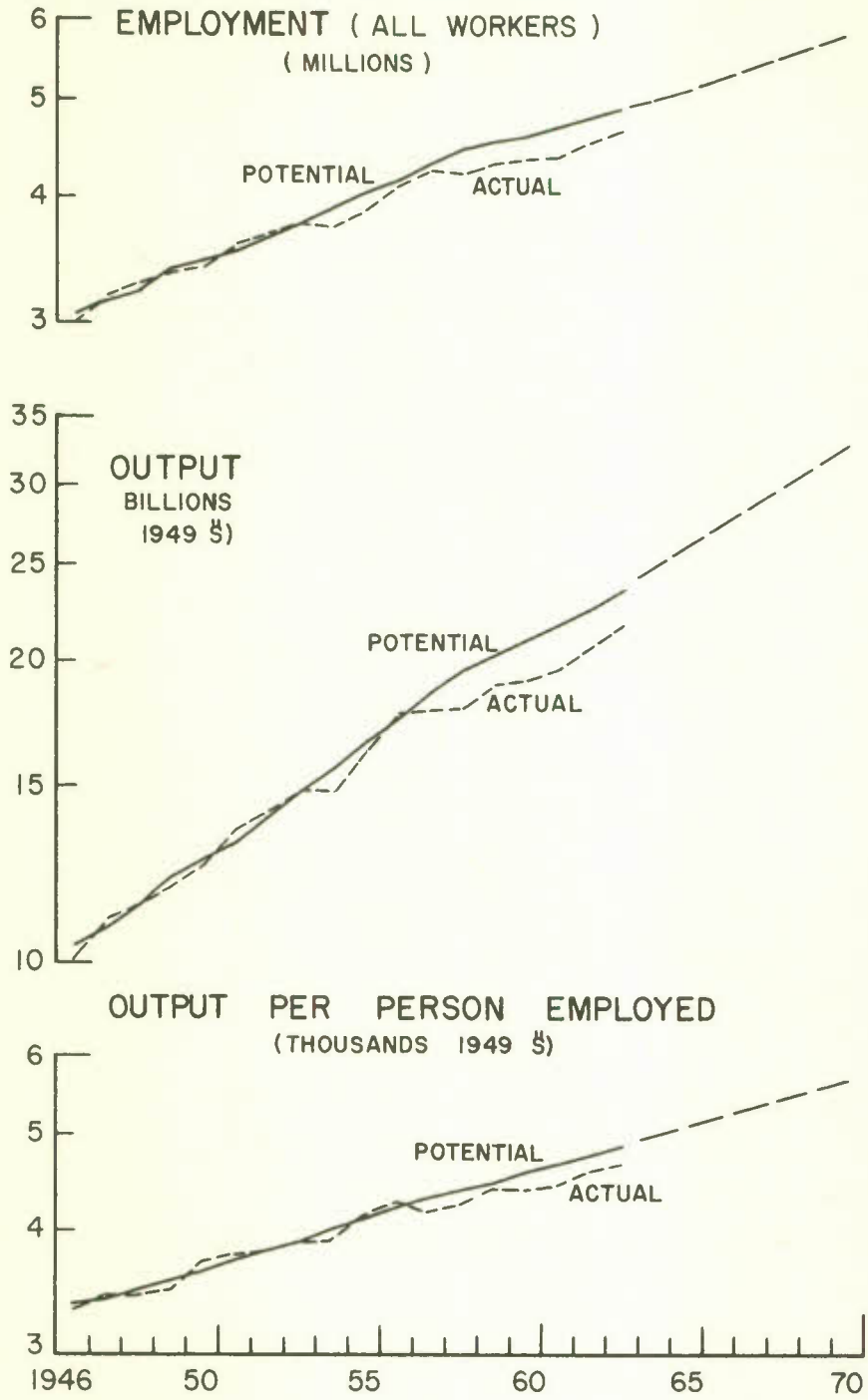
(e) Potential Output

The estimate of potential commercial nonagricultural output was obtained as the product of the two calculations described in the immediately preceding sections, namely, the man-hours of paid workers at potential and the potential man-hour productivity of paid workers. The resulting estimates of potential output are compared with actual output in Chart 9 and Table 9.

CHART 9

COMMERCIAL NONAGRICULTURAL ECONOMY

(RATIO SCALE)



Source: Table 27

Table 9

Output of the Commercial Nonagricultural Economy

(Actual as percentage of potential)

1946	97.1	1952	100.7	1958	91.5
1947	101.4	1953	100.4	1959	93.4
1948	100.4	1954	94.9	1960	91.0
1949	97.2	1955	97.9	1961	90.0
1950	99.7	1956	101.0	1962	91.9
1951	102.3	1957	96.1	1963	92.2

Source: Table 28

(f) Output per Person Employed at Potential

Potential output per person employed (that is, of all workers) in the commercial nonfarm economy was obtained as a residual calculation from the above estimate of potential output in section 4(e) and the estimate of total potential employment in section 4(a). The growth path of the resulting estimates, which is shown in Chart 9, naturally shows some deviation from the constant rate of growth calculated for potential output per man-hour of paid workers, because it also reflects the estimated trends at potential in average hours, and in the ratio of paid workers to other persons employed. For similar reasons, the actual series shows wider deviations from potential in the period after 1956 than does the series of man-hour productivity of paid workers, as may be seen by comparing the figures in Table 10 with those in Table 8.

Table 10

Output per Person Employed in the Commercial Nonagricultural Economy

(Actual as percentage of potential)

1946	99.2	1952	99.8	1958	96.9
1947	100.4	1953	100.1	1959	98.0
1948	99.1	1954	98.8	1960	95.9
1949	98.0	1955	101.2	1961	95.6
1950	101.8	1956	101.6	1962	96.2
1951	101.1	1957	97.5	1963	95.9

Source: Table 27

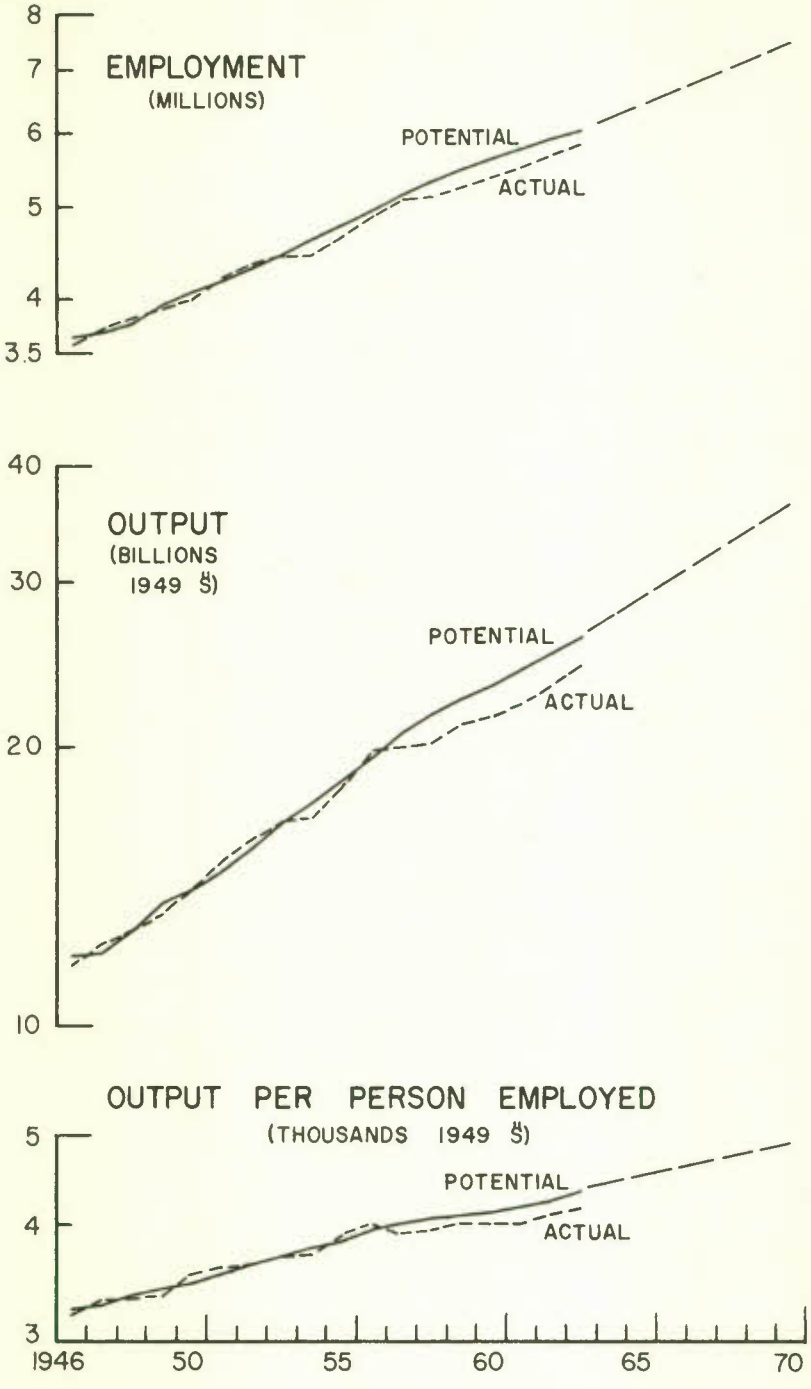
5. Calculation of Potential Output, Employment and Productivity in the Nonagricultural Economy

Potential employment in the total nonagricultural economy was obtained by deducting agricultural employment at potential, as described in section 2, from total

CHART 10

TOTAL NONAGRICULTURAL ECONOMY

(RATIO SCALE)



Source: Table 29

potential employment, as described in section 1. Comparison with actual employment is made in Chart 10 and Table 11.

The potential output of the total nonagricultural economy was obtained by the addition of the potential output estimates for the commercial nonagricultural economy, as described in section 4(c) to those for public and community services as described in section 3. Comparison with actual output is made in Chart 10, and also in Chart 12 and Table 13 in Section III, Summary of Results. As may be observed from Chart 12, the comparison of actual and potential output in the total nonagricultural economy shows a pattern identical to that for the commercial segment of the nonagricultural economy, except for the slightly smaller deviations in actual output from potential. The explanation is that, for reasons given in section 3, public and community service output at potential was assumed to be unchanged from actual output for the whole period 1946-63.

Potential productivity, that is potential output per person employed, in the nonagricultural economy was then derived from the above estimates of potential output and potential employment. It is compared with actual output per person employed in Chart 10 and Table 11.

Table 11

Employment and Output per Person Employed

in the Nonagricultural Economy

(Actual as percentage of potential)

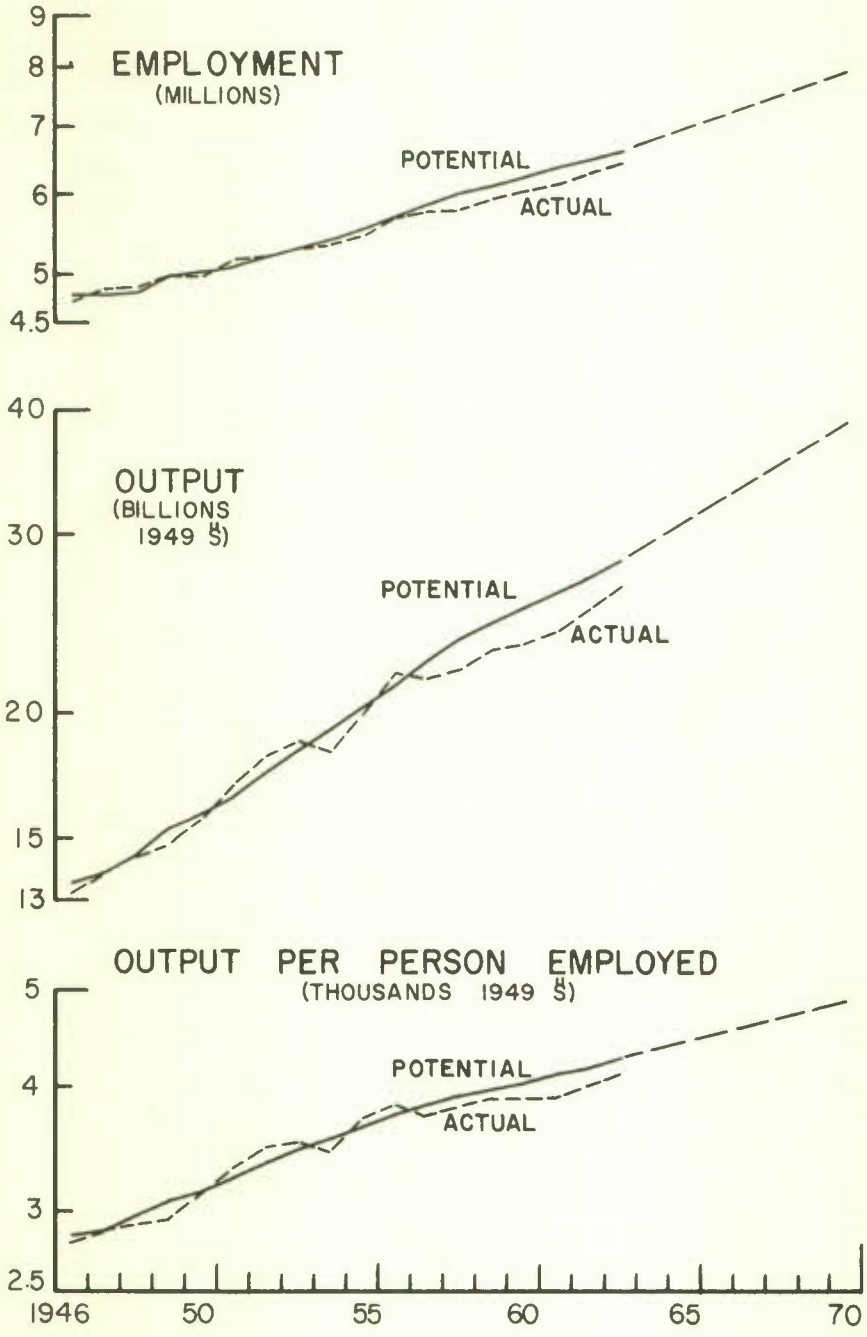
	Employment	Output per Person Employed		Employment	Output per Person Employed
1946	98.2	99.2	1955	97.3	100.9
1947	100.9	100.3	1956	99.5	101.4
1948	101.1	99.3	1957	98.8	97.7
1949	99.3	98.1	1958	95.4	96.8
1950	98.2	101.5	1959	96.1	97.9
1951	101.0	101.1	1960	95.8	95.9
1952	100.8	99.9	1961	95.2	95.5
1953	100.2	100.1	1962	96.4	96.2
1954	96.7	98.9	1963	96.9	95.9

Source: Table 29

CHART II

TOTAL ECONOMY

(RATIO SCALE)



Source: Table 31

6. Calculation of the Potential Output, Employment and Productivity in the Total Economy

The calculation of total potential employment was described in section 1.

Total potential output was obtained by the addition of the potential output estimates for the nonagricultural economy (described in the preceding section) to those for agriculture, as described in section 2. Comparison with the actual output of the economy is made in Chart 11, and also in Chart 12 and Table 13 in Section III.

Total output person employed was then derived from the estimates of potential output and employment. This series is compared with actual output per person employed, together with a similar comparison of the employment estimates, in Chart 11 and Table 12.

Table 12

Employment and Output per Person Employed in the Total Economy

(Actual as percentage of potential)

	Employment[1]	Output per Person Employed		Employment[1]	Output per Person Employed
1946	99.4	98.6	1955	98.0	101.1
1947	100.6	99.8	1956	99.7	102.4
1948	100.8	99.1	1957	99.0	97.1
1949	99.8	96.7	1958	95.9	97.0
1950	98.6	100.4	1959	96.6	97.8
1951	100.3	102.1	1960	96.3	96.0
1952	100.2	103.2	1961	96.0	94.5
1953	100.0	101.8	1962	97.0	96.1
1954	98.0	96.5	1963	97.4	96.5

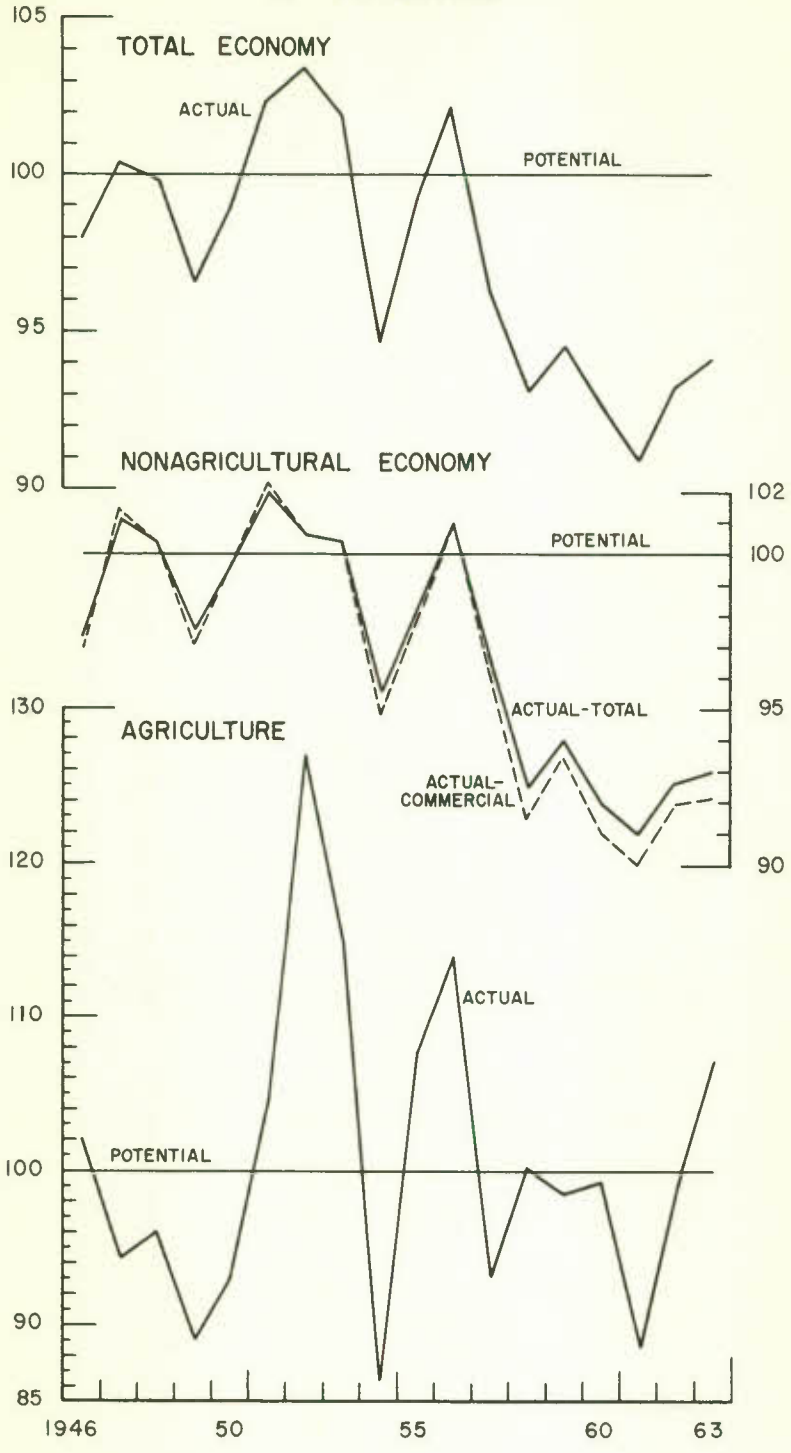
(1) Includes the Armed Forces; this accounts for fractional differences in the employment ratios in this Table and those in Table 2.

Source: Table 31

A more integrated analysis of the results of these calculations, particularly of those in this and in the immediately preceding section concerning the nonagricultural economy, follows in Section III, Summary of Results.

CHART 12

ACTUAL OUTPUT AS A PERCENTAGE OF POTENTIAL



Source: Table 13

III - SUMMARY OF RESULTS

There are a variety of ways in which the resulting estimates of potential employment, output and productivity may be examined. In this Section, it is proposed to examine them from three aspects:

(1) The assessment of the post-war performance of the economy in relation to these estimates of potential.

(2) The growth trends of potential employment, productivity and output over the period 1946-70.

(3) The implications for growth in moving from the 1963 levels of output and employment to a potential level by 1970.

1. Assessment of Post-War Performance

Table 13 and Chart 12 show actual annual output for the post-war period as a percentage of estimated potential for those sectors of the economy which have been studied separately.

Table 13

Output by Sector

(Actual as percentage of potential)

	Nonagricultural Economy		Agriculture	Total Economy
	Commercial	Total*		
1946	97.1	97.4	102.0	98.0
1947	101.4	101.2	94.5	100.4
1948	100.4	100.4	96.1	99.8
1949	97.2	97.5	89.2	96.5
1950	99.7	99.7	93.3	99.0
1951	102.3	102.1	104.7	102.4
1952	100.7	100.6	126.9	103.4
1953	100.4	100.4	114.5	101.8
1954	94.9	95.5	86.4	94.6
1955	97.9	98.1	107.8	99.1
1956	101.0	100.9	113.9	102.1
1957	96.1	96.5	93.0	96.2
1958	91.5	92.4	100.1	93.0
1959	93.4	94.1	98.6	94.5
1960	91.0	91.9	99.4	92.5
1961	90.0	91.0	88.7	90.8
1962	91.9	92.7	99.0	93.2
1963	92.2	93.0	106.9	94.0

* Includes public administration and community services, which are not shown separately; under the procedures adopted in this study, these services are at potential (100) throughout.

Source: Tables 27, 29, 30, 31

Broadly speaking, the pattern of economic performance indicated by these estimates is one of close-to-potential operation throughout the post-war period up to 1956.

The average level of output by sector over these 11 years was: commercial nonagricultural output 99.4 per cent of potential, total nonagricultural 99.3 per cent, and the total economy 99.6 per cent (the average in agriculture was 102.7 per cent).

In only two years prior to 1956 — 1949 and 1954 — was the total output of the economy more than 2 per cent below potential. Both of these were years of business cycle recessions in the United States and, more especially in 1954, in Canada as well; and, on both occasions, the following year showed a rapid recovery towards potential. A third year should perhaps be included on the basis of the 2½ per cent short-fall in nonagricultural output below potential in 1946. This, of course, was the year of general post-war demobilization and therefore a rather special case. The tendency in most other years of this period was towards a level of operation above potential — that is to say, of unsustainably high levels — more particularly in 1947, 1951 and 1956. By contrast, in the period after 1956, and excluding the transitional year of 1957, there followed six successive years in which total output at no time came within 5 per cent of potential. The average level of output by sector in these six years was: commercial nonagricultural output 91.7 per cent of potential, total nonagricultural 92.5 per cent, and the total economy 93.0 per cent (the average in agriculture was 98.8 per cent).

The performance of the total economy in relation to its potential is noticeably affected by the high volatility of agricultural output. Although these variations have little, if any, direct relation to the general level of resource utilization in the economy, the coincidence of years of high output in the farm sector and in the rest of the economy — as in 1951-53 and again in 1956 — and similarly the coincidence of years of low output in both sectors — as in 1949, 1954 and 1961 — tends to accentuate the divergences of total output from potential. Therefore, in assessing the performance during the 1946-63 period in terms of the general level of resource utilization, it may be preferable to analyse the output of the nonagricultural economy in relation to its potential rather than the output of the total economy. In Table 14 the years from 1946 to 1963 are ranked according to the size of the gap between actual output and potential in the nonagricultural economy. The gap is shown as positive (+) when actual output is below potential, and negative (-) when output is above potential. In the second column, the gap as measured by the unemployment rate is shown for purposes of comparison. In this case, a positive number indicates the percentage points by which the unemployment rate exceeds 3 per cent, while a negative figure indicates an unemployment rate below 3 per cent.

Table 14

Deviation from Potential Output and Unemployment

(Measured in percentage points)

	Output Gap(1)	Unemployment Gap(2)
1951	-2.1	-0.4
1947	-1.2	-0.6
1956	-0.9	+0.4
1952	-0.6	0
1948	-0.4	-0.6
1953	-0.4	0
1950	+0.3	+0.8
1955	+1.9	+1.4
1949	+2.5	+0.3
1946	+2.6	+0.6
1957	+3.5	+1.6
1954	+4.5	+1.6
1959	+5.9	+3.0
1963	+7.0	+2.5
1962	+7.3	+2.9
1958	+7.6	+4.1
1960	+8.1	+4.0
1961	+9.0	+4.2

(1) Nonagricultural potential output (100) minus actual output as percentage of potential.

(2) Actual unemployment rate, as percentage of labour force, minus rate at potential (3.0).

Source: Calculated from Tables 13 and 23.

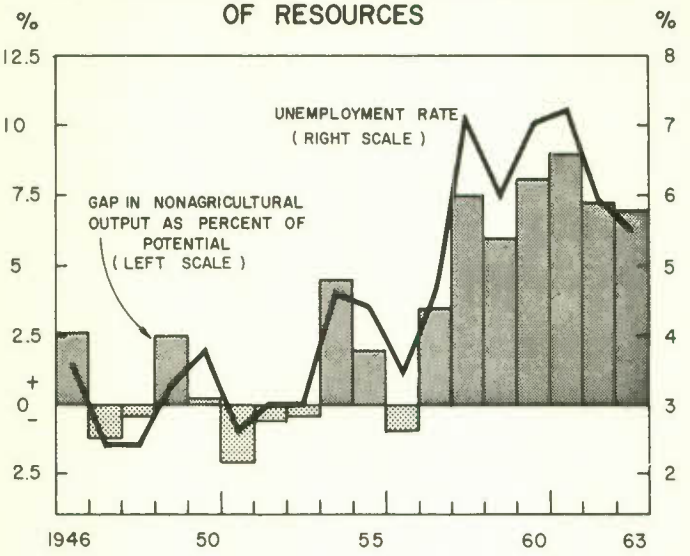
As one would expect, the sign of the gap (that is, whether above or below potential) is generally consistent between these two alternative measures of resource utilization. Only in 1956 is there a conflict in sign: output was above potential while unemployment remained slightly in excess of 3 per cent. On the other hand, in most other years (the exceptions are 1948 and 1950), the gap as measured by the comparison of output with potential indicates a wider divergence from potential than that indicated by the unemployment rate. Again, in the light of the discussion in Section I this is as one would expect, since the potential estimate should allow for the many other factors which vary with the intensity of resource utilization and which are reflected in the performance of output per person employed. This is most strikingly evident in the more recent years such as 1962 and 1963, when following a prolonged period of underemployment of resources the output gap is between 2½ to 3 times as large as that indicated by the unemployment rate.[1/] This relationship is demonstrated in

[1/] In the light of the brief comparative study with measures of potential output in the United States in Appendix A, the relative amplitude of the deviations in output and unemployment indicated by this analysis is fairly conservative.

Chart 13 which compares the output gap and the unemployment rate as measures of resource utilization, using a 2½ to 1 ratio.[1/]

CHART 13

UNEMPLOYMENT RATE AND GAP IN NONAGRICULTURAL OUTPUT (AS PERCENTAGE OF POTENTIAL NONAGRICULTURAL OUTPUT) AS INDICATORS OF THE UNDERUTILIZATION OF RESOURCES



Source: Table 14.

Of the years in which discrepancies occur, the weight of the evidence suggests that in 1950 and 1956 the output gap is probably a more accurate measure -- that is to say, these were years of more intense resource use than is suggested by the unemployment rate. The output gap in 1948 is perhaps the one instance where the results of the potential analysis are no better than the unemployment rate, as a measure of the intensity of resource utilization.

2. Growth Trends in Potentials, 1946-70

It may be useful to consider the growth trends in potential output over the period from 1946 to 1970, that is, assuming that the economy had maintained a potential level of operation throughout. These trends may be examined by subdividing the period

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1/ This method of graphic presentation is adapted from one developed by the Council of Economic Advisers in the United States. See "Economic Report of the President", January 1964, p. 38.

as follows: 1946 to 1956, 1956 to 1963 and 1963 to 1970. The first two periods have more relevance to an examination of the pattern of actual growth in the economy, but 1956 remains a helpful dividing line in the analysis of the potential growth path as well, in view of the assumed trends at potential in agriculture and in public administration and community services. Moreover, it will aid comparisons with subsequent analysis where the actual growth patterns will be reviewed. It may be useful to examine first the two main constituents of the growth in potential output -- namely, the growth trends of potential employment and the growth trends of output per person employed at potential. These are summarized in Tables 15 and 16.

Table 15

Growth of Employment by Sector at Potential Output

(Average annual percentage change)

	Nonagricultural Economy			Agriculture	Total Economy
	Commercial	Public Admin. & Community Services*	Total		
1946-56	+3.0	+3.3	+3.1	-3.8	+1.8
1956-63	+2.3	+5.7	+2.9	-2.9	+2.2
1963-70	+2.6	+4.8	+3.1	-2.0	+2.6

* It will be recalled that for the period 1946-63, the levels of employment and output in this sector at potential are assumed to be identical with their actual levels. The Armed Forces are included.

Source: Tables 23 and 24.

The salient features of the growth trends in employment at potential are: (1) the increasing rate of growth in total employment; (2) the offsetting effects of a diminishing rate of decline in agricultural employment and of the decreasing relative importance of the movement out of agriculture as its share of the work force shrinks; and (3) the resulting relative stability of the rate of growth in nonagricultural employment at potential. Within the nonagricultural economy, the high rate of growth in employment in public administration and community services in recent years and over the projected period to 1970 results in a slower rate of growth in commercial employment at potential after 1956 than in the 1946-56 period.

Table 16

Growth of Output Per Person Employed by Sector at Potential Output

(Average annual percentage change)

	Nonagricultural Economy			Agriculture	Total Economy
	Commercial	Public Admin. & Comm. Services*	Total		
1946-56	+2.2	0	+1.9	+5.5	+2.8
1956-63	+2.1	-1.8	+1.4	+4.6	+1.9
1963-70	+2.2	-0.5	+1.7	+3.6	+1.9

* See footnote to Table 15.

Source: Tables 26, 27, 29, 30 and 31.

There is one outstanding feature of the growth trends in productivity (output per man) at potential -- namely, the relatively high rate of growth in the total economy in the early post-war period up to 1956. In the more recent period and over the projected period to 1970, the growth rate of 1.9 per cent at potential is more or less in line with its long-term performance since the 1920's.[1/] The higher rate in the 1946-56 period was mainly a result of the unusually high rate of growth in the productivity of agriculture as calculated at potential. In the period from 1956 to 1963, potential agricultural productivity increased more slowly, and there was an appreciable decline in output per man in the public administration and community services sector, as was noted earlier. A continuation of the slow-down in agricultural productivity growth at potential is projected to 1970, though the rate remains high relative to other sectors and to its own long-term performance. In public and community services, however, a less unfavorable trend than in the 1956-63 period is projected for reasons mentioned earlier. Potential output per man in the commercial nonagricultural economy has a relatively stable rate of growth throughout.

The combined effects of these various growth patterns in employment and productivity are reflected in the growth rates of potential output as summarized in Table 17.

1/ See Appendix B.

Table 17

Growth of Potential Output by Sector

(Average annual percentage change)

	Nonagricultural Economy			Agriculture	Total Economy
	Commercial	Public Admin. & Comm. Services*	Total		
1946-56	+5.3	+3.3	+5.1	+1.5	+4.7
1956-63	+4.4	+3.8	+4.3	+1.5	+4.1
1963-70	+4.9	+4.3	+4.8	+1.5	+4.6

* Actual output for the period 1946-63.

Source: Tables 26, 27, 29, 30 and 31.

Because of offsetting variations in the growth rates at potential of employment and productivity, the growth trend in total potential output in the projected period to 1970 is approximately the same as in the 1946-56 period, while it is somewhat more rapid than the potential rate of growth between 1956 and 1963, owing to the faster rate of growth which is projected for employment in the period to 1970.

3. Implications of Reaching 1970 Potentials

In the previous section we have examined growth trends in output and their main constituents at potential, that is to say assuming that the economy had maintained a potential level of operation throughout the post-war period from 1946 to 1963 and ahead to 1970. In fact, of course, as we have already seen in III - 1, marked variations in actual output have occurred from the estimated level of potential performance. Between 1946 and 1956, total output rose from 98 per cent of potential to 102 per cent, while between 1956 and 1963 the ratio of actual output to potential fell back from 102 per cent to 94 per cent. In other words the growth in the first period exceeded the 4.7 per cent rate that would have been consistent with the maintenance of potential throughout, while in the period from 1956 to 1963, the actual rate of growth fell considerably short of the 4.1 per cent potential rate indicated for that period. Similarly, when we postulate a return of the economy to its potential level of output by 1970, the rate of growth from 1963 to 1970 must be not merely sufficient to match the estimated growth rate at potential of 4.6 per cent but also must be sufficiently greater to eliminate the output gap of 6 per cent which existed in 1963.

It may be useful, again, to compare the required rate of growth to 1970 with earlier periods of actual growth and to examine first the main constituents of the overall growth in output. Table 18 compares the average annual rates of change in population, labour force and employment that are involved in the achievement of potential by 1970 with the actual changes between 1946 and 1956 and between 1956 and 1963.

Table 18

Factors in Labour Supply

Actual Changes, 1946-56, 1956-63 and Implied Changes, 1963-70

	Noninstitutional Population (1) (14 yrs. & over)	Total Labour Force(1)	Unemployment	Total Employment(1)
		(thousands)		
1946(A)	8,903	4,935	171	4,764
1956(A)	10,922	5,899	197	5,702
1963(A)	12,589	6,860	373	6,487
1970(P)	14,782	8,237	244	7,993
		(Average annual percentage change)		
1946-56	+2.1	+1.8		+1.8
1956-63	+2.0	+2.2		+1.9
1963-70	+2.2(2)	+2.6		+3.0

(A) Actual. (P) Potential.

(1) Includes the Armed Forces.

(2) Calculated after adjustment of the actual 1963 figure to a comparable basis with the 1970 estimate; that is, by adjusting the published data to conform with the 1961 Census.

Thus in order to keep pace with labour force expansion alone, employment between 1963 and 1970 would have to increase at 2.6 per cent per annum; in order to reduce unemployment at the same time from its 1963 level of 5.5 per cent to its "potential" rate of 3 per cent (of the civilian labour force), employment would have to increase at an average rate of 3.0 per cent per annum, or more than 1½ times as fast as the average for the whole period from 1946 to 1963.

It should be noted, however, that relatively wide variations in the rate of unemployment that is assumed for purposes of calculating potential employment in 1970 make surprisingly little difference to the indicated rate of employment growth required between 1963 and 1970. For example, if the "potential" rate were lowered to 2½ per cent from the 3 per cent used in the above calculations, it would mean that employment would

have to increase at an average rate of 3.1 per cent rather than 3.0 per cent per annum; similarly, if the assumed "potential" unemployment rate were as high as 4 per cent, employment would still have to increase at a rate of 2.9 per cent per annum between 1963 and 1970.

The implications of the over-all rate of increase in employment for the various sectors are shown for the same periods in Table 19.

Table 19

Employment by Sector

Actual Changes, 1946-56, 1956-63 and Implied Changes, 1963-70

	Nonagricultural Economy			Agriculture	Total Economy
	Commercial	Public Admin. & Comm. Services(1)	Total		
			(thousands)		
1946(A)	3,007	583	3,590	1,174	4,764
1956(A)	4,123	803	4,926	776	5,702
1963(A)	4,661	1,185	5,846	641	6,487
1970(P)	5,805	1,645	7,450	543	7,993
			(Average annual percentage change)		
1946-56	+3.2	+3.3	+3.2	-4.1	+1.8
1956-63	+1.8	+5.7	+2.5	-2.7	+1.9
1963-70	+3.2	+4.8	+3.5	-2.3	+3.0

(A) Actual. (P) Potential.

(1) Includes the Armed Forces.

Source: Tables 23 and 24.

It is of interest to note that the rate of increase in commercial nonfarm employment implied by a return to potential by 1970 is no greater than in the 1946-56 period, despite the more rapid rate of growth in total employment. This reflects both the diminished importance of the outflow from agriculture and the higher rate of increase in public and community service employment. However, the postulated rate of growth in commercial nonfarm employment is nearly double that actually achieved between 1956 and 1963.

The implications for productivity performance (on an output-per-man basis) of a return to potential levels of resource utilization by 1970 are presented in the same way in Table 20.

Table 20

Output per Person Employed by Sector

Actual Changes, 1946-56, 1956-63, and Implied Changes, 1963-70

	Nonagricultural Economy			Agriculture	Total Economy
	Commercial	Public Admin. & Comm. Services	Total		
	(Millions of 1949 dollars)				
1946(A)	3,371	2,537	3,235	1,486	2,804
1956(A)	4,288	2,545	4,004	2,912	3,855
1963(A)	4,682	2,244	4,187	3,672	4,137
1970(P)	5,684	2,166	4,907	4,501	4,879
	(Average annual percentage change)				
1946-56	+2.4	0	+ 2.2	+ 7.0	+ 3.2
1956-63	+1.3	-1.8	+ 0.6	+ 3.4	+ 1.0
1963-70	+2.8	-0.5	+ 2.3	+ 2.9	+ 2.4

(A) Actual. (P) Potential.

Source: Tables 26, 27, 29, 30 and 31.

With regard to the implied changes between 1963 and 1970, the results of this analysis indicate three points of special interest. The first is that a return to an optimum utilization of resources would necessarily imply substantially better rates of productivity growth in the commercial nonagricultural economy than were achieved in the 1956-63 period, and significantly better, even, than those achieved in the 1946-56 period. This is not because it has been assumed that the rate of productivity growth at potential has increased over the period — this rate is quite stable as was indicated in Table 16. Rather, the relatively high rate of growth between 1963 and 1970 reflects the fact that the commercial nonagricultural economy was much further below its potential level in 1963 than in 1946 (92 per cent compared to 97 per cent). Similarly, the difference with the 1956-63 period is even more striking, because in that period output fell from 101 per cent of its potential to 92 per cent, a situation in which productivity was bound to increase at a much slower rate.

The second major point of interest is that, mainly as a result of declines in both the growth rate and the relative importance of agricultural productivity, the rate of productivity growth in the whole economy in attaining potential by 1970 would remain appreciably less than the rate which was actually achieved between 1946 and 1956.[1/]

1/ This effect is amplified by a level of output in agriculture which was appreciably above the calculated trend at potential in both 1956 and 1963.

A third important point indicated in Table 20 is the significant effect of variations in the behaviour of output per man in public administration and community services. This sector exerts appreciably more "drag" on over-all productivity growth in the 1963-70 period than in the 1946-56 period, both on account of its more adverse productivity performance and because of its increased share of total employment.[1/]

When these elements of employment growth and productivity growth are combined in estimates of growth in total output, the following results are obtained for the 1963-70 period.

Table 21

Output by Sector

Actual Changes, 1946-56, 1956-63, and Implied Changes, 1963-70

	Nonagricultural Economy			Agriculture	Total Economy
	Commercial	Public Admin. & Comm. Services	Total		
	(Millions of 1949 dollars)				
1946(A)	10,136	1,479	11,615	1,745	13,360
1956(A)	17,678	2,044	19,722	2,260	21,982
1963(A)	21,821	2,659	24,480	2,354	26,834
1970(P)	32,994	3,563	36,557	2,444	39,001
	(Average annual percentage change)				
1946-56	+5.7	+3.3	+5.4	+2.6	+5.1
1956-63	+3.1	+3.8	+3.1	+0.6	+2.9
1963-70	+6.1	+4.3	+5.9	+0.5	+5.5

(A) Actual. (P) Potential.

Source: Tables 26, 27, 29, 30 and 31.

The implied average rate of growth in total output necessary to attain potential by 1970 is clearly high in relation to the post-war experience up to 1963. This is a reflection both of the size of the gap that still existed in 1963 and the high rate of growth of the labour supply at potential. The first point is illustrated by comparison of the 5.5 per cent growth rate in total output in the above table with the growth rate at potential of 4.6 per cent per annum noted in Table 17. In other words, the closing of the gap between 1963 and 1970 adds almost 1 per cent per annum to the required growth rate of the total economy, and slightly more than 1 per cent to that of the nonagricultural economy. In the case of agriculture, the fact that in 1963 output was above the calculated trend level "at potential" means that the rate of growth to 1970 is less than the assumed trend rate at potential of 1.5 per cent per annum.

1/ In 1946 it accounted for 12 per cent of total employment; by 1970 at potential it would account for over 20 per cent.

To summarize the implications for growth between 1963 and 1970 involved in attaining potential by the latter year, Table 22 draws together the growth rates in employment, output, output per man and output per man-hour for this period. It will be recalled from Section II, "Methods of Calculating Potential Employment, Productivity and Output", that estimates of hours were used only in the calculations relating to productivity in the commercial nonagricultural economy.[1/] Although the estimates of man-hour productivity for agriculture and public and community services per se are not regarded as being of major significance, they are necessarily included to provide estimates of output per man-hour in the nonagricultural economy, the commercial economy and the total economy.

Table 22

Summary of Implied Average Annual Rates of Growth by Sector

In Moving From Actual Levels in 1963 to Potential Levels in 1970

	Output	Employment	Output per Man	Hours	Output per Man-hour
Total Economy	+5.5	+3.0	+2.4	-0.6(1)	+3.0
Agriculture	+0.5	-2.3	+2.9	-0.4	+3.4
Nonagricultural Economy	+5.9	+3.5	+2.3	-0.5	+2.8
Commercial	+6.1	+3.2	+2.8	-0.5	+3.3
Public Admin. & Comm. Services	+4.3	+4.8	-0.5	-0.5	0
Commercial Economy (2)	+5.6	+2.6	+2.9	-0.6(1)	+3.6

(1) The higher rates of decline in these aggregate measures are a result of a "shift" effect between agriculture and other sectors. The greater length of the average work-week in agriculture, where employment is declining absolutely and relatively to other sectors, is responsible for this.

(2) Agriculture plus commercial nonagricultural sector.

Source: Tables B-2a, b and c.

1/ On theoretical grounds, the appropriateness of allowing for changes in the length of the average work-week in the other two sectors when analysing productivity trends is open to question, especially in agriculture, because man-hours data as recorded may not be a particularly accurate measure of the intensity of utilization of the work force. As a practical matter, calculation of man-hour productivity in the two isolated sectors was unnecessary for the following reasons: (a) the decision to derive agricultural productivity residually, that is, from output and employment trends at potential; (b) the use of actual series of output, employment and output per man in public administration and community services for the period 1946-63.

IV - STATISTICAL SECTION

IV - STATISTICAL SECTION

Statistical Note to Tables 23 to 31

1. Estimates of the civilian noninstitutional population, 14 years of age and over, the civilian labour force and civilian employment for the period 1946 to 1963 were obtained from the DBS Labour Force Survey. In most instances, these data correspond with those contained in DBS publications. There are, however, certain exceptions. Annual averages of labour force and employment data for the years 1946 to 1952 inclusive have been adjusted to correspond more closely with the published data for subsequent years, which are averages of monthly survey estimates (prior to November 1952, the labour force survey was on a quarterly basis). Annual estimates for 1949 have been adjusted to include Newfoundland, as from the start of the year, rather than from the first time the province was actually surveyed. The estimates of the number of persons employed in public administration and community services are not published by the DBS because these estimates are not considered as meeting the same standards of accuracy as other labour force data and their use in this study is solely the responsibility of the author. The series in Table 28 on average hours of work in the commercial nonagricultural sector corresponds with that contained in a forthcoming DBS study entitled "Indexes of Output per Man and Per Man-Hour in Canada Commercial Nonagricultural Economy, 1947-63", a summary of which has been released, as noted previously.

2. All calculations of output in this study and in the accompanying statistical tables are estimates of Gross Domestic Product (GDP) in constant (1949) dollars. Both on conceptual grounds and on grounds of general suitability, this measure was preferred to the alternative measure of aggregate output -- the Gross National Product (GNP) in constant dollars. Conceptually, the essential difference between these measures is that GDP measures the product of all industries located within the geographical boundaries of Canada. GNP, on the other hand, includes production in foreign countries accruing to Canadian owners residing in Canada and excludes that production within the boundaries of Canada which accrues to non-residents. In practice, differences over longer periods of time between the two measures have been small. The more important consideration in using the GDP measure in the present study was the fact that it permitted the analysis of output by industrial sector. In order to calculate GDP by industrial sectors in 1949 dollars, use was made of "Indexes of Real Domestic Product by Industry of Origin", published in May 1963 by the DBS and

subsequent revisions thereto. These indexes were applied to base-year estimates (1949) in order to obtain estimates of GDP in all years other than 1949. Total GDP in 1949 was obtained from "National Accounts, Income and Expenditure". However, the estimates of GDP by industrial sector for the base year were not taken directly from the National Accounts table. These sector estimates were obtained by applying the appropriate industry weights, as given in "Indexes of Real Domestic Product by Industry of Origin", to total GDP in 1949. This procedure gives a slightly different result from that provided in the National Accounts table for 1949, but it yields a more accurate industrial allocation.

3. With the exception of the annual figure for the Armed Forces, which was obtained from the Bank of Canada Statistical Summary and Annual Supplement, all other series in these tables are the responsibility solely of the author or of other staff members of the Economic Council of Canada. This pertains to all the calculations of output per man or per man-hour derived from the output and employment statistics referred to above, to all the projections of output and employment at potential and to all projections for the period 1964-70 inclusive. Where the derivation of these series is not self-explanatory or covered by footnote, the method used in making the calculation is described in Section II.

Table 23

Population, Labour Force, the Armed Forces, Civilian Employment and Unemployment
(thousands of persons)

	Noninstitutional Population[1] (14 years and over)	Labour Force Participation Rate		Total Labour Force[1]		Armed Forces	Civilian Labour Force		Unemployment		Total Civilian Employment	
	Actual/ Projected[2]	Actual	Adjusted[3]	Actual	Adjusted	Actual/ Projected[2]	Actual	Adjusted	Actual	Potential[4]	Actual	Potential
1946	8,903	55.43	55.43	4,935	4,935	125	4,810	4,810	171	144	4,639	4,666
1947	9,042	54.81	54.81	4,956	4,956	35	4,921	4,921	119	148	4,802	4,773
1948	9,177	54.68	54.60	5,018	5,011	36	4,982	4,975	119	149	4,863	4,826
1949	9,540	54.31	54.28	5,181	5,178	44	5,137	5,134	168	154	4,969	4,980
1950	9,667	53.77	54.06	5,198	5,226	52	5,146	5,174	197	155	4,949	5,019
1951	9,809	53.81	53.84	5,278	5,281	78	5,200	5,203	137	156	5,063	5,047
1952	10,054	53.74	53.65	5,403	5,394	98	5,305	5,296	159	159	5,146	5,137
1953	10,269	53.58	53.59	5,502	5,503	105	5,397	5,398	162	162	5,235	5,236
1954	10,505	53.37	53.63	5,607	5,634	114	5,493	5,520	250	166	5,243	5,354
1955	10,714	53.45	53.79	5,727	5,763	117	5,610	5,646	246	168	5,364	5,478
1956	10,922	54.01	53.96	5,899	5,894	117	5,782	5,777	197	173	5,585	5,604
1957	11,224	54.53	54.15	6,120	6,078	117	6,003	5,961	278	179	5,725	5,782
1958	11,477	54.43	54.42	6,247	6,246	120	6,127	6,126	433	184	5,694	5,942
1959	11,682	54.34	54.56	6,348	6,374	120	6,228	6,254	373	188	5,855	6,066
1960	11,908	54.77	54.56	6,522	6,497	119	6,403	6,378	448	192	5,955	6,186
1961	12,131	54.72	54.57	6,639	6,620	121	6,518	6,499	469	195	6,049	6,304
1962	12,350	54.53	54.56	6,734	6,738	126	6,608	6,612	391	199	6,217	6,413
1963	12,589	54.49	54.50	6,860	6,861	123	6,737	6,738	373	202	6,364	6,536
1964	12,946[5]		54.30		7,030	120		6,910		207		6,703
1965	13,227		54.49		7,207	115		7,092		213		6,879
1966	13,522		54.73		7,400	110		7,290		219		7,071
1967	13,830		54.97		7,602	110		7,492		225		7,267
1968	14,142		55.21		7,808	110		7,698		231		7,467
1969	14,461		55.47		8,022	110		7,912		237		7,675
1970	14,782		55.72		8,237	110		8,127		244		7,883

(1) Includes the Armed Forces. (2) Used without modification in the calculations of potential. (3) For the period 1948-61, the series is a centered five-year moving average of the actual ratio. (4) 3 per cent of "adjusted" civilian labour force. (5) Estimates for 1964-70 adjusted for 1961 Census. (They are not, therefore, exactly comparable with Dominion Bureau of Statistics published data for prior years which are still subject to this revision).

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

Table 24

Components of Total Civilian Employment

(thousands of persons)

	Agricultural		Total Civilian Nonagricultural		Public Administration Community Services	Commercial Nonagricultural					
						Total		Self Employed, etc.		Paid Workers	
	Actual	Potential (1)	Actual	Potential	Actual / Projected (2)	Actual	Potential	Actual	Potential (3)	Actual	Potential (4)
1946	1,174	1,135	3,465	3,531	458	3,007	3,073	476	492	2,531	2,581
1947	1,111	1,115	3,691	3,658	482	3,209	3,176	537	524	2,672	2,652
1948	1,085	1,090	3,778	3,736	482	3,296	3,254	530	524	2,766	2,730
1949	1,072	1,055	3,897	3,925	499	3,398	3,426	534	534	2,864	2,892
1950	1,008	1,005	3,941	4,014	536	3,405	3,478	528	525	2,877	2,953
1951	930	955	4,133	4,092	553	3,580	3,539	516	517	3,064	3,022
1952	886	910	4,260	4,227	562	3,698	3,665	507	517	3,191	3,148
1953	858	870	4,377	4,366	592	3,785	3,774	516	513	3,269	3,261
1954	878	835	4,365	4,519	619	3,746	3,900	505	511	3,241	3,389
1955	819	803	4,545	4,675	647	3,898	4,028	498	512	3,400	3,516
1956	776	770	4,809	4,834	686	4,123	4,148	502	510	3,621	3,638
1957	744	740	4,981	5,042	719	4,262	4,323	520	519	3,742	3,804
1958	712	713	4,982	5,229	767	4,215	4,462	507	527	3,708	3,935
1959	692	690	5,163	5,376	847	4,316	4,529	525	528	3,791	4,001
1960	675	670	5,280	5,516	935	4,345	4,581	526	527	3,819	4,054
1961	674	653	5,375	5,651	981	4,394	4,670	551	530	3,843	4,140
1962	653	638	5,564	5,775	1,048	4,516	4,727	559	529	3,957	4,198
1963	641	625	5,723	5,911	1,062	4,661	4,849	563	536	4,098	4,313
1964		613		6,090	1,119		4,971		542		4,429
1965		601		6,278	1,183		5,095		548		4,547
1966		589		6,482	1,251		5,231		554		4,677
1967		577		6,690	1,316		5,374		562		4,812
1968		565		6,902	1,386		5,516		568		4,948
1969		554		7,121	1,458		5,663		575		5,088
1970		543		7,340	1,535		5,805		581		5,224

(1) See Section II-2. (2) Used without modification in calculations of potential. (3) See Table 25. (4) Obtained as a residual after deducting the calculated number of self-employed at potential from potential commercial nonagricultural employment.

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

Table 25

Calculation of the Number of Self-Employed Persons and Unpaid Family Workers at Potential in the Commercial Nonagricultural Economy

(Thousands of persons)

	Number of Self-Employed and Unpaid Family Workers in -			Commercial Nonagricultural Economy			
	Total Nonagricultural Economy	Public and Community Services	Commercial Nonagricultural Economy	Ratio of Self-Employed, etc., to Total Employment		Total Employment	Number of Self-Employed, etc.
	Actual	Actual[1]	Actual	Actual	Potential[2]	Potential[3]	Potential
1946	488	12	476	15.8	16.00	3,073	492
1947	552	15	537	16.7	16.50	3,176	524
1948	545	15	530	16.1	16.10	3,254	524
1949	550	16	534	15.7	15.60	3,426	534
1950	545	17	528	15.5	15.10	3,478	525
1951	533	17	516	14.4	14.60	3,539	517
1952	525	18	507	13.7	14.10	3,665	517
1953	535	19	516	13.6	13.60	3,774	513
1954	525	20	505	13.5	13.10	3,900	511
1955	518	20	498	12.8	12.70	4,028	512
1956	523	21	502	12.2	12.30	4,148	510
1957	542	22	520	12.2	12.00	4,323	519
1958	529	22	507	12.0	11.80	4,462	527
1959	549	24	525	12.2	11.65	4,529	528
1960	553	27	526	12.1	11.50	4,581	527
1961	577	26	551	12.5	11.35	4,670	530
1962	587	28	559	12.4	11.20	4,727	529
1963	590	27	563	12.1	11.05	4,849	536
1964					10.90	4,971	542
1965					10.75	5,095	548
1966					10.60	5,231	554
1967					10.45	5,374	562
1968					10.30	5,516	568
1969					10.15	5,663	575
1970					10.00	5,805	581

(1) Estimated from decennial census data. (2) See Section II-3. (3) See Table 24.

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

Table 26

Public Administration (including Defence) and Community Services[1]

	Gross Domestic Product			GDP per Person Employed			Employment		
	Public Admin. and Defence[2]	Community Services	Total	Public Admin. and Defence	Community Services	Total	Public Admin and Defence[3]	Community Services	Total
	(Millions of 1949 Dollars)			(1949 Dollars)			(Thousands)		
1946	922	557	1479	2426	2744	2537	380	203	583
1947	704	584	1288	2271	2821	2491	310	207	517
1948	702	602	1304	2356	2736	2517	298	220	518
1949	761	625	1386	2487	2637	2552	306	237	543
1950	809	649	1458	2408	2575	2480	336	252	588
1951	903	666	1569	2494	2476	2486	362	269	631
1952	1027	686	1713	2798	2341	2595	367	293	660
1953	1083	722	1805	2873	2256	2590	377	320	697
1954	1136	759	1895	2883	2239	2585	394	339	733
1955	1175	783	1958	2908	2175	2563	404	360	764
1956	1198	846	2044	2880	2186	2545	416	387	803
1957	1236	881	2117	2971	2098	2532	416	420	836
1958	1292	930	2222	2943	2074	2505	439	448	887
1959	1322	993	2315	2819	1994	2394	469	498	967
1960	1350	1054	2404	2749	1872	2281	491	563	1054
1961	1394	1121	2515	2771	1871	2282	503	599	1102
1962	1432	1168	2600	2775	1775	2215	516	658	1174
1963	1436	1223	2659	2816	1812	2244	510	675	1185
1964	1488	1284	2772	2935	1799	2237	525	714	1239
1965	1543	1347	2890	2835	1787	2226	544	754	1298
1966	1599	1414	3013	2835	1774	2214	564	797	1361
1967	1657	1484	3141	2835	1762	2202	594	842	1426
1968	1718	1557	3275	2835	1750	2189	606	890	1496
1969	1781	1634	3415	2835	1738	2178	628	940	1568
1970	1848	1715	3563	2835	1727	2166	652	993	1645

(1) Actual and projected estimates used without modification in calculation of potential. (2) Includes the Post Office. (3) Includes the Armed Forces.

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

Table 27

Commercial Nonagricultural Economy

	Total Employment[1]		Gross Domestic Product		GDP per Person Employed	
	Actual	Potential[2]	Actual	Potential[3]	Actual	Potential
	(Thousands)		(Millions of 1949 Dollars)		(1949 Dollars)	
1946	3007	3073	10,136	10,441	3371	3398
1947	3209	3176	11,032	10,882	3438	3426
1948	3296	3254	11,454	11,408	3475	3508
1949	3398	3426	11,904	12,250	3503	3576
1950	3405	3478	12,683	12,722	3725	3658
1951	3580	3539	13,555	13,247	3786	3743
1952	3698	3665	14,164	14,084	3836	3843
1953	3785	3774	14,874	14,814	3930	3925
1954	3746	3900	14,877	15,675	3971	4019
1955	3898	4028	16,223	16,566	4162	4113
1956	4123	4148	17,678	17,505	4288	4220
1957	4262	4323	17,884	18,603	4196	4303
1958	4215	4462	17,939	19,605	4256	4394
1959	4316	4529	18,976	20,315	4397	4486
1960	4345	4581	19,139	21,042	4405	4593
1961	4394	4670	19,653	21,848	4473	4678
1962	4516	4727	20,764	22,594	4598	4780
1963	4661	4849	21,621	23,677	4682	4883
1964		4971		24,868		5003
1965		5095		25,977		5099
1966		5231		27,260		5211
1967		5374		28,613		5324
1968		5516		30,095		5456
1969		5663		31,491		5561
1970		5805		32,994		5684

(1) Includes self-employed, unpaid family workers, etc.
(2) See Table 24.
(3) See Table 28.

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

Table 28

Calculation of Potential Output in the Commercial Nonagricultural Economy

	Employment		Average Hours of Work per Week		Man-Hours per Year		Output per Man-Hour		Gross Domestic Product	
	Actual	Potential(1)	Actual	Potential	Actual	Potential(2)	Actual	Potential	Actual	Potential(3)
	(Thousands)				(Millions)		(1949 dollars)		(Millions of 1949 dollars)	
1946	2,531	2,581	43.82	43.72	5,785	5,884	1.7527	1.7745	10,136	10,441
1947	2,672	2,652	43.26	43.27	6,027	5,983	1.8304	1.8188	11,032	10,882
1948	2,766	2,730	43.16	42.87	6,242	6,119	1.8349	1.8644	11,454	11,408
1949	2,864	2,892	42.87	42.51	6,401	6,410	1.8594	1.9111	11,904	12,250
1950	2,877	2,953	42.13	42.18	6,320	6,495	2.0068	1.9587	12,683	12,722
1951	3,064	3,022	41.74	41.87	6,668	6,598	2.0328	2.0077	13,555	13,247
1952	3,191	3,148	41.32	41.58	6,894	6,844	2.0574	2.0579	14,184	14,084
1953	3,269	3,261	41.30	41.30	7,040	7,023	2.1128	2.1094	14,874	14,814
1954	3,241	3,389	40.73	41.03	6,883	7,250	2.1614	2.1621	14,877	15,675
1955	3,400	3,516	40.54	40.77	7,187	7,475	2.2573	2.2162	16,223	16,566
1956	3,621	3,638	40.65	40.52	7,696	7,707	2.2970	2.2714	17,678	17,505
1957	3,742	3,804	40.29	40.28	7,861	7,990	2.2750	2.3283	17,884	18,603
1958	3,708	3,935	39.94	40.04	7,722	8,215	2.3231	2.3865	17,939	19,605
1959	3,791	4,001	39.92	39.81	7,891	8,305	2.4048	2.4461	18,976	20,315
1960	3,819	4,054	39.46	39.59	7,879	8,392	2.4291	2.5074	19,139	21,042
1961	3,843	4,140	38.98	39.38	7,811	8,501	2.5161	2.5701	19,653	21,848
1962	3,957	4,198	39.19	39.18	8,086	8,577	2.5679	2.6343	20,764	22,594
1963	4,098	4,313	38.93	38.99	8,319	8,769	2.6230	2.7001	21,821	23,677
1964		4,429		38.80		8,985		2.7677		24,868
1965		4,547		38.62		9,157		2.8368		25,977
1966		4,677		38.44		9,375		2.9077		27,260
1967		4,812		38.26		9,600		2.9805		28,613
1968		4,948		38.08		9,851		3.0550		30,095
1969		5,088		37.91		10,057		3.1313		31,491
1970		5,224		37.74		10,280		3.2095		32,994

Note: All calculations relate to paid workers only.

(1) See Table 24

(2) Estimates derived from calculations of potential employment and potential average hours of work converted to annual basis

(3) Estimates derived from calculations of potential man hours per year and potential output per man-hour (see Section II- 3).

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

Table 29

Total Nonagricultural Economy

	Employment[1]		Gross Domestic Product		GDP per Person Employed	
	Actual	Potential[2]	Actual	Potential[3]	Actual	Potential
	(Thousands)		(Millions of 1949 Dollars)		(1949 Dollars)	
1946	3590	3656	11,615	11,920	3235	3260
1947	3726	3693	12,320	12,170	3306	3295
1948	3814	3772	12,758	12,712	3345	3370
1949	3941	3969	13,290	13,636	3372	3436
1950	3993	4066	14,141	14,180	3541	3487
1951	4211	4170	15,124	14,816	3592	3553
1952	4358	4325	15,895	15,797	3647	3652
1953	4482	4471	16,679	16,619	3721	3717
1954	4479	4633	16,772	17,570	3745	3792
1955	4662	4792	18,181	18,524	3900	3866
1956	4926	4951	19,722	19,550	4004	3949
1957	5098	5159	20,001	20,720	3923	4016
1958	5102	5349	20,161	21,827	3952	4081
1959	5283	5496	21,291	22,630	4030	4118
1960	5399	5635	21,543	23,446	3990	4161
1961	5496	5772	22,168	24,363	4033	4221
1962	5690	5901	23,364	25,194	4106	4269
1963	5846	6034	24,480	26,336	4187	4365
1964		6210		27,640		4451
1965		6393		28,867		4515
1966		6592		30,273		4592
1967		6800		31,754		4670
1968		7012		33,370		4759
1969		7231		34,906		4827
1970		7450		36,557		4907

(1) Includes the Armed Forces.

(2) See Tables 23 and 24

(3) See Tables 26 and 27.

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

Table 30

Agricultural Sector

	Employment		Gross Domestic Product		GDP per Person Employed	
	Actual	Potential[1]	Actual	Potential[2]	Actual	Potential
	(Thousands)		(Millions of 1949 Dollars)		(1949 Dollars)	
1946	1174	1135	1745	1710	1486	1507
1947	1111	1115	1640	1736	1476	1557
1948	1085	1090	1693	1762	1560	1617
1949	1072	1055	1595	1788	1488	1695
1950	1008	1005	1694	1815	1681	1806
1951	930	955	1928	1842	2073	1929
1952	886	910	2373	1870	2678	2055
1953	858	870	2174	1898	2534	2182
1954	878	835	1664	1926	1895	2307
1955	819	803	2107	1955	2573	2435
1956	776	770	2260	1984	2912	2577
1957	744	740	1874	2014	2519	2722
1958	712	713	2046	2044	2874	2867
1959	692	690	2046	2075	2957	3007
1960	675	670	2093	2106	3101	3143
1961	674	653	1896	2138	2813	3274
1962	653	638	2148	2170	3289	3401
1963	641	625	2354	2202	3672	3523
1964		613		2235		3646
1965		601		2269		3775
1966		589		2303		3910
1967		577		2338		4052
1968		565		2373		4200
1969		554		2408		4347
1970		543		2444		4501

(1) See Table 24. (2) See Section 11-2.

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

Table 31

Total Economy

	Employment[1]		Gross Domestic Product		GDP per Person Employed	
	Actual	Potential[2]	Actual	Potential[3]	Actual	Potential
	(Thousands)		(Millions of 1949 Dollars)		(1949 Dollars)	
1946	4764	4791	13,360	13,630	2804	2845
1947	4837	4808	13,960	13,906	2886	2892
1948	4899	4862	14,451	14,474	2950	2977
1949	5013	5024	14,885	15,424	2969	3070
1950	5001	5071	15,835	15,995	3166	3154
1951	5141	5125	17,052	16,658	3317	3250
1952	5244	5235	18,270	17,667	3484	3375
1953	5340	5341	18,853	18,517	3531	3467
1954	5357	5468	18,436	19,496	3441	3565
1955	5481	5595	20,288	20,479	3702	3660
1956	5702	5721	21,982	21,534	3855	3764
1957	5842	5899	21,875	22,734	3744	3854
1958	5814	6062	22,207	23,871	3820	3938
1959	5975	6186	23,337	24,705	3906	3994
1960	6074	6305	23,636	25,552	3891	4053
1961	6170	6425	24,064	26,501	3900	4125
1962	6343	6539	25,512	27,364	4022	4185
1963	6487	6659	26,834	28,538	4137	4286
1964		6823		29,875		4379
1965		6994		31,136		4452
1966		7181		32,576		4536
1967		7377		34,092		4621
1968		7577		35,743		4717
1969		7785		37,314		4793
1970		7993		39,001		4879

(1) Includes the Armed Forces.
(2) See Table 23.
(3) See Tables 29 and 30.

Source: Based on data from Dominion Bureau of Statistics and estimates by Economic Council of Canada (see Statistical Note).

APPENDIX A

Appendix A

A COMPARISON OF ACTUAL AND POTENTIAL OUTPUT: CANADA AND THE UNITED STATES

It will be recalled that one of the purposes of this study was to provide an assessment of Canada's post-war economic performance, by comparing the actual level of output of the economy with its estimated potential. In this Appendix we propose to compare these results with the results of some of the similar analyses which are available for the United States economy. Throughout the post-war period the two national economies have been subject to many similar, and often related, forces. This is true of both the forces which have produced short-term cyclical variations and those of a longer term character. Thus, both economies underwent periods of cyclical expansion and recession that were strikingly similar as to strength, duration and timing; both experienced, apart from brief cyclical recessions, generally high levels of output and employment in the early post-war period; and both experienced, after the mid-1950's, a period of lower levels of resource utilization and higher unemployment. Given these similarities, it would be reasonable to expect that our estimates of potential would produce results for the Canadian economy that are not too different in their general characteristics from those arising from similar analyses of the United States economy. In fact, one of the main functions of this brief study is to use the results of United States analyses as a test of credibility on the results of the main study. While moderate differences in the indicated size of the output gap in particular years are to be expected, more substantial differences might suggest that the innovations in our own methods of procedure had introduced possibly serious distortions or bias which would require re-examination.

In this analysis we confine the comparison to only two of the several published estimates of potential for the United States economy. This is primarily for the sake of simplicity and because the two selected were designed for purposes that more closely resemble those of our own study than some of the alternative analyses. One of these estimates is the quarterly series of potential GNP, which was developed by the Council of Economic Advisers (CEA) a few years ago and is now used regularly as a tool of current economic analysis in the annual Economic Report of the President. The second is the series originally developed in 1960 by James W. Knowles in "The Potential Economic Growth in the United States", as subsequently modified and revised by him for publication in "Fiscal Policy, Cycles and Growth" by Michael Levy.[1/]

1/ Studies in Business Economics, No. 81, published by the National Industrial Conference Board in 1963. This study contains an excellent summary and comparative analysis of various U.S. measures of potential GNP, and the statistical data which it contains have greatly simplified the author's work in this Appendix.

For the Canadian side of this comparison we include the estimates of potential nonagricultural output, as well as the series for the total Canadian economy. The reason for this is that the high volatility of annual output of the Canadian agricultural sector complicates a comparison concerned primarily with measuring the relative levels of resource utilization in the two economies. In the United States the inclusion of agriculture in the measure causes less difficulty because its relative importance is less and output is subject to less pronounced year-to-year variation.

Table A-1

Actual Output as Percentage of Potential: Canada and the United States

	Canada		United States*	
	Non-agriculture	Total Economy	CEA	Knowles
1946	97.4	98.0	N/A	N/A
1947	101.2	100.4	N/A	N/A
1948	100.4	99.8	99.3	100.8
1949	97.5	96.5	94.9	96.5
1950	99.7	99.0	98.8	101.2
1951	102.1	102.4	101.8	104.6
1952	100.6	103.4	100.8	103.9
1953	100.4	101.8	100.9	104.1
1954	95.5	94.6	95.5	98.3
1955	98.1	99.1	99.8	101.7
1956	100.9	102.1	98.4	99.1
1957	96.5	96.2	96.8	96.5
1958	92.4	93.0	91.8	91.6
1959	94.1	94.5	94.8	93.9
1960	91.9	92.5	94.0	93.1
1961	91.0	90.8	92.4	91.7
1962	92.7	93.2	94.9	93.7
1963	93.0	94.0	94.7	N/A

* For the period 1948-62, the ratios have been calculated from Table A-2, p. 124-5, "Fiscal Policy, Cycles & Growth" Michael Levy. The 1962 estimates, however, have been adjusted to conform to revised estimates of GNP for that year. The CEA estimate for 1963 is a provisional estimate.

For the period over which comparison is possible -- namely, 1948-63 -- quite striking similarities are evident in the results given by the estimates for Canada and those for the United States. Thus in the first nine years, the United States calculations, like the Canadian, indicate a level of actual output which on the average remained close to potential throughout the period. In Canada, the average level of output in these nine years was 99.5 per cent of potential in the nonagricultural sector, or 99.9 per cent if agriculture is included; in the United States, the average level of output was 98.9 per cent of potential on the basis of the CEA estimates, or 101.1 per cent of potential, using the Knowles' estimates. Similarly, if one compares the last six years (that is, excluding the transitional year of 1957), our estimates for Canada show the average level of output at 92.5 per cent of potential for the nonagricultural

sector, or 93.0 per cent of potential if agriculture is included; output in the United States on the basis of the CEA estimates averaged 93.8 per cent of potential for this period, while the Knowles series, for which we have no calculation for 1963, would indicate a level of about 92.9 per cent. In addition to this broadly similar pattern of behaviour over the post-war period, the estimates for the two countries show a number of similarities in individual years. For example, in both countries, 1951 is the year when output exceeded potential by its widest margin (excluding agriculture in Canada), while prior to 1957, the years when the gap between actual and potential output was greatest were 1949 and 1954. Perhaps the year of most notable difference is 1956, when our measure shows Canadian output above potential, while both measures for the United States indicate a level of output slightly below potential. The difference in that year, however, seems reasonable in the light of all the evidence pointing to the relatively greater strength of the cyclical expansion in the Canadian economy at the time.

In other words, on the basis of the comparative analysis up to this point, our calculation of potential would appear to produce a measure of the output gap that corresponds closely to that indicated by similar calculations for the United States over most of the post-war period, except for a slightly wider deviation from potential in Canadian output in the more recent years. However, the purpose of this analysis would not be fulfilled without some reference to the behaviour of unemployment in the two countries. It will be recalled that in the main study a comparison was made of the deviation of output from potential and the deviations in the unemployment rate from the 3 per cent level.[1/] This comparison showed that the percentage deviations in output from potential had considerably greater amplitude, as was to be expected. A question remains, however, as to whether or not the margin of difference was an adequate measure of the short-fall in productivity. This is particularly important at the end of the period because of the effects of any possible understatement or overstatement on the implied growth rate to attain potential by 1970.

At first sight, the size of the gap in output in 1963 produced by our estimates may appear generous, when comparison with United States estimates is made in conjunction with the respective unemployment rates. The estimates in Table A-1 indicate a gap in Canadian nonagricultural output in 1963 of 7.0 per cent, compared with a gap of 5.3 per cent in output in the United States, by the CEA calculation. Yet the annual average rate of unemployment in Canada was 5.5 per cent in 1963, or slightly below the

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1/ Table 14, p.41

United States unemployment rate of 5.7 per cent. Direct comparison of unemployment rates in the present context, however, is misleading because both the U.S. calculations of potential used in this analysis assume an unemployment rate of 4 per cent as the level appropriate to potential output for the period in question in that country. In other words, the CEA estimate of an output gap of 5.3 per cent in 1963 must be compared with an unemployment gap of 1.7 per cent, indicating a ratio of 3.1 to 1 in that year.[1/] On the other hand, the Canadian output gap of 7.0 per cent in 1963 (excluding agriculture for reasons stated earlier) compares with an unemployment gap of 2.5 per cent, producing a ratio of 2.8 to 1. This is slightly less than that indicated by the CEA calculation and appreciably less than that produced by the Knowles' production function, on the basis of its behaviour in earlier years.

It may, of course, be argued that a difference as wide as 1 per cent of labour force is too great to be appropriate in potential calculations for the two economies over the period in question. This is much too complex a question to be dealt with in this brief analysis.[2/] However, the point most relevant to this analysis can be made, without having to resolve this admittedly difficult question, by a comparison of changes in the average levels of output and unemployment between 1948-56 and 1958-63, as in Table A-2. In this procedure one may take merely the change in the unemployment rate without regard to the assumed "potential" level and compare it directly with the change in the output gap as measured by the potential estimates.

Table A-2

Changes in Deviation of Output From Potential
Compared With Changes In The Unemployment Rate

	Canada		United States		
	Output Gap(1)	Unemployment Rate	Output Gap CEA	Output Gap Knowles	Unemployment Rate
Annual Average					
1948-56	99.5	3.4	98.9	101.1	4.3
1958-63	92.5	6.5	93.8	92.9	6.0
Change in percentage points	7.0	3.1	5.1	8.2(2)	1.7

(1) Nonagricultural economy only
(2) Includes estimate of output gap by this measure in 1963

1/ On the basis of the calculations for earlier years, the Knowles' estimates of potential would produce a ratio of about 4 to 1.

2/ For reference to the current United States literature on the nature of unemployment and its implications for assessing "minimum" levels, see F.T. Denton and Sylvia Ostry, op. cit., Staff Study No. 3., Economic Council of Canada.

The amplitude in the deviation of output from potential relative to the change in the unemployment rate indicated by the calculations for Canada is thus only 2.3 to 1 between these two periods (that is, 7.0 to 3.1), while the United States measures have relative amplitudes of 3.0 to 1 and 4.8 to 1 for the CEA and Knowles' series respectively. In other words, using a series of years for the comparison, the relative amplitude of the output gap by our measure of potential is rather less than that indicated by the CEA measure for the United States economy and much more conservative than that given by the Knowles' estimates.

To sum up, we feel that as far as this analysis goes, the comparison of our own measure of potential output with two of the better-known series for the United States economy, confirms that our calculations in the main study are reasonable and quite conservative. It is recognized that this analysis has left unanswered the question of whether a wider or narrower deviation in output from potential relative to deviations in unemployment might not be appropriate for the Canadian economy. However, much further study of the relative behaviour of output and unemployment changes in Canada and comparison with the results of similar studies in the United States is necessary to answer this question. Moreover, in a year such as 1963, this is not simply a question of comparing the relative amplitudes in the two economies over the ordinary business cycle but of determining the relative amplitudes appropriate to a situation of fairly high levels of cyclical activity, as in 1959 or 1963, that are still well short of potential. In the meantime, pending more extensive investigation, it would not appear to be inappropriate that estimates of potential which are being used as a basis for appraisal of the capabilities and the Canadian economy should tend to err, if at all, on the conservative side.

APPENDIX B

Appendix B

LONGER TERM GROWTH RATES IN CANADA, 1928-70

In this Appendix the growth rates which were calculated for the 1946-70 period will be examined in a longer term context. It will be recalled that, in Section I of the main study, reference was made to the value of a longer term series of observations in making estimates of potential, and to the reasons why it was found necessary to restrict the analysis to the post-war period--primarily, the lack of statistical data of sufficiently high quality and in sufficient detail for the late 1920's.

Questions of statistical availability apart, it may be asked why such long-term growth rates are helpful in this type of analysis. Obviously, many changes occur in the industrial structure of an economy and in technology over a period of thirty years or more. It could be argued further that, until we have more effective ways of measuring the contribution to growth of these and other long-term forces, undue reliance on long-term growth experience could conceivably be misleading. On the other hand, several growth studies covering the experience of a number of countries including Canada suggest that, despite frequently uneven short-term behaviour, productivity growth rates and the over-all rate of growth in output tend to change remarkably slowly over very long periods of time.[1/] In order to be meaningful, of course, the calculation of such long-term rates has to allow for the distortions to growth paths that arise from major economic disturbances such as the major depression of the 1930's or the two World Wars.

In the United States, the long-term growth record has been extensively analysed by Edward Denison. In discussing the importance of the selection of appropriate terminal years for establishing the longer term growth path he states that: "They should be prosperous peacetime years, in which output was at about the same percentage of potential production, so the growth rate of potential output is the same as that of actual output. The composition of output should be as little distorted as possible by special developments. Productivity should not be abnormal. The period should be long enough to minimize the influence of statistical errors or of differences in the rate at which capacity is utilized, but not so long as to embrace periods in which the underlying factors making for growth were fundamentally different. The period should come

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1/ See, for example, "Economic Growth: The Last Hundred Years" by Deborah Paige and others, National Institute of Economic and Social Research, "Economic Review", July, 1961.

as nearly as possible to the present. I believe the years 1929 to 1957 come closest to meeting this criteria . . ."[1/]

Denison goes on to point out that after dividing the 1929-57 period at 1948, the growth for the 1929-48 sub-period was appreciably below that for the period from 1948 to 1957. He then goes on to say "It is probably safe to conclude that the nation's ability to produce did increase more rapidly from 1948 to 1957 than from 1929 to 1948. But it is not possible to infer that this indicates any change in the underlying long-term trend of the increase in productive potential. . . the cautious, and probably the proper interpretation of the faster post-war rate is that the 1929-48 growth rate was retarded by deep depression and war and that the 1948-57 rate was abnormally large as the lag was made good."

In other words, in Denison's view, the growth path at potential of an economy over a relatively short period of time may exceed, in the aftermath of major economic disturbances, its long-term growth rate at potential. Since there is a sufficiently close parallel between the experiences of the Canadian and United States economies over the period from the late 1920's to the middle 1950's, this analysis immediately raises some pertinent questions regarding the methods of procedure which were followed in our main study. It will be recalled that in estimating the short-fall below potential in the period after 1956, we relied on the patterns of growth between 1946 and 1956 to determine the extent of the subsequent deviation. Obviously if this period was one in which unusual short-term factors were tending to raise the growth rate at potential above its long-term rate, then the implied shortfall in the 1956-63 period may have been overstated. Therefore, in this brief analysis, we have attempted first of all to establish the basis for a long-term potential growth rate similar to that calculated by Denison for the United States. Having established the growth rate over the whole period from the late 1920's to the mid-1950's we shall then attempt to answer two questions:

(1) Subdividing this long-term period, do the Canadian estimates, like those in the United States, show rates of growth in the post-war period that exceed the long-term growth rate?

(2) Does the growth rate from the mid-1950's to our estimated potential level in 1970 exceed, equal or fall short of the long-term rate?

1/ Edward F. Denison, "The Sources of Economic Growth in the United States and the Alternatives Before Us", op. cit., p. 18-19.

After examination of the data, we have selected the years 1928 and 1956 as being the most suitable in Canada for establishing the long-term growth path. These two years seem slightly better for Canada than 1929 and 1957 in meeting the criteria for terminal years which Denison establishes (see above). In Canada, 1928 and 1956 were both the last full calendar years of cyclical expansion prior to business cycle peaks. They were both years in which output was a little above potential[1/] and they were both years of above average grain harvests, reducing the likelihood of any serious bias in growth rate calculation from this source. Finally, and this is most important, they were both the last years of high levels of employment and output prior not only to ordinary business cycle recessions, but also prior to more prolonged periods of high unemployment and underemployment of resources generally.

Having established on the basis of available statistical data the suitability of the year 1928 for the purposes of calculating long-term growth trends, estimates of Gross Domestic Product and employment were made for that year for those sectors of the economy which were treated separately in the main study -- namely, agriculture, public and community services and the commercial nonagricultural economy. A brief description of the sources of these estimates is given in the statistical note which accompanies the Tables B-2a, b and c. It must be emphasized that these estimates are no more than reasonable approximations but, given the length of the period between 1928 and 1956, it is felt that they are sufficiently accurate for the purpose of calculating annual average rates of growth.

We have attempted to summarize the results of this analysis in Table B-1. In this table the estimated productivity growth rates for the period 1928-56 are compared with the rates in moving from the actual level in 1956 to potential in 1970, as indicated by the calculations in the main study.[2/] Each of these two periods is then divided into two sub-periods, namely 1928-46 and 1946-56, and 1956-63 and 1963-70. Because the most uncertain (and least meaningful) sector with regard to this analysis is public and community services, a sub-aggregate is carried for the total commercial

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1/ In the case of 1956 this was established on the basis of calculations in the main study; in the case of 1928 this has been concluded on the basis of the low level of unemployment.

2/ We have preferred the use of productivity growth rates in this analysis to rates of growth in total output (as Denison uses) because the marked variations in the rate of growth of the labour supply in Canada between these periods provide an additional source of variation in output growth trends, which is not relevant to the present analysis.

economy, that is the total economy with these services excluded.

Table B-1

Growth in Productivity, 1928-70

(Average annual percentage change)

	1928 to 1956	1956 to 1970	1928 to 1946	1946 to 1956	1956 to 1963	1963 to 1970
Commercial Nonagr.						
Output per man	+1.7	+2.0	+1.3	+2.4	+1.3	+2.8
Output per man-hour	+2.4	+2.6	+1.9	+3.2	+1.9	+3.3
Agriculture						
Output per man	+2.4	+3.2	0	+7.0	+3.4	+2.9
Output per man-hour	+2.9	+3.9	+0.7	+6.9	+4.5	+3.4
Total Commercial Economy						
Output per man	+2.1	+2.3	+1.3	+3.7	+1.6	+2.9
Output per man-hour	+3.0	+3.1	+2.1	+4.6	+2.6	+3.6
Public & Community Services						
Output per man	-0.2	-1.1	-0.3	0	-1.8	-0.5
Output per man-hour	(+0.4)	(-0.5)	(+0.3)	(+0.7)	(-1.1)	(0)
Total Economy						
Output per man	+1.9	+1.7	+1.1	+3.2	+1.0	+2.4
Output per man-hour	+2.7	+2.5	+2.0	+4.1	+2.0	+3.0

Source: Tables B-2a, b and c.

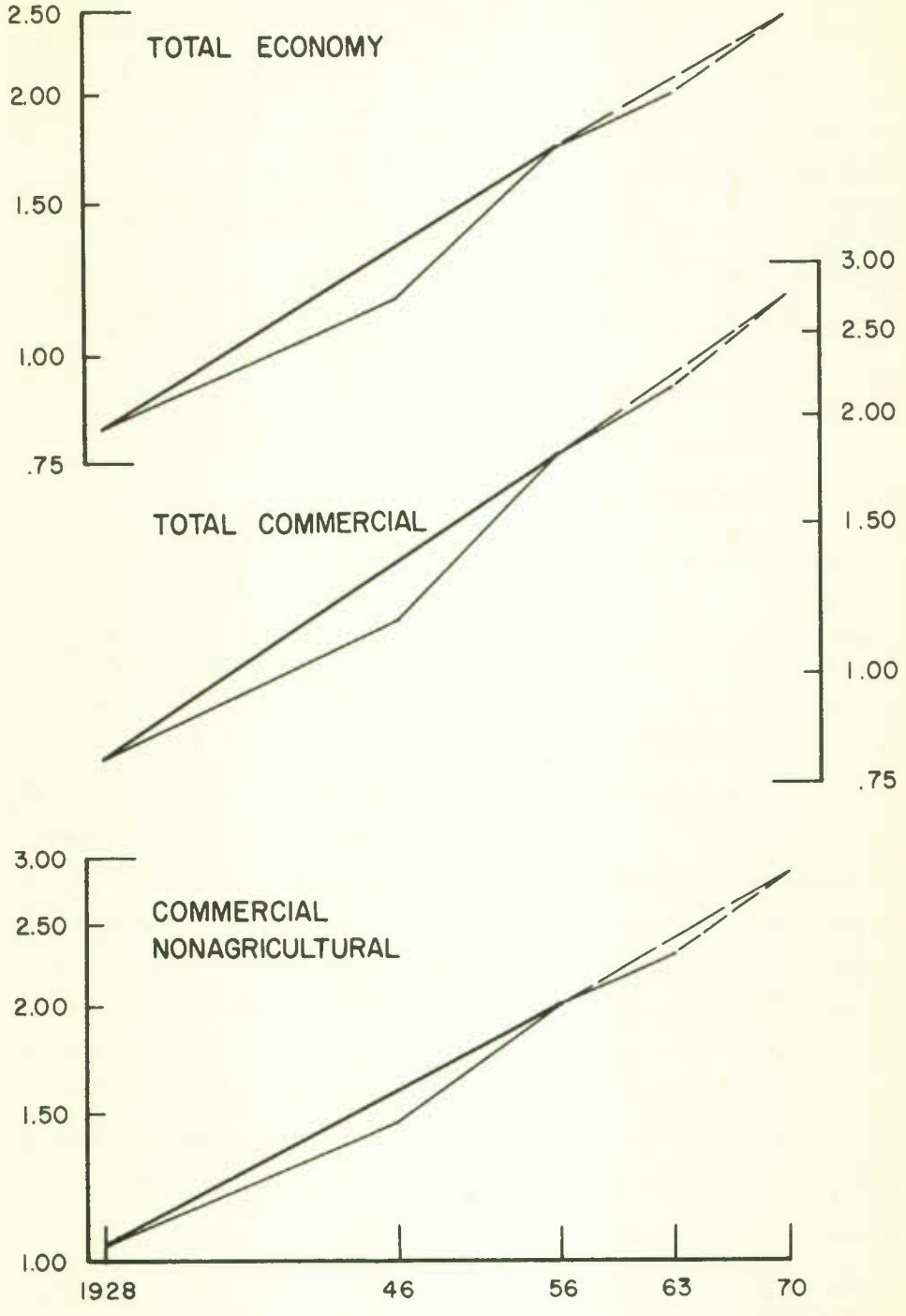
Before commenting on the above table, a few technical points should be noted. First, both output per man and output per man-hour series are given, because although the man-hour series are preferable on conceptual grounds, the hours data for 1928 must be considered as the most tentative part of the estimates that we have made for that year.[1/] Fortunately there is sufficient agreement between the two series for present purposes to permit the use of either in the conclusions which we wish to draw. Secondly, the period 1928-56 is divided at 1946. This was a year of slightly below potential output, and on conceptual grounds, 1947 or 1948 would have been more suitable. We have used 1946 here because the 1946-56 period is used so extensively in the analysis in the main study, and because the use of 1947 instead of 1946 was found not to make

1/ In addition there are difficult questions as to the relevance of relatively small changes in the average hours data for the agricultural and public and community service sectors.

CHART B-1

OUTPUT PER MAN-HOUR: CHANGES OVER SELECTED PERIODS

(1949 DOLLARS)



Source: Tables B-2a, b and c.

sufficient difference to affect our conclusions. Thirdly, growth rates over the second longer term period, that is 1956-70, should ideally be calculated from the potential level in 1956, rather than from the actual level as is done in Table B-1. This, however, would have introduced additional complications of presentation which did not seem worthwhile in view of the relatively small differences that this would have made, except in the case of agriculture, where output in 1956 was well above potential.

Turning to the conclusions that may be drawn from the table, it is clear that the rates of productivity growth between 1946 and 1956, either for the total economy or for the two commercial sectors were substantially higher than the longer term rates indicated for the period 1928 to 1956 inclusive. Thus, it may well be, as Denison has indicated in his study of growth rates in the United States, that the early post-war period witnessed unusually high rates of growth at potential because it followed a period when growth had been inhibited by depression and wartime restrictions. In the Canadian economy, it is apparent that the rapid rate of productivity growth in agriculture, in particular, followed a period of virtually no growth over the previous 18 years and undoubtedly reflected to some extent a catching-up following a period of relative stagnation between the late 1920's and the end of the Second World War.

However, when we compare the growth rates for the period 1956 to 1970 with the average rate for the 1928-56 period, it is also clear that our methods of procedure, especially the isolation and special treatment of the agricultural sector, would seem to have largely discounted those "special" elements in the 1946-56 period in the Canadian economy which accounted for the relatively high rates of productivity growth in the early post-war years. In fact, the growth rate between actual 1956 and potential 1970 for the total economy, measured either on the basis of output per man or output per man-hour, is slightly below the 1928-56 rate, though measured from the potential level in 1956 to potential 1970, the growth rate for output per man would be identical at 1.9 per cent.[1/] If one excludes public and community services, and looks only at the commercial economy, the rates of productivity growth from 1956-70 exceed the long-term rate indicated by the 1928-56 trend by a very slight margin. In other words,

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1/ In Miss Paige's Study (op. cit. Table 2 p. 28), Canada's long-term rate of productivity growth as measured by national product per man-year, is estimated to be 1.7 per cent annually over the period from 1872 to 1959, and only 1.5 per cent over the period from 1913. However, for various reasons, not the least of which are the serious data deficiencies for years prior to the 1920's, the growth rate of 1.9 per cent indicated by the above analysis of 1928-56 trends, is considered to be more appropriate in the context of the present discussion.

in the commercial economy, the catch-up in productivity implied in our estimates in moving from 1963 to potential 1970 makes up for the short-fall below the 1928-56 trend which occurred between 1956 and 1963 and also allows for a very modest increment in the underlying rate of growth. (See Chart B-1).

To conclude, on the basis of this review of longer term trends in productivity growth, it may at least be tentatively suggested that our methods of procedure in the main study do not appear to have been unreasonably biased by confining the analysis to the post-war period. Although the analysis suggests that the relatively high rate of productivity growth of the Canadian economy in the early post-war period may well have reflected in part a catching-up to the long-term potential growth path, such as Denison has suggested in regard to the United States economy, our methods of procedure would appear to have discounted this special element. This is primarily due to the isolation of the agricultural and public services sectors and the assumptions underlying our projections for these sectors. It may, of course, still be true that we have not allowed sufficiently in the projections to potential to 1970 for an acceleration in the underlying long-term growth path arising from technological changes, higher levels of education and skill in the labour force, etc. On the other hand, our projections to 1970 do imply a full catching-up to the long-term growth path and the regaining within a seven-year period of ground lost in the period from 1956 to 1963. Following the unquestionably far greater dislocation of the depression years, it appears to have required a fairly prolonged period of operation at potential levels of output before the economy succeeded in catching up to its long-term potential growth path. In the light of these balancing considerations, therefore, the projections in the main study would appear to lie well within the admittedly wide limits that may be regarded as reasonable in long-term growth rate analysis of the type attempted here.

Table B-2a

Output, Employment, Man-Hours and Productivity, 1928-70

	Actual				Potential	Average Annual Percentage Change					
	1928	1946	1956	1963	1970	1928 to 1956	1956 to 1970	1928 to 1946	1946 to 1956	1956 to 1963	1963 to 1970
TOTAL ECONOMY											
Gross Domestic Product (millions 1949 $)	8,575	13,360	21,982	26,834	39,001	+3.4	+4.2	+2.5	+5.1	+2.9	+5.5
Employment (thousands)	3,736	4,764	5,702	6,487	7,993	+1.5	+2.4	+1.4	+1.8	+1.9	+3.0
Average hours per week	53.56	46.21	42.27	39.67	37.97	-0.8	-0.8	-0.8	-0.9	-0.9	-0.6
Annual man-hours (millions)	10,463	11,479	12,603	13,418	15,825	+0.7	+1.6	+0.5	+0.9	+0.9	+2.4
Output per man (1949 $)	2,295	2,804	3,855	4,137	4,879	+1.9	+1.7	+1.1	+3.2	+1.0	+2.4
Output per man-hour (1949 $)	.8196	1.1639	1.7442	1.9999	2.4645	+2.7	+2.5	+2.0	+4.1	+2.0	+3.0

Table B-2b

	Actual				Potential	Average Annual Percentage Change					
	1928	1946	1956	1963	1970	1928 to 1956	1956 to 1970	1928 to 1946	1946 to 1956	1956 to 1963	1963 to 1970
PUBLIC ADMINISTRATION AND COMMUNITY SERVICES											
GDP (millions 1949 $)	715	1,479	2,044	2,659	3,563	+3.8	+4.0	+4.1	+3.3	+3.8	+4.3
Employment, total (thousands)	269	583	803	1,185	1,645	+4.0	+5.3	+4.4	+3.3	+5.7	+4.8
Employment, civil (thousands)	(264)	(458)	(686)	(1,062)	(1,535)						
Average hours per week, total	44.51	40.53	37.99	36.16	34.85	-0.6	-0.6	-0.7	-0.6	-0.7	-0.5
Average hours per week, civil	(44.51)	(39.60)	(36.99)	(35.23)	(34.20)						
Annual man-hours (millions)	626	1,232	1,595	2,234	2,989	+3.4	+4.6	+3.8	+2.6	+4.9	+4.2
Output per man (1949 $)	2,658	2,537	2,545	2,244	2,166	-0.2	-1.1	-0.3	0	-1.8	-0.5
Output per man-hour (1949 $)	1.1422	1.2005	1.2815	1.1902	1.1920	+0.4	-0.5	+0.3	+0.7	-1.1	0
TOTAL COMMERCIAL ECONOMY											
GDP (millions 1949 $)	7,860	11,881	19,938	24,175	35,438	+3.4	+4.2	+2.3	+5.3	+2.8	+5.6
Employment (thousands)	3,467	4,181	4,899	5,302	6,348	+1.2	+1.9	+1.0	+1.6	+1.1	+2.6
Average hours per week	54.27	47.14	42.98	40.45	38.78	-0.8	-0.7	-0.8	-0.9	-0.9	-0.6
Annual man-hours (millions)	9,837	10,276	11,008	11,184	12,836	+0.4	+3.7	+0.2	+0.7	+0.2	+2.0
Output per man (1949 $)	2,267	2,842	4,070	4,560	5,583	+2.1	+2.3	+1.3	+3.7	+1.6	+2.9
Output per man-hour (1949 $)	.7990	1.1562	1.8112	2.1616	2.7608	+3.0	+3.1	+2.1	+4.6	+2.6	+3.6

Table B-2c

	Actual				Potential	Average Annual Percentage Change					
	1928	1946	1956	1963	1970	1928 to 1956	1956 to 1970	1928 to 1946	1946 to 1956	1956 to 1963	1963 to 1970
COMMERCIAL NONAGRICULTURAL											
GDP (millions 1949 $)	6,000	10,136	17,678	21,821	32,994	+3.9	+ 4.6	+3.0	+5.7	+ 3.1	+6.1
Employment (thousands)	2,227	3,007	4,123	4,661	5,805	+ 2.2	+ 2.5	+ 1.7	+3.2	+ 1.8	+3.2
Average hours per week	49.28	43.82	40.65	38.93	37.74	-0.7	-0.5	-0.7	-0.7	-0.6	-0.5
Annual man-hours (millions)	5,738	6,905	8,763	9,461	11,423	+ 1.5	+ 1.9	+ 1.0	+2.4	+ 1.1	+2.7
Output per man (1949 $)	2,694	3,371	4,288	4,682	5,684	+ 1.7	+ 2.0	+ 1.3	+2.4	+ 1.3	+2.8
Output per man-hour (1949 $)	1.0457	1.4679	2.0173	2.3064	2.8884	+ 2.4	+ 2.6	+ 1.9	+3.2	+ 1.9	+3.3
AGRICULTURE											
GDP (millions 1949 $)	1,860	1,745	2,260	2,354	2,444	+ 0.7	+0.6	-0.4	+2.6	+0.6	+0.5
Employment (thousands)	1,240	1,174	776	641	543	-1.7	-2.5	-0.3	-4.1	-2.7	-2.3
Average hours per week	63.23	55.07	55.33	51.56	50.00	-0.5	-0.7	-0.8	0	-1.0	-0.4
Annual man-hours (millions)	4,099	3,371	2,245	1,723	1,416	-2.1	-3.2	-1.1	-4.0	-3.7	-2.8
Output per man (1949 $)	1,500	1,486	2,912	3,672	4,501	+ 2.4	+3.2	-0.1	+7.0	+ 3.4	+ 2.9
Output per man-hour (1949 $)	.4528	.5177	1.0067	1.3662	1.7260	+ 2.9	+3.9	+ 0.7	+6.9	+ 4.5	+ 3.4

Statistical Note to Tables B-2a, b and c

The estimates in the accompanying tables contained data derived from a number of sources. For the years 1946, 1956, 1963 and 1970, the estimates of output, employment and output per man were obtained from the tables in Section IV of the main study (Tables 23 - 31).

Estimates of the length of the average work-week in the commercial nonagricultural economy for 1946 and later years are those contained in Table 28. Estimates of average hours of work for 1946, 1956 and 1963 in agriculture and in public and community services (civil) were obtained from unpublished data in Labour Force worksheets. For 1970 the hours of work estimates for these sectors were obtained by extrapolation of the annual data from 1946 to 1963. To obtain an estimate of the average hours of work for all employees in public and community services, it was assumed that the average work-week in the Armed Forces was 44 hours throughout.

Calculations of man-hours per year were obtained using the appropriate conversion factors to put the hours data on an annual basis, and then combining the resulting estimates with the relevant estimates of annual employment; annual man-hours estimates for the aggregate series (that is, the commercial and total economies) were obtained by summing the man-hours estimates for the appropriate sectors. Thus the estimates of the average number of hours worked per week for the aggregated sectors were derived residually from the summed man-hours estimates.

Output per man-hour was then calculated from the above estimates of man-hours and output.

The estimates for 1928 are inevitably less accurate than those for later years. Estimates of total civilian employment, agricultural employment and civilian nonagricultural employment were obtained from Appendix Table II, "National Accounts Income and Expenditure, 1926-56", published by DBS. An adjustment was made to agricultural employment to improve consistency with the annual averages for later years (the DBS estimates for 1928 are as of June 1st). The division of nonagricultural employment between the commercial sector and public and community services was made after investigation of various estimates which had been made by others. It was decided to adopt the employment estimate for public and community services contained in "Output, Labour and Capital in the Canadian Economy" by Wm. C. Hood and Anthony Scott, Page 219,

The Royal Commission on Canada's Economic Prospects; employment in the commercial non-agricultural economy was then obtained as a residual.

Published estimates of real Domestic Product by industry are available only as far back as 1935. The estimate of total GDP for 1928 was calculated after testing a variety of alternative computations and linking procedures, using available National Accounts data back to 1928 and the GDP data going back to 1935. Inevitably each procedure produced slightly different results and the final estimate reflects a compromise between them. For purposes of comparison this estimate indicates an annual average rate of growth in total output of 3.4 per cent for the period 1928-56; the published estimates of GNP in 1949 dollars indicate a growth in total output of 3.5 per cent per annum over the same period. In view of the complex index number problems and definitional differences, this margin of difference is considered acceptable.

Estimates of GDP for the three sectors were similarly calculated after testing various alternative procedures and comparing results with other available estimates both published and unpublished. The final estimates again reflect a compromise between alternative calculations, including reconciliation with the total which had been estimated independently. The results seemed reasonable by such tests as could be applied but undoubtedly they could have been improved further by more extensive analysis of basic source material.

The estimates of average hours worked per week in 1928 were based upon certain unpublished estimates developed for internal use in a federal government department. The absence of basic statistical data is particularly acute in this area and these estimates should not be regarded as more than fairly rough approximations, though they probably represent a more comprehensive analysis of such scattered data as is available than earlier attempts to construct similar estimates.

The procedures followed to calculate estimates of man-hours and output per man-hour for 1928 were identical with those followed for later years, as described above.

TECHNICAL STUDIES

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

Staff Studies

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

Special Studies

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

Potential Output, 1946 to 1970, by B. J. Drabble

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