THE CANADIAN ECONOMIC GAP, 1950-1969

by Jean F. Somcynsky

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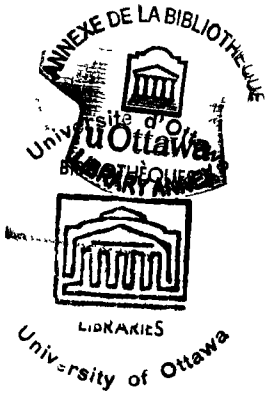

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FOREWORD

The economic gap is the measure, in terms of lost output, of the extent of unutilization and underutilization of economic resources. This refers to unemployment and underutilization of industrial capacity; but it refers also to workers, machinery and structures that could be employed more effectively than they are; and it refers also to such things as the manpower that did not join the labour force, and the investment that were not made, because of some unsatisfactory performance of the economy. If the economic gap was closed, the economy would produce its potential output, which is the output that maximizes social welfare.

Considerable work has been made in the field of estimating the potential output. However, there has been no systematic attempt to take the economic gap as a subject of inquiry. The purpose of this thesis is to analyze the gap, and to relate it to the interplay of supply and demand forces both as a product of their lags and as a cause of further disequilibrium. This is done via a limited macroeconomic model and with an analysis of some major issues in growth theory and in the economics of welfare. The results may throw some light on these issues, and may help understand the nature of some problems that have plagued the Canadian economy during the period covered by this study.

The author would like to express his appreciation to Professor O. J. Firestone for his guidance throughout the preparation of this thesis. His deep interest in both the qualitative and the quantitative aspects of this study has been most helpful. However, the author alone is responsible for the views expressed and the analytical errors and stylistic infelicities which remain.

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CHAPTER 1: INTRODUCTION

The Economic Gap in Output

This thesis is an analysis of the economic gap in output, with an application to the Canadian case. As a topic of economic theory, the gap in output is relatively new; most of the significant studies of the gap have appeared in the literature in the past decade. However, such a study fits into the framework of thought of growth theory, and it is a logical outcome of any "inquiry into the nature and causes of the wealth of nations".

The economic gap in output, also called economic gap, or gap in output, is the difference between potential output and actual output. Actual output means the sum of goods and services produced by the economy in a given span of time, whether measured on a domestic or national, gross or net, basis. Similarly, potential output means the output that could have been produced by the same economy, in the same period, if all the available inputs had been used in a fuller and better way. The economic gap is the measure of the output that has not been produced. It implies a measure of the inputs that have not been utilized, or that have been under-utilized or misallocated; the latter case requires an estimate of productivity.

Yet, such a definition is by no means clear. Ezra Mishan interprets it as follows: "... Potential growth ... is a term apt to the technocratic view of things, that envisages the country as some sort of vast power-house with every grown man and woman a potential unit of input to be harnessed to a generating system from which flows this vital stuff called industrial output"[1]. Such appears to be the interpretation of the Soviet planners, which have for economic objective the reaching of the highest output, with the fullest use of resources possible to attain the fullest production possibilities[2]. This is likely to be a layman's understanding of the concept. But this is not potential output as considered in this thesis.

Potential output is a measure of the capacity of the economy to produce. It is a supply concept. But it requires that the inputs be used in an efficient manner, and that their output maximizes social welfare. In today's complex social and economic setting, potential output becomes a controversial magnitude to assess. There is merit to Adam Smith's dictum that "consumption is the sole end and purpose of all

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1 Ezra J. Mishan, Growth: The Price We Pay, London, Staples Press, 1969, p. 15.

2 Philippe J. Bernard, Planning in the Soviet Union, Oxford, Pergamon Press, 1966.

production"[3]. But, it is often argued, to maximize consumption does not necessarily enhance social welfare; likewise, people are not necessarily better off with more production. For instance, as recreation trends indicate a shift of tastes towards such activities as walking for pleasure, sightseeing, picnicking, bicycling[4], people would be happier with fewer industrial plants and with an environment left more unspoiled than is the case in a modern, largely urbanized society[5]. If potential output is considered as the output that uses all the inputs efficiently in a way that maximizes social welfare, its composition should be the mix of goods and services which satisfies people.

The economic gap, in this context, is no longer a "technocratic" measure of loss of output, but a measure of unachieved well-being. Its quantitative dimension is also a qualitative one. Together with analytical implications as to why and how actual output differs from the output warranted by the capacity of the economy and the desires of people, there are policy implications that concern the potential improvement of life.

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3 Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, Chicago, Encyclopaedia Britannica, Inc., 1952, p. 287.

4 "Not so Leisurely Growth", in Financial World, January 29, 1969, p. 6.

5 This simplifies the issue. Besides, it should not be taken as meaning that welfare may be inversely related to growth. The management of the environment requires economic inputs and output of goods and services. Furthermore, the unmet needs of the less affluent people calls for more growth.

Need for Gap Analysis

If the economic gap was only a measure of unattained welfare, this would suffice to make its study worthwhile. The gap implies that resources are not utilized, or are not fully utilized, or are not utilized as well as they could be. As far as the input labour is concerned, this refers to the costs incurred in terms of unemployment and underemployment. The costs to society are both direct and indirect. The former include: hardship to the unemployed, loss of family security, loss of happiness, some loss of dignity for many, loss of educational opportunities for the young, use-up of savings, decline in the quality of nutrition and housing, deterioration of skills, indebtedness affecting future periods, sense of failure, social frustration, emotional shock. The indirect costs include all those borne by society when it has to rally in support of its less favoured members. This means that resources must be diverted from other purposes[6], in order to relieve the urgent needs (food, housing, medical care) of the unemployed.

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6 There are many claims on scarce resources even in relatively rich societies. Help to the unemployed and the poor means that fewer resources would go to research, to pollution control, to improvement of the environment, to education, and so forth.

But there is more to the gap than the hardships of the unemployed. Unemployment depresses the labour market, and discourages increases in participation and immigration. Inputs that could have been added to the stock of resources are foregone; this reduces potential productive capacity and it may add to the underutilization and deterioration of skills. Such a misuse of manpower contributes to a relative reduction in incomes; the latter in turn reduces potential demand to a lower level. As inputs are related, the failure in using labour efficiently affects capital. Plants and equipment are left idle for lack of demand for goods. Increasing inventories depress the incentive to innovate. Consequently, productivity does not increase as much as it could. For an open economy, this may mean a loss of foreign markets, as world competitors keep innovating and exporting new products. The gap in demand may become a gap in supply, as bottlenecks develop in labour and as applied technology lags behind inventions. Industries that suffer from the demand effects of the gap hesitate to invest, and intensify both the demand and the supply effects of the gap. Financial problems arise: in a recession, bankers would raise their solvency criterion, and refuse to finance risky undertakings, accepting only "sound" small-scale investments. Psychologically, there would be a lack of motivation and enterprise.

One year's gap affects next year's potential. Today's unused capacity, in men and capital, puts a brake on the supply of more and better workers and capital goods, thus shrinking the level of tomorrow's capacity. This is why a study of the gap might be more important than a study of potential output. As the gap widens or narrows year after year, the economist can discover what causes its variations, and how the elements of the gap affect each other, whatever the level of actual and potential output. The study of the gap becomes an inquiry into the interrelation between supply and demand, which is the core of the growth process, and gives it welfare overtones.

Alternative Methods of Analysis

The formulation of a growth model is a way of approaching the gap. A model gives a result according to the values given to its factors; a growth model, or a production function, with inputs at their potential value, give a measure of potential output, which becomes a gap estimate when compared to actual output[7]. Such is the approach of scholars like

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7 Chapter 2 describes various methods used by a number of economists, mainly in the United States, Canada and Great Britain.

Okun[8], Drabble[9], Knowles[10]. More fundamental models, like those of Harrod[11], Domar[12], Hamberg[13], Hansen[14], provide a better insight in the process, as the difference between actual and potential output is viewed in relation to the behaviour of investment, saving, the capital-output ratio, the multiplier, the accelerator, and other economic factors and concepts. They propose a theoretical explanation of the gap, even though they do not analyze it as such.

Another way to approach the economic gap is the analysis of the determinants of growth. Studies on the economic effects of, say, education programs, use of wildlife, more

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8 A. M. Okun, The Gap Between Actual and Potential Output, in Edmund S. Phelps (ed.), Problems of the Modern Economy, New York, W. W. Norton and Co. Inc., 1966.

9 B. J. Drabble, Potential Output 1946 to 1970, Staff Study No 2, Economic Council of Canada, Ottawa, Queen's Printer, 1965.

10 J. W. Knowles, The Potential Economic Growth in the United States, Study Paper No 20, in Joint Economic Committee, Congress of the United States, Study of Employment, Growth and Price Levels, Washington, U. S. Government Printing Office, 1960.

11 R. F. Harrod, An Essay in Dynamic Theory, in Joseph E. Stiglitz and Hirofumi Uzawa (eds.), Readings in the Modern Theory of Economic Growth, Cambridge, The M.I.T. Press, 1969.

12 Evsey D. Domar, Capital Expansion, Rate of Growth and Employment, in Ibidem.

13 D. Hamberg, "Full Capacity vs. Full Employment Growth", in The Quarterly Journal of Economics, Vol. LXVI, No 3, August 1952.

14 See Benjamin Higgins, Economic Development, Revised edition, New York, W. W. Norton and Co. Inc., 1968, pp. 120-46.

efficient operation of primary industries, pollution control, management of renewable and non-renewable resources, and so forth, give an indication of potential output, and, incidently, on the causes of the gap. Studies in the potentialities for growth, with an analysis of what keeps capacity from being fully utilized, are equally relevant. This may include studies of employment, studies of demand, structural studies of bottlenecks, studies in regional disparities, studies of poverty. Such a general approach has been taken by the Council of Economic Advisers[15], the Economic Council of Canada[16], the National Goals Research Staff[17], and several economists[18] concerned with assessing the economic prospects of a country, and who often write for the general public.

A further way of study is to concentrate on a specific aspect of the gap. Creamer[19] analyzed the unemployment of

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15 Council of Economic Advisers, Annual Reports, Washington, U. S. Government Printing Office, 1960-1969.

16 Economic Council of Canada, Annual Reviews, Ottawa, Queen's Printer, 1964-1969.

17 National Goals Research Staff, Toward Balanced Growth: Quantity with Quality, Washington, U. S. Government Printing Office, 1970.

18 For example: George W. Wilson, Scott Gordon and Stanislaw Judek, Canada: An Appraisal of its Needs and Resources, New York, Twentieth Century Fund, 1965; Richard E. Caves and Richard H. Holton, The Canadian Economy: Prospects and Retrospects, Cambridge, Harvard University Press, 1961.

19 Daniel Creamer, Capital Expansion and Capacity in Postwar Manufacturing, New York, The National Industrial Conference Board, 1961.

capital. Denison endeavoured to identify and measure the sources of growth[20]. Mishan[21] studied the effects of growth on social welfare, providing a base for the analysis of the gap in relation to human well-being. Schultze[22] analyzed the effects of changes in the rate of capacity utilization. These contributions, though they do not purport to be gap studies, provide essential elements for an analysis of the economic gap. Creamer's treatment of spare capacity has been found particularly valuable, as well as Mishan's discussions, though the latter are too often biased by normative assumptions.

Another alternative is the study of potential output, its measurement, its comparison with actual output, and the interpretation of the results within the framework of growth theory. This is the approach of Hood and Scott[23], Levy[24], Wilson and Lithwick[25], Brown[26]. These scholars analyzed the

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20 Edward F. Denison and Jean-Pierre Poullier, Why Growth Rates Differ: Postwar Experience in Nine Western Countries, Washington, The Brookings Institution, 1967.

21 Ezra Mishan, op.cit.

22 Charles L. Schultze, "Uses of Capacity Measures for Short-run Economic Analysis", in American Economic Review, Papers and Proceedings, Vol. LIII, No 2, May 1963.

23 W. C. Hood and A. D. Scott, Output, Labour and Capital in the Canadian Economy, Ottawa, Royal Commission on Canada's Economic Prospects, 1957.

24 Michael E. Levy, Fiscal Policy, Cycles and Growth, New York, The National Industrial Conference Board, 1963.

25 Thomas A. Wilson and N. Harvey Lithwick, The Sources of Economic Growth, Studies of the Royal Commission on Taxation, No 24, Ottawa, Queen's Printer, 1968.

26 T. M. Brown, Canadian Economic Growth, Royal Commission on Health Services, Ottawa, Queen's Printer, 1965.

economic gap with a particular objective, which was, respectively, the assessment of Canada's growth potential, of the American "full employment budget surplus", of the impact of a proposed taxation system, of the ability to afford a plan of medical care. They used gap analysis as a tool for the study of the economy and the growth process; they did not intend to discuss systematically the economic gap.

The Gap as a Subject of Inquiry

This thesis takes the economic gap as a subject of inquiry. It is indebted to the work of the scholars, theorists and generalists, that have chosen to approach the gap with other methods. Their contributions are acknowledged, commented and discussed in the review of the literature, but their influence permeates much of the following chapters.

A first step in the study of the gap is to describe the formation of the economic gap, within a context of input-output and supply-demand relationships. The gap is viewed as resulting from (1) excess capital, when there is spare capacity in plants and equipment, due to inadequate aggregate demand, changes in relative demand, shortage of specific manpower, shifts in prices and costs, difficulties in financing, changes in product mix or technology; from (2) excess labour, when there is inadequate demand, restrictions on the use of capital, shifts in the occupational and geographical

structure of manpower, changes in technology, discrimination; and from (3) disguised excess resources, when either man or capital, for a variety of reasons, are utilized at less than capacity or in a mix which produces less output than the maximum, the latter being defined in physical terms (i.e. real GNP) or in welfare terms.

The results of this study are put in a suitable framework of analysis, that distinguishes three levels of the gap: (1) gap in growth, which equals the output lost because some resources are not utilized, or are underutilized, and which could be "filled" by the expanding use of these resources;[27] (2) gap in development, which refers to the output lost because of an inefficient use of resources, and which could be closed with an increase in productivity; and (3) gap in progress, which considers improvements in happiness, cultural betterment, well-being, quality of life, that would have been achieved if the economy had performed, more or less consistently, at its potential level.

This framework is the cornerstone in the quest towards a workable model of the gap. The assessment of potential output requires definite assumptions concerning the nature and causes of the gap (that is, whether it is demand- or supply-induced,

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27 Such expansion would not increase the output per employed person, but it is desirable because it would relieve the economy of the need to care for the unemployed. In practice, it is likely that increases in productivity would follow.

due to non-utilization or underutilization of resources, and so forth), the impact of potential output on the structure of the economy, its composition, its internal trends, the effect of such performance on the environment, on people's attitudes and motivations, on actual and potential inputs. The use of a model and the validity of the concepts and measures available are discussed. Once the assumptions that underlay a gap model are clearly stated, its uses and limitations are considered.

A model of the economic gap is then formulated. This implies an assessment of potential manpower, of potential capital formation and of potential productivity. It includes an array of economic concepts relevant to the gap, like the output-capital ratio, the capital deepening, the depreciation rate, and assumptions on the participation rate, the level of unemployment, the extent and type of immigration. The proposed model can be used for measurement as well as for analysis.

In this thesis, the model of the gap is tested for the period 1950 to 1969, using National Income and labour statistics and some supplementary data. For illustration purposes, the model is also applied to selected years between 1926 and 1949. The model is simple and no attempt is made to test it with different variables, insofar that the basic assumptions are concerned. Its intermediate and final results are discussed. In conclusion, the analytical and policy implications of the findings are discussed.

Limitations and Results

The scope of gap analysis is as complex as growth theory and welfare economics. All the factors influencing the gap cannot be included in a simplified model, nor in a study like this one. For example, there is an interaction of social and political variables with the economic process which favours or hampers growth: some unrealized potential can be due to adverse uneconomic behaviour[28]. As far as motivations go, the concern with growth helps growth. The model does not consider the effects of sudden shifts from a high to a low rate of money creation, or viceversa. It does not take account of policy measures that do not affect directly the National Accounts. It relates capital, labour and productivity trends largely to demand, while additions and substractions to the labour force are a function not only of demographic and economic factors, but also of attitudes towards work. Similarly, changes in productivity and investment decisions are also functions of technology and business psychology, particularly the often hectic stock market.

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28 See Irma Adelman and Cynthia Taft Morris, "Factor Analysis of the Interrelationship Between Social and Political Variables and Per Capita Gross National Product", in The Quarterly Journal of Economics, Vol. LXXIX, No 4, November 1965, pp. 555-78.

Despite such limitations, the estimate of the gap would help answer some theoretical problems and would assist the policy-makers in reaching better decisions. Some examples can be given. It is now feasible to use job retrieval by computers to match job vacancies with employment (including retraining and mobility programs as needed), provided adequate information is fed into the system[29]. The gap in manpower could be used to direct such programs, pointing out the areas of need.

In the fall of 1967, the Minister of Finance announced that the economy was working at its potential level, and was unable to withstand more demand pressures without developing strong inflationary trends. However, it was disclosed shortly afterward that the crucial steel industry was producing below its capacity, presumably because of lack of demand[30]. The study of the gap, by indicating variations of the rate of use of capacity, would give a better view of the state of the economy.

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29 This is an objective of the U. S. Manpower Training Act. See Edward P. Dear, "Computer Job Matching Now and Tomorrow", in Personnel, May-June 1970, p. 57.

30 The average use of capacity in the steel industry from 1953 to 1968 was 85.7 %, with the lower levels in 1954 (63.2 %), 1959 (69.7 %) and 1967 , and with peaks in 1956 (97.1 %), 1963 (94.6 %) and 1968 (88.6 %). See Commission des Prix et Revenus, L'Acier et l'Inflation, Ottawa, February 1970, p. 50. As it could be expected, an increase in production from 1962 to 1965 increased the growth rate of capacity, while a decline in the rate of actual production from 1965 to 1967 depressed the growth of capacity. See Ibidem, p. 9.

The problem of inflation can be lighted by gap studies. It is often held that inflationary pressures exist when supply lags behind demand. However, the persistance of large gaps suggests that inflationary pressures exist when capacity is underutilized. Gap analysis would clarify this relationship of supply, demand and inflation, putting the question of "overheating" in its proper perspective.

Investments depend largely on expected demand for goods and services and on the availability of savings to finance them. The study of the gap would show how the use of resources and added income (in wages, salaries, profits, taxes) may guarantee the existence of a demand adequate for the new supply of goods and services.

The production of actual output carries with its benefits some undesirable side-effects, like the undue depletion of fixed resources, the deterioration of the environment, the crowding of people in noisy cities, the problems of waste disposal. A study of the gap may indicate whether the potential performance of the economy would intensify these externalities, or whether it would make possible the use of resources to fight these "spillovers" of growth and make the world a better place in which to live.

This work attempts to give some answers to such problems. If successful, gap analysis could become a valuable tool in the hands of economists and would make possible a better performance of the economy which would ultimately enhance social welfare.

CHAPTER 2: THE THEORY OF THE ECONOMIC GAP

The Forerunners

The concern with growth is far from recent: Adam Smith was probably the first development economist. Within growth theory, the inability of the economy to match aggregate demand with aggregate supply appeared as a recurrent problem. Thus, it was possible for Higgins to deal with the gap between actual and potential output as it was perceived by the Classicals, Marx, Schumpeter, Keynes and Hansen[1]. But the treatment of the economic gap given by the pre-Keynesian economists is only inherent in their work, and far from explicit. It was only with the macroeconomic tools provided by Keynes and his followers that a more adequate analysis of the gap has appeared.

The economists that did the pioneering work in this field were Harrod, Domar and Hansen, followed by Solow, Tobin, Hamberg, and others. Their primary contributions were to use the rate of growth as a tool of analysis, and to clarify the role and interaction of the factors of growth. It is useful to review briefly that part of their theories which is of relevance to the study of the economic gap.

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1 B. Higgins, op.cit., pp. 128-32. Higgins neglects the neo-classicists; Chapter 4 will indicate how the economic gap fits into the general equilibrium theory and welfare economics.

Harrod's Model

R. F. Harrod considers the Keynesian multiplier ($s = \frac{S}{Y}$), the accelerator ($C = \frac{\Delta K}{\Delta Y}$), which is a capital-output ratio, and the rate of population growth (which is linked to the rate of growth of manpower, and to the natural rate of growth)[2]. With these elements, he takes care of labour, output per head (dependent on the level of technology and supplies of known resources) and quantity of capital available.

To calculate the actual rate of growth, Harrod uses the identity I = S, developed as $\frac{\Delta Y}{Y} \cdot \frac{I}{\Delta Y} = \frac{S}{Y}$, which he writes as GC = s.

For a given capital-output coefficient (p) during a period of investment, the required net saving and investment is $Ir = \Delta Y.p$, and the capital requirement is $Cr = \frac{Ir}{\Delta Y}$. The rate of growth that satisfies entrepreneurs, or warranted rate of growth, is $Gw = \frac{\Delta Y}{Y} = \frac{\Delta Y}{\Delta K} \cdot \frac{\Delta K}{Y} = \frac{1}{Cr} \cdot s = \frac{s}{Cr}$, i.e. GwCr = s.

The natural rate of growth, or potential rate of growth, with full employment and optimum population growth and invention rate, may or may not be equal to either the actual or the warranted growth rate: GnCr = or ≠ s.

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2 Throughout this thesis, unless otherwise stated, the standard symbols will be used: Y for income, I for investment, K for capital, S for saving, O for output (O = Y), L for labour force, N for employed persons, M for import, X for export.

This treatment implies that there is only one equilibrium rate of growth. If Gw > Gn, the capital requirement is too small, and there will be increased unemployment in a deflationary gap economy. If Gw > G, the required capital would be excessive, supply would exceed demand, and there will be further reductions in the rate of growth. If Gw < Gn and Gw < G, the boom will be maintained in an inflationary gap economy, provided there is a high population growth, invention rate and geographical expansion.

What is called Harrod's knife-edge proposition, is that the warranted rate of growth is unstable, and that a slight difference in growth rates would create an increasing economic gap. Any wrong decision from the entrepreneurs would immediately disturb the whole economy in an accelerating way. In his words: "A unique warranted line of growth is determined jointly by the propensity to save and the quantity of capital required by technological and other considerations per unit increment of total output", and "departure from the warranted line sets up an inducement to depart farther from it. The moving equilibrium of advance is thus a highly unstable one"[3].

Harrod's model allows for policy measures. When the natural rate of growth is high, like in young countries (Canada could be an example), the warranted rate of growth can

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3 R. F. Harrod, An Essay..., op.cit., p. 23.

be healthily increased by imports of capital. In general, "the ideal policy would be to manipulate the proper warranted rate so that it should be equal to the natural rate", with anti-cycle policy and proper management of the foreign account and of the rate of interest[4].

Domar's Model

At the same time as Harrod, Evsey Domar endeavoured to use the rate of growth as a tool of analysis. His approach was also Keynesian. Considering that the economy is at equilibrium when its productive capacity (P) equals its national income (Y), "employment is a function of the ratio of national income to productive capacity"[5].

Taking the "potential social average investment productivity" $k = \frac{dP/dt}{I}$, (which is an output-capital ratio), the ratio of potential net value added to I, $k' = \frac{P}{K}$, (which is the maximum that k can attain), and the marginal propensity to save, $s = \frac{I}{Y}$, it is possible to write the potential rate of growth as $\frac{dP}{dt} = Ik$, and the actual rate of growth as $\frac{dY}{dt} = \frac{dI}{dt}.\frac{1}{s}$. In equilibrium, Po = Yo, that is, $Ik = \frac{dI}{dt}.\frac{1}{s}$, the solution of which is $I = I_o e^{skt}$.

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4 R. F. Harrod, op.cit., pp. 31-32.

5 E. D. Domar, Capital..., op.cit., p. 36.

In Domar's words, "(sk) is the equilibrium rate of growth. So long as it remains constant, the maintenance of full employment requires investment to grow at a constant compound-interest rate"[6]. If the economy grows at a lower rate, there is unused capacity and unemployment. If it grows at a faster rate, there is unused capital that inhibits new investment. When $k < k'$, full employment requires accumulation of capital at a faster rate than it can be used, and society shall then reduce its propensity to save or speed up technological progress[7].

Domar's model, like Harrod's, is essentially concerned with the rate of growth in the economy and in capital. "As soon as investment comes on, growth cannot be left out, because for an individual firm investment may mean more capital and less labour, but for the economy as a whole (as a general case) investment means more capital and not less labour"[8]. An economic gap is deemed to appear because the proper rate of growth, warranted by the propensity to save and the capital-output ratio, is not maintained.

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6 E. D. Domar, op.cit., p. 38.

7 Ibidem, pp. 40-44.

8 Ibidem, p. 44.

Contributions of Solow and Others

The Harrod-Domar model's knife-edge notion is due to the rigidities of the saving ratio, the capital-output ratio, the rate of increase of the labour force. Robert M. Solow proposed a "model of long-run growth which accepts all the Harrod-Domar assumptions except that of fixed proportions"[9]. He stated his theory in neo-classical relations, allowing for price-wage-interest reactions. However, his approach does not bear too much on the problem of potential growth. It reveals a major short-coming in the Harrod-Domar model, but solves it by placing it in another perspective.

The same thing has been done by James Tobin. He introduces a link "between the world of real magnitudes and the world of money and prices"[10]. By considering wages and money supply, and allowing for capital and labour substitution, he includes adjustment mechanisms that permit different rates of growth. But the concern with the economic gap is gone.

In a similar vein, Nicholas Kaldor described a Keynesian model showing "technical progress" as "the main engine

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9 R. M. Solow, A Contribution to the Theory of Economic Growth, in J. E. Stiglitz and H. Uzawa, op.cit., p. 59.

10 J. Tobin, A Dynamic Aggregative Model, in J. E. Stiglitz and H. Uzawa, op.cit., p. 53.

of economic growth", determining the "rate of growth of productivity" and "also the rate of obsolescence, the average lifetime of equipment, the share of investment in income, the share of profits, and the relationship between investment and potential output (i.e. the 'capital-output ratio' on new capital)"[11].

D. Hamberg[12] noticed that a given investment does not necessarily increase income and capacity equally, and that capital and labour do not grow necessarily at the same rate. The full-capacity growth rate being $\frac{\Delta Y}{Y} = os$, where $s = \frac{S}{Y}$ and $o = \frac{\Delta Y}{\Delta K}$, a net investment sY increases capacity by osY, and requires an increase in income of $osY = \Delta Y$ not to stay idle. The coefficient of required growth is then $g = \frac{E}{U}$, where E is the full employment growth rate and U the growth rate needed to fully utilize the capital. The optimal growth pattern is $g = 1$, because $g > 1$ (that is, $E > U$) would mean a reserve army of labour, increasing too fast even with fully utilized capital, and $g < 1$ (that is, $U > E$) would mean long-term stagnation, slow labour growth, idle capital, too much saving for the economy's capacity to absorb it.

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11 N. Kaldor and James A. Mirrlees, A New Model of Economic Growth, in J. E. Stiglitz and H. Uzawa, op.cit., p. 398.

12 D. Hamberg, "Full Capacity vs. Full Employment Growth", in The Quarterly Journal of Economics, Vol. LXVI, No 3, August 1952, pp. 444-49.

This development in growth rate analysis was rejected by H. Pilvin[13]. He argued that "whatever the individual rates of growth of factor supplies, a single rate of capacity increase results which is entirely consistent with full utilization of both factors"[14]. With a production function, which could include technological changes and effects on productivity, he established that "the required rate of growth equals the rate of increase in labour supply times the relative share of labour in the product plus the marginal product of capital times the propensity to save"[15]. In his view, lack of income to meet capacity produces unutilization of either or both inputs.

Invited to comment, Harrod[16] and Domar[17] were doubtful of the significance of Hamberg's two rates of growth, but they rejected also Pilvin's assumption of full factor substitution and of a movement along the production function curve.

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13 Harold Pilvin, "Full Capacity vs. Full Employment Growth", in The Quarterly Journal of Economics, Vol. LXVII, No 4, November 1953, pp. 545-52.

14 Ibidem, p. 550.

15 Ibidem, p. 550.

16 R. F. Harrod, "Comment", in The Quarterly Journal of Economics, Vol. LXVII, No 4, November 1953, pp. 553-59.

17 E. D. Domar, "Further Comment", in Ibidem, pp. 559-63.

The superiority of the Harrod-Domar model over these comes from its simplicity. The latter models have largely obscured the basic issue, while clarifying less important interrelations and adding some flexibility. The only original contribution to gap analysis might well be Hamberg's, with his suggestion of reasons why the inputs have to be treated separately.

Hansen's Model

Alvin Hansen, in his model, relates actual and potential output via the behaviour of their components. He purports to show how economic gaps result from acceleration or deceleration of the growth rates of the factors that influence autonomous investment. His model stems from a refinement of the basic Keynesian statement equating output with the multiplier times the investment[18].

Actual output can be written as:

$0a = \frac{1}{\frac{ds}{d0a} + \frac{dr}{d0a}} \cdot \left(Ii\ (\dot{0}a) + Ig + I_A\ (\dot{L}, \dot{K}, \dot{T}) \right)$, where s is savings, r is taxes, $\dot{0}a = \frac{d0a}{dt}$ (t being time), $\dot{L}$ is the rate of population growth, $\dot{K}$ the rate or resource discovery, $\dot{T}$ the rate of technological progress, Ii induced investment, Ig government investment and I_A autonomous (long-run) investment.

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18 This treatment follows B. Higgins, op.cit., pp. 121-24.

Potential output can be written as $0p = f(L, K, Q, T)$, where Q is the supply of capital.

Through time, if marginal propensities to save and to pay taxes are constant, and G is the combined growth effect of autonomous investment $I_A(\dot{L}, \dot{K}, \dot{T})$, there is the rate of growth $\frac{d0a}{dt} = \frac{1}{\frac{ds}{d0a} + \frac{dr}{d0a}} \cdot \left(\frac{\Delta Ii}{\Delta 0a} \cdot \frac{d^2 0a}{dt^2} + \frac{dIg}{dt} + \frac{\Delta I_A}{\Delta G} \cdot \frac{d^2 G}{dt^2} \right)$, where $\frac{\Delta Ii}{\Delta 0a} \cdot \frac{d^2 0a}{dt^2}$ depends on the increase in national income and $\frac{dIg}{dt}$ depends on policy decisions, and where $\frac{\Delta I_A}{\Delta G} \cdot \frac{d^2 G}{dt^2}$ may be constant. There is also, through time, the rate of growth of potential output: $\frac{d0p}{dt} = \frac{\delta f}{\delta L} \cdot \frac{dL}{dt} + \frac{\delta f}{\delta K} \cdot \frac{dK}{dt} + \frac{\delta f}{\delta Q} \cdot \frac{dQ}{dt} + \frac{\delta f}{\delta T} \cdot \frac{dT}{dt}$.

The rate of growth in potential output depends on the growth rates of L, K, Q and T, while the rate of growth in actual output depends on investment. Thus, both need not be equal. An economic gap would appear as soon as there is a decline in the rate of increase of the factors affecting autonomous investment. Hansen mentions several factors pointing toward a permanent gap. As most innovations are capital-saving, the $\frac{\delta I_A}{\delta T}$ falls through time, as well as the capital-output ratio. There being less entrepreneurship in mature economies, and monopolized research being wary of obsolescence costs, innovations do not attract too many investors in consumer goods. The disappearance of a frontier lessens the rate of discovery of new resources, and causes a fall in $\frac{dI_A}{dK}$, $\frac{dI_A}{dT}$ and $\frac{dI_A}{dL}$. The multiplier is likely to decrease with time, as taxes are rising, and also the propensity to save, due to

the institutionalization of saving. The rate of population growth tends to diminish, and with it the increases in demand and employment.

These long-term tendencies limit the possibilities for government to achieve a steadier rate of growth by increasing Ig, or by increasing the multiplier via a reduction in taxes or in the propensity to save through a redistribution of income from savers to spenders. Hansen sees the economic gap as increasing till a point of stagnation, where actual and potential output taper off. In his analysis, advances in technology cannot offset, except for a short period, the decreases in population growth and in the discovery of new resources.

However critical one can be of Hansen as a prophet[19], his framework of analysis remains a most useful one. His contribution consists in having related actual and potential output with long-term factors, which the Harrod-Domar model does not, while preserving the rate of growth as a crucial tool for the analysis of the economic gap. Yet, his model does not take account of the behaviour of employment, and does not lead easily to measurement, as components like the rate of resource discovery or the rate of technical progress cannot be put directly in money terms.

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19 For example, the institutionalization of saving may step up the saving rate, oligopolies may favour innovations and obsolescence of goods in order to expand their markets, entrepreneurship is not bound to disappear, new resources may be created, and so forth.

Recent Approaches

The Harrod-Domar model has often been used as a rough way to measure the level of investment needed, with a given capital-output ratio, to sustain a target rate of growth. But as a whole, it has been replaced by more sophisticated models of growth, which consider explicitly factors like technology, quality of labour, kinds of investment, wage-profit relations, etc. As a result, economists have learned more about growth. But little work has been accomplished on a theoretical level to relate the change in the rate of growth with the economic gap, which is the essence of the models of Harrod, Domar, Hamberg and Hansen.

Nevertheless, the problem of the economic gap remained, in itself, a formidable one. It was often evident that the economic system did not maximize social welfare. Thus, especially after the recession of the late fifties, a lot of work has been done on the problem. The aim, though, was to measure the gap between actual and potential output, to assess the long-run potential growth rate, and not to develop a model specifically oriented towards economic gap analysis. Three main approaches have been taken: the measurement of unemployed labour, the measurement of unused capacity, and a combination of the two. The results threw some light on the sensitiveness of unused inputs to potential output.

Unemployment of Labour

The British Estimates. W. A. H. Godley and J. R. Shepherd[20] calculated the potential output in a rather complex way. They considered, separately, demographic changes, cyclical fluctuations in labour force participation rates, responsiveness of employment and unemployment to changes in output, and the trend in labour input and man-hour productivity. They found productivity to have an accelerating rate of growth.

Okun's Method. The British method is a refinement of the approach taken by Arthur M. Okun[21] in his work for the Council of Economic Advisers. Okun considered that potential output is a hypothetical magnitude known only when the economy attains its target rate of employment (96 % of the labour force in the United States, and 97 % in Canada). He realized that the rate of unemployment is a very rough measure, that does not take into account the average number of hours worked, the participation rate of the labour force, the rate of utilization of capital, the sectoral distribution

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20 W. A. Godley and J. R. Shepherd, "Long-term Growth and Short-term Policy", in National Institute Economic Review, August 1964, discussed in Economic Growth 1960-1970: A Mid-Decade Review of Prospects, Organization for Economic Co-operation and Development, Paris, 1966, pp. 108-09.

21 A. M. Okun, op.cit.

of manpower, the altered efficiency in the use of employees and its effect on overall productivity. But, for the sake of simplicity, he leaped from the rate of unemployment to potential output, viewing the former as a "proxy variable for all the ways in which output is affected by idle resources", and assuming "that, whatever the influence of slack economic activity on average hours, labour-force participation, and manhour productivity, the magnitude of all these effects are unrelated to the unemployment rate"[22].

This "heroic" assumption leads Okun to a "truncated production function"[23], as Michael Levy calls it, in which the unemployment rate represents both labour and capital. He measures, with past statistics, the degree of sensitivity of output to unemployment, which he represents as k. A decline in the rate of unemployment is associated with an increase in GNP of k %. Then, P being potential output, A actual output, u the rate of unemployment and u' the target rate of unemployment, the following formulas are arrived at:

$$P = gap + A$$

$$gap = k.(u - u').A$$

$$P = A.\left\{1 + k.(u - u')\right\}$$

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22 A. M. Okun, op.cit., p. 190.

23 M. E. Levy, op.cit., pp. 64-72.

The Drabble Variant. In his work for the Economic Council of Canada, B. J. Drabble[24] considered not only the unemployment rate as representing the unused factors of production, but he used also the trend in productivity. Furthermore, a measurement by sectors was devised to take into account fluctuations in output and short-term features applicable to productivity in agriculture, to solve the problem of assessing the productivity in government and services, and to isolate the manufacturing sector for which the conceptual and statistical framework is more reliable.

The basic calculation is as follows: the estimated potential employment in man-hours for a sector is combined to the trend of man-hour productivity, which gives the potential output[25]. This is used for the commercial nonagricultural sector. The agricultural "normal" output is considered to be a straight-line logarithmic trend fitted to a seven-year moving average. Potential output in public administration and community services depends on the estimated demand.

Drabble's calculations suggest a potential growth rate of output of 4.0 % a year for the period 1960 to 1965. Using the Okun method, the OECD Secretariat[26] estimated it

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24 B. J. Drabble, op.cit.

25 Ibidem, pp. 7, 12, 17, 31. In symbols, the basic formula would be: $Y = \frac{Y}{N}.N.$

26 Organisation for Economic Co-operation and Development, Economic Growth 1960-1970: A Mid-decade Review of Prospects, Paris, 1966, p. 108.

to be 3.8 %. The result indicates that, in this case, Okun would have underestimated the potential rate of growth by 5.2 %; and by more than that, if it happened that Drabble's method also underestimates the potential growth rate[27].

Unemployment of Capital

The Surveys of Business Firms. As capital and labour are stocks of economic resources, both can be used to give levels of utilization of potential. The methods employed by Okun, Drabble and Godley-Shepherd are largely labour-biased. A measurement affected mostly by capital is provided by estimates of industrial capacity, which are computed mainly in the United States.

The Department of Economics of McGraw-Hill Publishers, Inc., conducts a yearly survey of large, medium and some small-size firms in the manufacturing industry, asking for information concerning their recent and planned additions to capacity, and their rate of operation (as prefered maximum output under a normal work schedule, as defined by the businessmen themselves)[28]. Such approach may gauge the mood of

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27 The actual average annual growth rate for that period, per National Accounts, in constant (1961) dollars, was 5.24 %. The average annual compound rate was 5.7 %.

28 For more explanatory and critical views, see Almarin Phillips, "An Appraisal of Measures of Capacity", in The American Economic Review, Papers and Proceedings, Vol. LII, May 1963, No 2, pp. 275-92.

entrepreneurs more than real use of capital, for businessmen may well identify capacity, which is a supply concept, with output possibilities, which is a demand concept.

The Federal Reserve Board utilizes the perpetual inventory measure of the gross stock of capital goods, as available from the Department of Commerce, the McGraw-Hill index of capacity, and its own index of production divided by the McGraw-Hill rate-of-operation measure[29]. Capacity is estimated by dividing output by the utilization rate. The Board is concerned with primary and advanced processing industries only. Their measure is probably a slight improvement over the McGraw-Hill series. Interestingly enough, de Leeuw found that price changes go on par with capacity utilization, as shown in American statistics.

The Wharton School Econometrics Unit uses the Federal Reserve Board Index of Industrial Production, with capacity as a straight line between quarterly peak periods, and extrapolates the last slope to the next peak. Fortune magazine publishes also similar measures, partly subjective, but gives little information about their methodology.

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29 Frank de Leeuw, "A Revised Index of Manufacturing Capacity", in Federal Reserve Bulletin, The Board of Governors of the Federal Reserve System, November 1966. See also Jarez Enzler, "Revised Indexes of Manufacturing Capacity and Capacity Utilisation", in Federal Reserve Bulletin, The Board of Governors of the Federal Reserve System, July 1967.

Creamer's Method. The preceding surveys call forth several criticisms. If output is defined as the output that can be produced on a single shift or potential second and third shifts, at a minimum average cost, or at anything less than a prohibitively high cost, there is a strong technological bias in the measure. Economic output is that one that meets a real demand for it, and where marginal cost equals selling price; yet demand can be manipulated, or increased by exports. To avoid discrepancies in definitions, capacity output could be said to be not a maximum output under a normal work schedule, but the output that induces neither net investment nor disinvestment in real capacity[30]. Elaborating what became the National Industrial Board estimates, Daniel Creamer defined capacity as "that level of output that triggers new investment primarily for additions to output"[31].

This definition of capacity not only differentiates it from mere output possibilities, but permits a more satisfactory measurement than surveys, for it is a clear concept. For a businessman, capacity may mean "rated capacity" (technical, designed rate, often underrated for safety), "boom

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30 A. Phillips, op.cit., p. 287.

31 Daniel Creamer and Delos R. Smith, Recent Changes in Manufacturing Capacity, New York, The National Industrial Conference Board, 1962, p. 25.

capacity" (when there is high demand, making quantity more important than quality; it might be 170 % of "rated capacity"), "normal capacity" (capacity used currently, often 130 % of "rated capacity"), or "recession capacity" (used in slack periods, with quality increasing with lengthening of time, with a less favourable input-output relationship, often at 80 % of "normal capacity", i.e. just above "rated capacity")[32]. These different concepts of capacity can be used by a same firm, and they are not specified in a survey. Creamer's method leads to a clear-cut measure.

Changes in gross fixed capital-output ratio are similar in trends to changes in net fixed capital-output ratio, therefore inaccuracies in calculating depreciation become of little importance. Creamer computes the ratio of net capital to output, taken in bench-mark years of full capacity, that is, usually, of a lowest capital-output ratio. Then, any significant increase in the ratio would indicate excess capacity. The exception would be a change to capital-intensive technology, through automation, allowing for further economies in capital (less space, cheaper plant location, less heating, less manpower, optimum use, etc), which would lower future increases in the capital-output ratio.[33]

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32 Bruce Williams, "Notes on Cost and Capacity", in The Manchester School of Economics and Social Studies, Vol. XXIX, No 3, September 1961, p. 291, quoted in D. Creamer, op.cit., p.24.

33 D. Creamer, Capital Expansion..., op.cit., pp. 16-19.

Comparing net fixed capital formation in a given year with the lowest capital-output ratio of a bench-mark year, it is possible to estimate the capacity output, which, as denominator to the actual output, gives the percentage of capacity utilized. Because of the rough estimates used, Creamer considers only 95 % and less to distinguish excess capacity from full capacity utilization.

This approach, which gives results comparable to those obtained via surveys, is such that unemployment rates do not affect the measurement. "Despite the crucial importance of the relationship of peak demand to capacity, there is surprising little evidence that bears on it"[34], says Creamer. It may well be that industries operate at capacity in times of great unemployment. And, in strong competition and expansion periods, capacity may be increased to meet future demand. Then, there will be no unemployment in some periods because businessmen expand and operate with excess capacity.

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34 D. Creamer, Capital..., op.cit., p. 17.

Mixed Approaches

The Production Function Method. James W. Knowles[35] developed an econometric model accounting for capital and labour growth, productivity and technological change, age of stock, man-hour trends, etc. Such a model could be used to estimate the long-term potential growth. Thurow and Taylor[36] used a production function that can be easily transformed in a productivity function. Richard Nelson[37] equated potential output from a Cobb-Douglas function maximized at full employment to demand for goods at full employment measured from Keynesian equations: as aggregate demand should equal potential output, his method, like Hansen's, shows investment as both a contributor to growth of potential output and a dynamic determinant of the level of aggregate demand.

This approach is disputed by Cambridge economists, who question the soundness of utilizing production functions at a macro level[38]. But, in any event, Knowles' estimates are similar in trends to the measurements of the Council of Economic

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35 J. W. Knowles, op.cit.

36 Lester C. Thurow and L. D. Taylor, "The Interaction Between the Actual and the Potential Rates of Growth", in The Review of Economics and Statistics, Vol. 48, No 4, November 1966, pp. 351-60.

37 Richard R. Nelson, "Full Employment Policy and Economic Growth", in The American Economic Review, Vol. LVI, No 5, December 1966, pp. 1178-92.

38 This problem of aggregation, together with related difficulties, will be discussed in Chapters 5 and 6.

Advisers; the latter's figures, compared to Knowles', overestimate slightly the potential output[39]. An advantage of the production function method is that it leads to a breakdown of the factors of growth: it concentrates on growth as depending on expansion of the inputs and their productivity, on qualitative changes brought about by education and technical progress, on the relations of different kinds of investment and increases in the capital stock, etc. These factors, variables, parameters, can then be worked upon with usual mathematical techniques. One problem is that the function utilizes minimum average cost for full capacity output, available manpower in lieu of employable manpower, and fully utilized real capital instead of real capital utilized; but in fact the real capital is not well known, unless at peak periods, there is no reason to use average cost rather than marginal cost, and available manpower is "guesstimated"[40]. The results, despite the mathematical precision of the model, are nonetheless computed with a broad margin of error, this adding to the questionable assumption of a straight relation of inputs to output.

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39 See B. J. Drabble, op.cit., p. 65.

40 L. R. Klein and R. S. Preston, "Some New Results in the Measurement of Capacity Utilization", in The American Economic Review, Vol. LVII, No 1, March 1967, pp. 34-58.

The Council of Economic Advisers. The Council of Economic Advisers has concentrated on the factors of economic growth. They identified the basic determinants of productive capacity as the number of people available for employment, the number of hours they wish to work, their incentives and motivations, their health, general education, occupational desires, vocational skills; the stock of new and old equipment, and its composition by type and location; the terms of access to natural resources, through domestic production or imports; the level of technology, managerial and organizational competence, scientific, engineering and mechanical understanding; and the efficiency of domestic and foreign resource allocation to different economic ends, the extent of monopolistic barriers, and the movement of labour from low-productivity to high-productivity sectors[41]. An implicit conclusion is that several leading factors of growth can hardly be given a value in money terms.

Growth in investment maintains and sustains growth in labour. Thus, to increase potential GNP while meeting the demand due to a higher national income, the government shall encourage investment in human resources (education, health, social welfare, security), in technological progress (R & D,

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41 "The Council of Economic Advisers", in Edmund S. Phelps (ed.), The Goal of Economic Growth, New York, W. W. Norton and Co. Inc., 1962.

and more effective use of existing technology by adequate legislation on patents, codes and standards, and monopolies), in plant and equipment (by monetary credit policies and fiscal incentives), in natural resources (to fight depletion and deterioration, and promote a better use of water resources and lands), in public services, in housing. Another implicit conclusion is that not only the ingredients of growth are often not measurable, but more efficient or simply different use may alter their relation to the final output.

In their analysis of the mid-fifties GNP gap, they concluded that the insufficiency of demand was due to excessively restrictive federal budget structure[42]. The gap was therefore more structural than cyclical. The Council then developed the technique of the full-employment budget surplus,[43] which amounts to the calculation of government saving, on a national-income-accounts basis, generated at full employment with stable prices. A sluggish demand would call for the pursuit of a low saving effect, and viceversa. A tax reduction would then boost consumption and investment, with a cumulative expansion set in each case by the multiplier. The full-employment budget surplus approach does not distinguish on whether its

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42 Council of Economic Advisers, Annual Reports, Washington, U. S. Government Printing Office, 1962-1963.

43 See M. Levy, op.cit.

effects will be stronger on consumption or investment; it helps fight the cycle, to fill the GNP gap, but does not necessarily promote long-term economic growth. It is possible, also, that the sudden expansion of demand is partly responsible for inflationary pressures.

To estimate the potential output, required to evaluate the full-employment budget surplus, the Council used first the growth rate extrapolation method[44]. They considered the growth rate in some years of full employment, and used it for the adjacent period. This rough technique was then replaced by Okun's method, on a quarterly basis.

Denison's Contribution. The linked-peak method used by Edward Denison[45] consists in selecting years of full employment levels and connecting them by means of a semilogarithmic straight line. This appears to be helpful for long-term studies; but, like the growth rate extrapolation method, it has little theoretical significance.

The greatest contribution of Denison to the analysis of the gap resides in the measurement of the sources of growth. Basically, the technique is as follows: separate

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44 See Michael E. Levy, op.cit., pp. 64-72. The Council of Economic Advisers, like Denison, used, for different periods of study, and with alternative assumptions, several rates of potential growth, all of which are presented, compared and discussed by Levy.

45 E. F. Denison and J.-P. Poullier, op.cit.

indexes are established for every type of input, according to its share of total output as derived from national accounts or comparable statistical tables; that index is then weighted with the marginal product of the input. Thus, if net value of the service of an input at factor cost is 5 % of total constant price national income, and the growth rate of national income is 4 %, the influence of that input is said to be 5 % of 4 %, that is, 0.20 %[46]. For capital, the weight used is the relative sales price or cost of production. Education is measured by mean income values and school-years.

Sometimes, direct measurements are impossible. Denison measures the effect of planning by its effect on capital stock and the effect of the latter on growth rates. He covers many elements in similar ways. Per example, advance in knowledge includes the rate of application of new techniques, the catching-up, organized research. Education may or may not cover side-effects like increased versatility, mobility, awareness, problem-solving capacity, depending on whether or not those human improvements command higher incomes. Other elements are left unmeasured, like experience, intensity of work, health. However, what is measured comprises the main components of the major inputs.

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46 E. F. Denison and J.-P. Poullier, op.cit., pp. 7, 124, 142.

The relevance of some measurements could be disputed. Moses Abramowitz, while recognizing the "admirable lucidity" of Denison's book, challenged it on grounds of statistics[47]. Thus, use of capital varies with fluctuations in demand, and inventories vary with demand, transportation, durability, rate of interest, retailing facilities. To include or not short-term economic phenomena, however, is a matter of defining what output consists of. The main problem in measuring actual output, and at fortiori potential output, is the lack of extensive and accurate statistics to test conceptual hypotheses.

The Economic Council of Canada. The Economic Council defined, broadly, potential output as the "inherent capacity for development or achievement" of an economy[48]. It is a supply concept, that assumes that the aggregate demand to meet it can be generated. Using the Drabble method, the Council considered that potential output is determined by "the size and structure of the labour force, the extent to which the labour force is employed, and the productiveness of those employed"[49]. These

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47 Moses Abramowitz, "Economic Growth in the United States", in The American Economic Review, Vol. LII, No 4, September 1962, pp. 762-82.

48 Economic Council of Canada, First Annual Review: Economic Goals for Canada to 1970, Ottawa, Queen's Printer, 1964, p. 31.

49 Ibidem, p. 32.

three components are deemed to represent all the factors of economic growth. The potential rate of growth is then equal to the potential rate of increase in employment and the potential rate of increase in productivity. The Council allowed also for the "temporary and unsustainable boost to growth arising from the closing of the gap between actual output and potential output"[50].

In the following annual reviews, the Council studied the factors of growth in the Canadian context, without adding to gap analysis. Their concern was mainly to show how a target output could be attained, and not to analyse further the potential rate of growth. A breakthrough came with the fourth review. On one hand, they stopped working with the GDP and suggested that, to maximize the rate of growth and high performance, what should be maximized is the NY, not the GNP[51]. On the other hand, they abandoned their measure of labour productivity and replaced it by a concept of factor productivity, considering both labour and capital. Also, they started using the Denison method in their calculations.

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50 Economic Council of Canada, Fourth Annual Review: The Canadian Economy from the 1960's to the 1970's, Ottawa, Queen's Printer, 1967, p. 83.

51 Ibidem, p. 90.

The method was further refined in the next year[52]. Economic growth was found to depend on an increase in the quantity and quality of resources and on an increase in the efficiency of their utilization. The Council could measure the contribution of manpower (in volume, education, age-sex distribution, hours of work), capital (business and residential) and productivity (demand pressures, climatic effects on agriculture, reallocation of resources, economies of scale, and non-isolated factors like legal improvements, innovations, higher technology). The rate of increase of each component was then estimated in the sixth review[53], to arrive at a potential rate of growth. As a further important contribution, the Council worked on a potential GNE[54], dividing output in its main demand components. Thus, with a link with National Income Accounts, it became possible to precise how a given potential output could be met with a given potential demand.

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52 Conseil Economique du Canada, Cinquième Exposé annuel: Défi posé par la croissance et le changement, Ottawa, Imprimeur de la Reine, 1968, p. 21.

53 Conseil Economique du Canada, Sixième Exposé annuel: Perspectives 1975, Ottawa, Imprimeur de la Reine, 1969, p. 15.

54 Ibidem, pp. 17, 21.

Some American Contributions

Several independent economists contributed to the analysis of potential output in the last years. Klein and Preston[55] suggested that the approach should be to derive capacity output from capacity inputs, the rate of new investment being a proxy of capital utilization, and manpower being estimated in people and manhours. The procedure would then be to determine total manhours available (except for agriculture and the self-employed), to apportion this total to the several industrial sectors, and to determine Cobb-Douglas functions for each sector. This would be mainly an improvement over the production function method. Aigner and Chu[56] argue that random shocks, differences in technical and economic efficiency, put a firm closer to the average than to a frontier function of production, which may imply that it is wishful thinking to try to maximize both inputs in a Cobb-Douglas function.

Henry Bruton[57], who utilizes Cobb-Douglas production functions, made some significant suggestions for theory. He

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55 L. R. Klein and R. S. Preston, op.cit.

56 D. J. Aigner and S. F. Chu, "On estimating the Industry Production Function", in The American Economic Review, Vol. LVIII, No 4, September 1968, pp. 826-39.

57 Henry J. Bruton, "Productivity Growth in Latin America", in The American Economic Review, Vol. LVII, No 5, December 1967, pp. 1099-116.

considers that growth in capacity derives from input growth, while growth in productivity is largely the result of increased utilization of capacity. Thus strong demand pressure on capacity would increase prices, while strong demand pressures on utilization would increase productivity. "Underutilization is largely due to the problems of aggregate demand, and as such has nothing to do with the productivity of the inputs", unless "ability to exploit capacity is an important factor in potential output"[58]. His area of study is Latin America; yet he suggests an idea that is of relevance for Canada, which is that availability on easy terms of foreign capital pushes the economy towards growth via increased capacity, i.e. development in breadth, and puts a brake on development in depth, by increased use of inputs. In other words, if inputs have a high rate of growth, there is no incentive to increase productivity.

Changes in the rate of capacity utilization have been studied by C. L. Schultze[59]. He concluded that an increase in industrial capacity utilization leads to increases in the rate of growth of gross profits, and to increases in productivity, because long-term expectations induce high output,

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58 H. J. Bruton, op.cit., pp. 1100-101.

59 C. L. Schultze, op.cit., pp. 293-308.

reducing the ratio to labour costs. He suggests that prices increase in expansion periods, because they were linked to markup of costs under normal (pre-boom) conditions; but that they are also affected by retail trade and decrease with larger supplies. The effect upon investment is uncertain, because it depends on the absorptive capacity of management, and the estimate of future sales (and profits) should exceed the long-run costs incurred by new investment. Schultze's contribution is useful insomuch that he returns, in a way, to the first concern with the rate of growth.

By estimating changes in employment, hours worked and output per man-hour, M. F. Elliott-Jones[60] obtained a measure of potential output. He considered school enrollments, student-employee ratios, sectoral employment projections. Output per manhour was viewed as reflecting the effects of amount, age and quality of capital, stock of knowledge (in production, organization and management), quality of labour (including education, health, skills, motivation), internal and external economies of scale, and working conditions. For the farm and private nonfarm sectors, his formula is $0 = N.h.\frac{0}{Nh}$, where 0 is output, N is employment, h is hours per week, and Nh is manhours; for the government sector, he uses $0 = N.\frac{0}{Ny}$,

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60 M. F. Elliott-Jones, "A Portrait of Economic Growth in the Seventies", in The Conference Board Record, March 1970, pp. 41-56.

where Ny is man-years. He then establishes potential National Accounts, estimating and deriving the components of national income, GNP and GNE.

An important development in the United States is the attempt to supplement economic information with social data, with analytical and policy implications. A major contribution appeared with the Report[61] published in 1969 by the U. S. Department of Health, Education, and Welfare. This was a first step toward the eventual publication of Social Accounts, which, with a set of "social indicators", would supplement the measure of income and illustrate better how well-off people are. To avoid excessive normative bias, the indicators must be measurable, directly or indirectly. The Report suggests the following social indicators: health (death, illness, life expectancy), social mobility (equality of opportunity), physical environment (air, water and soil pollution, standards of housing, quantity of homes), income (poverty), public order (safety, crime levels), learning, science and art (education, cultural life), participation and alienation (discontent, discrimination, inequalities). These social accounts were viewed as providing a frame of reference for some form of a "democratic management of society". They were to be

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61 U. S. Department of Health, Education, and Welfare, Toward a Social Report, Washington, U. S. Government Printing Office, 1969.

complemented by "policy accounts"[62], to show the effects of policies and programs on the social indicators (that is, on public well-being). For the purpose of gap analysis, such research is doubly useful. On one hand, it helps link economic with social phenomena, and it makes possible the comparison of the economic gap with a "social" gap, and the study of the interaction between social and economic factors. On the other hand, it clarifies the welfare dimension of the gap, showing in terms of social indicators the gap that economic analysis presents in money terms.

This trend, aiming at supplementing quantitative economics with qualitative information, continued in the Report[63] of the National Goals Research Staff. The objective of the Research Staff was to formulate guidelines for "balanced growth". The latter concept was defined as a specific kind of growth, the composition of which equates the advantages of reaching a goal with the disadvantages of "neglecting" alternative demands[64]. This fits into gap analysis as understood in this thesis: for example, pollution has aesthetic and health dimensions besides economic implications; to

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62 U. S. Department of Health, Education, and Welfare, op.cit., pp. 100-01.

63 National Goals Research Staff, Toward Balanced Growth: Quantity with Quality, Washington, U. S. Government Printing Office, 1970.

64 This is the ultimate economic problem of choosing how to devote scarce resources to meeting competing claims. See Ibidem, pp. 158-9.

maximize social welfare requires that all dimensions be considered, not only economic output[65]. The Research Staff discussed together problems of quality of life and economic growth. They concentrated on population (growth, and urban-rural distribution), ecological equilibrium, environmental deterioration, educational issues, funding and nature of basic research, viewed as cultural value (i.e. consumption good) and long-term investment, technology assessment (which is needed to control the direct effects and side-effects of technology, with its impact on society and the environment, and its private and social costs and benefits), and problems of consumerism (which involve the organization of the market, quantity and quality of goods and services, monopolistic features of production). The Report stops short of defining a national policy of "balanced growth". Such a policy is difficult to formulate, because of the extent of competing demands, and because it would have to be carried by governments, institutions, groups and individuals separately, i.e. be almost self-controlled, within a general consensus[66]. On a theoretical level, gap analysis requires such studies,

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65 The issue is complex, for the factors interact with each other. For instance, in this example, to maximize economic output would probably affect health adversely, because of the pulmonary and cardiac diseases associated with pollution. But maximizing health via a reduction of pollution would improve the quality (and possibly the quantity) of manpower, which would positively affect output and productivity.

66 National Goals Research Staff, op.cit., p. 166.

which are the basis from which can be described the potential output that maximizes social welfare. The quantitative dimension of the gap provides an estimate of the resources available to attain that level of well-being. Together, the two approaches would eventually leads to the formulation of actual and potential "National Welfare Accounts".

Finally, it is worth mentioning the terminology proposed by Thurow and Taylor[67] for three different concepts of potential growth: immediate potential output, which depends on existing stocks of labour and capital[68]; steady-state potential output, if the economy were adjusted to target levels of utilization; and steady-growth potential output, if the economy consistently grew at its potential level. This classification is useful, because it helps differentiate the economic gap when it is studied for one year, for one period, over the medium term, or over the long term, and under alternative assumptions.

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67 L. C. Thurow and L. D. Taylor, op.cit., pp. 351-52.

68 There could even be two measures of immediate potential output, whether the study considers a specific point in time, or whether it covers one year, in which case there could be some allowance for training and changes in capacity.

Some Canadian Contributions

Several Canadian scholars have been interested by the problem of measuring potential output. An earlier contribution has been made by O. J. Firestone in 1956[69]. He considered the trends in the economic variables affecting GNP growth, namely population, participation rate, employment, hours worked per week, and output per man-hour. This led to a potential GNP of $ 57.5 billion in 1953 dollars, that is, the mean between a low $ 53 and a high $ 62 estimate, at an average compound rate of 3.99 % per annum, forecasted for 1975[70]. An important feature of this study was to suggest four possible patterns[71] for the potential 1975 Canadian market:

	High C	High I	High G	Average
Consumption	68.7 %	62.3 %	62.1 %	64.9 %
Investment	16.7 %	23.1 %	15.6 %	19.1 %
Government	14.6 %	14.6 %	22.3 %	16.0 %

Obviously, the potentialities for growth in 1975 would be different for each type of market. An implicit conclusion is that the breakdown of GNP and GNE should be an essential part in presentations of potential output.

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69 O. J. Firestone, Growth and Future of the Canadian Market, 1900 to 1975, (mimeographed), Ottawa, July 1956.

70 Ibidem, pp. 110-12.

71 Ibidem, p. 122.

The Royal Commission on Canadian Economic Prospects, drawing on the work of W. C. Hood and A. D. Scott and on the results of a nation-wide enquiry, published in 1956 a view of the potentialities for growth in Canada[72]. Other studies on the same subject appeared later. Wilson, Gordon and Judek[73] utilized the tendencies in the determinants of output to evaluate the potential GNP, following the formulation: $GNP = P.\frac{L}{P}.\frac{O}{N}.\frac{N}{L}$, where P is population, $\frac{L}{P}$ the labour force propensity, or participation rate, $\frac{O}{N}$ output per man-year, and $\frac{N}{L}$ the percentage of labour force employed[74]. Caves and Holton[75] measured potential GNP by applying productivity to expected labour force; this approach was similar to the Hood-Scott method, which was a forecast of output according to different variables of productivity and net immigration, at a 3 % level of unemployment[76].

Two later works are highly relevant in gap analysis, both made for Royal Commissions.[77] In the first one, T. M. Brown considered historical tendencies in such economic variables as hours of work, employment, capital-labour and capital-output

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72 Royal Commission on Canada's Economic Prospects, Final Report, Ottawa, November 1957. For the Hood-Scott method, see W. C. Hood and A. D. Scott, Output, Labour and Capital..., op.cit., Chapter 5, Appendix A.

73 G. W. Wilson, et al., op.cit.

74 Ibidem, p. 376.

75 R. E. Caves and R. H. Holton, op.cit.

76 Royal Commission on Canada's Economic Prospects, op.cit., pp. 327-9.

77 T. M. Brown, Canadian Economic Growth, op.cit.

ratios, population trends, productivity gains and their allocation. He offered three projections, the last one being based on alternative policies within an econometric model. In the second work, Wilson and Lithwick[78], using Cobb-Douglas production functions, proposed three other projections, based upon several estimates of employment, hours worked and capital stock. For analytical purposes, they divided output into governmental, which is policy determined, agriculture, which is weather and export determined, residential-rent industry, which is determined by the stock of housing, and private nonfarm nonresidential sector, which is the heart of the economy[79]. The notable contribution of both works was that they switched the interest from the mere measurement of the gap to a study of the interaction between aggregate demand and aggregate supply, in an attempt to determine why and how a failure in demand or a bottleneck in supply keep GNP from attaining its potential level.

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78 T. A. Wilson and N. H. Lithwick, op.cit.

79 Ibidem, pp. 28-29.

Critical Comments on Gap Measurement

The work done on the problem of the economic gap, after the great models of the forerunners, can be divided in two groups: one approach concentrated on the measurement of potential output, while the other examined the potentialities for growth, with or without a specific model. In both cases, the movement has often been away from the crucial issue, which is to discover why do the rates of growth in actual and potential output differ. Both approaches are subject to certain criticism.

On the basis of previous performance, potential employment has been estimated by F. Denton and Sylvia Ostry[80] at 97 % of the labour force. The 3 % of "inevitable" unemployment is made of 1.6 % of frictional and structural unemployment, 1.0 % of seasonal unemployment, and 0.4 % of short-term underutilization of manpower due mainly to mobility reasons. The 3 % is backed up by dated statistics, and refers to a given period and a given structure of production and employment. For Canada, the unemployment rate could be reduced by increasing the aggregate demand in the eastern areas, by lowering the degree of seasonal character in the primary industries,

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80 Frank T. Denton and Sylvia Ostry, Une Analyse du Chômage depuis la Fin de la Guerre, Etude No 3, Conseil économique du Canada, Ottawa, Imprimeur de la Reine, 1964, p. 28.

by having an adequate labour policy for the 14-19 (especially) and the 20-24 age groups, and so on. Reciprocally, a momentary high degree of increase of the labour force could explain a short-lived higher rate of frictional unemployment. Though this is not a very important point, it should nonetheless be borne in mind when potential growth is considered over the long term.

Okun's method implies a constant, or average, sensitivity of output to unemployment, which he calls k, and has estimated at 3.2 for the United States. Utilizing Drabble's calculations, which are more sophisticated than Okun's, the following k is found for Canada[81]:

Year	Output gap $(1 - \frac{A}{P})$	Unemployment gap $(u - u')$	k
1956	- 0.9	0.4	- 2.25
1957	3.5	1.6	2.18
1958	7.6	4.1	1.80
1959	5.9	3.0	1.96
1960	8.1	4.0	2.02
1961	9.0	4.2	2.14
1962	7.3	2.9	2.51
1963	7.0	2.5	2.80

These data indicate that k rises over time during the economic gap period, that is, k accelerates with prolonged unutilization of human resources. After three years of recession, in 1959, 1 % of decline in unemployment would have been associated with an increase of 1.96 % in output; three years

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81 B. J. Drabble, op.cit., p. 41. The k is derived from data of Table 14.

later in 1962, an increase of output of 2.51 % would have been needed to raise employment by 1 %. An accelerating k means that Okun's formula can be used only over the short term.

In the case of Drabble's approach, the main difficulties are partly conceptual. It is not facile to assess potential rates of increase in productivity, for they are linked to the number of part-time workers[82], to relative levels of technical development, to quality of factor inputs, to the extent, strength and distribution of demand. Adjustments are to be made for fringe groups (teenagers, aged people, married women, etc) that join the labour force at the peak of an expansion and leave it when it loses momentum. No allowance is made for resource discovery, immigration, climatic hazards, changes in external markets, however important they might be. Measurements for the long term should include provisions for technological progress, innovations, higher levels of education, skill improvements, and similar factors.

His approach is not sufficient. The concept of constant productivity should be reconsidered while applying to public administration and community services. The non-agricultural commercial sector should be subdivided, by estimating

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82 As it will be seen later, there are reasons to believe that part-timers are in fact more productive than full-time workers.

the trends of employment to join particular industries with different productivity levels. Agricultural potential output should be seen as depending largely on foreign demand, and partly on the adequacy of export policies.

In any event, Drabble's method will remain a rough one, just an improvement over Okun's. His main formula is that the increase in output equals the increase in employment plus the increase in productivity. To be mathematically correct, his measure of productivity should be one of potential output per man (or manhour). But as he has not, at this stage, a measure of potential output, he has to utilize a measure of trend in productivity, which may underestimate the potential, because former recessions depressed the historical productivity trends, and increases in productivity accelerate as the economy closes the gap. Inasmuch as productivity depends on demand, and not on the ability of the inputs, such measurement is necessarily faulty.

To justify the rate of unemployment as a measure of unutilization of resources, the unemployment gap is often compared to the GNP or output gap[83] (i.e. economic gap as percent of potential). A strong correlation is immediately noticed. Yet this is not to surprise anybody, because the output gap has been derived from the unemployment rate.

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83 See an American example in M. Levy, op.cit., p. 20, and a Canadian example in B. J. Drabble, op.cit., p. 42.

Michael Levy made a comparison of alternative methods for estimating postwar real potential GNP. In general, he found the different methods (of Knowles, Okun, the Council of Economic Advisers and Denison) to be reasonably good in assessing the levels and changes of output gaps, the full-utilization unemployment rate, and the full-employment utilization rate. But remarkably high variations were found when comparing the real growth rates of potential GNP derived from the different methods, ranging from 2.6 % to 4.7 %[84]. The Canadian estimates were compared in the Wilson-Lithwick study: they indicate a variation from 3.22 % to 5.24 %, depending on the assumptions about potential employment, capital stock, average weekly hours, and periods covered by the study; most writers suggest their own low, mean and high projections[85]. This indicates that the methods mentioned above, while acceptable for a rudimentary presentation of the gap, are not adequate for an analysis and measurement of the potential growth path of the economy. It shows also that these economists are far away from the Harrod-Domar razor's edge proposition, and from any concern for the rate of growth.

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84 Michael E. Levy, op.cit., pp. 77, 80-1.

85 T. A. Wilson and N. H. Lithwick, op.cit., pp. 217, 218, 221, and also pp. 254-55.

Assessing the Potentialities for Growth

The concern with the economic gap did not lead to a coherent model fitted into the theory of growth. There are reasons for this failure: the work has been conducted, in the United States, as a part of the estimation of the full-employment budget surplus, and in Canada to provide a broad framework for growth policies, ability to afford health services, or to pay taxes. For these purposes, a rather rough and approximate measure of the GNP gap was sufficient, insomuch that it could indicate a trend and either an aggravation or a relative closing of the gap. But for a study of potential output, this is far from satisfactory.

A broad measure of the gap would equate potential output with actual output, plus the additional output that could be achieved if all the factors of production were fully employed, plus the additional output that would come from a better utilization of those factors. The different methods provide an estimate of full-utilization of inputs, but they do not give a measure of the additional output that would be realized if the underemployed factors were better employed, nor do they consider the possibility that the same factors be employed to produce a different output mix. Also, they do not consider the changes in quality, that are of prime importance when the economist concerns himself with a concept of better life. Furthermore, this measure of the gap does not

provide for the increased output resulting from the increase in the volume of the inputs, stocks of labour and capital being added from the outside in a mutually consistent manner.

Wilson and Lithwick[86] speak of three growth paths: actual or realized growth path, potential growth path (actual growth, plus growth potential of the unemployed inputs), and maintained full-employment growth path (that would exist if the potential was constantly achieved). The loss of output in one year would differ if only that year was examined, or if a longer period was studied. To illustrate: if in Canada, in 1963, all inputs had been fully and well utilized, there would have been no apparent economic gap; yet, had there been no wars nor recessions nor restrictions in immigration, the capital stock and the labour force would have been larger; it has been estimated[87], under a long-term equilibrium growth path of GDP of 4.06 %, that the output loss in 1963 was $ 4.7 billion (in 1963 current dollars). These examples indicate that several measures of the gap can be given, depending on the assumptions and the concepts that are used, as well as the aim that is pursued.

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86 T. A. Wilson and N. H. Lithwick, op.cit., pp. 5-6.

87 Ibidem, pp. 56-7.

An usual utilization of the potential rate of growth has been to evaluate, from past experience if the concern is over the long term, from the unemployment rate if the concern is over the short term, or from both if the concern is over the medium term, a growth trend line fitted to the economy. By knowing which rate of growth the economy is used to, the advisers could suggest policies for labour, investment, government expenditures, and the like. The recent literature on growth illustrates this approach. Often called "the steady-capacity-utilization" rate of growth of output[88], it assumes or compensates for a level of demand that meets the supply of inputs. During the last phase of a cycle, the potential rate of growth would be higher than normal, because besides the increased potential due to a growth in the volume of inputs, there is an expansion due to increased use of already existing resources, i.e. a catching-up of the economy.

An economy, however, should be expected to be able to sustain a higher growth rate when it becomes more diversified, more mature, technologically and educationally superior, with better financial organizations and more flexibility and overhead capital. The curb on the rate of growth, in this case, would come from a relative decrease in input growth (i.e. more leisure, or better equipment that lasts longer)

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88 Organization for Economic Co-operation and Development, op.cit., p. 23.

that counterbalances the advances in efficiency - provided, of course, that demand is kept strong. Thus, it would be useful to study separately the potential rate of growth, as increase in the factors of production, the potential rate of development, as increase in the productivity of the factors, and the potential rate of progress, as increase in well-being appropriately measured.

On theoretical grounds, nonetheless, the bulk of research should return to the basic problem indicated by Harrod, Domar, Hamberg and Hansen, within the framework of what is known of the ingredients of growth and the questions raised by welfare economics. Short-term policies can successfully close the economic gap, as the recent Canadian and American experience shows[89]. But then the gap opens anew after a couple of years. Today, it is felt necessary to slow down the rate of growth (i.e. to widen the gap) in order to lessen the pressures of inflation. More profound thinking is needed on the subject, to avoid short-term policies that "overkill" long-term expectancies.

The problem is manifold. To maximize actual output may lead to bottlenecks and overheating of the economy. To maximize potential would allow for increased demand with less

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89 See Jean-Marie Weydert, "Les Motivations conjoncturelles de la Politique fiscale américaine (1961-1968)", in Statistiques et Etudes financières, Paris, No 232, avril 1968.

inflationary pressures, but might also create spare capacity (i.e. an economic gap). Most "old" models are centered on investment, because it is the dynamic component of demand, it generates income, and results also in additions to capacity. But there are investments that add nothing to capacity, and there are investments that add to capacity only after many years, such that even a lagged model could not take full account of them. A further question is that the rate of growth is particularly sensitive to government expenditures and fixed investment that fluctuate strongly on a year-to-year basis. The difficulty is not only to relate the components of demand and supply to provide for a similar growth rate in potential and actual output, but to determine why a discrepancy arises, and how to avoid it. Besides, as potential output is that output that maximizes social welfare, the economist should consider also the state of employment, the balance between work and leisure, the composition and quality of output, and not only gross figures of investment. Moreover, the important issue of the economic and social cost of growth, which implies assumptions as to what kind of growth, have to be dealt with.

The Case of an Open Economy

A theory of the economic gap, to be relevant for a specific country, has to take into account its particular characteristics. Thus, in Italy, because of the high number of self-employed persons and unpaid family workers, there is little relationship between unemployment and output, while in Germany, with chronic manpower shortages, output is especially sensitive to changes in the immigration rate; in Japan, with a constant level of unemployment, the rate of growth of actual output dropped from 15.6 % in 1964 to 3.5 % in 1965[90]. These examples illustrate the need to consider the peculiarities of an economy, as they affect the relationship between the inputs, and of these with the output.

A major Canadian characteristic is its growing trend towards becoming a more open economy. This means that Canada can expand its output beyond its domestic needs, and benefit from increased productivity and economies of scale despite its relatively small population. It means also that Canada can increase its level of inputs by importing manpower and capital, utilizing foreign resources and savings.

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90 Organization for Economic Co-operation and Development, Economic Growth..., op.cit., p. 110.

The openness of an economy has certain drawbacks. International prices (under fixed exchange rates), if higher than those which would exist in a closed economy, may infuse inflationary pressures that do not only distort the industry's price and profit structure, but affect other sectors as well, via increased costs of the industry's product, or a demonstration effect of the industry's wage level[91]. The reliance on foreign technology may mean a saving on R & D expenses, but may also impede a country to take the lead in innovations or to enjoy the short-term monopoly of the inventor. The size of foreign control can be such that a subsidiary firm would not be allowed to compete with a parent firm in world markets, or would be subject to foreign political pressures: until lately, American-owned truck industries were barred from selling to Communist countries. Imports of labour and capital, though most useful, may complicate policies of domestic stability if there are no mechanisms for easy absorption and adjustment[92]. The overall expansion in output can always be curtailed by demand contractions abroad. This happens currently in the wheat market. Viceversa, American wars can add to the foreign demand

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91 On the topic of the concept of imported inflation, and the controversies about its causes and ways, see Ruth Logue, Imported Inflation and the International Adjustment Process, (a Ph.D. dissertation), Staff Economic Studies, Washington Board of Governors of the Federal Reserve System, 1969.

92 Richard E. Caves, Policies for Economic Growth in Canada, in T. N. Brewis et al. (eds), Growth and the Canadian Economy, (mimeographed), Ottawa, Carleton University, March 1965, pp. VIII-20-1.

for Canadian industrial products[93]. Growth can be constrained by policies concerning the balance of payments, as in 1962. A demand inflation in the United States became a cost inflation in Canada in the late sixties[94]. The American influence is so great and pervasive that whatever happens south of the border affects sooner or later the northern neighbour.

Because of its openness, the Canadian economy needs to be exceptionally strong, in order to withstand changing conditions in its foreign markets. But because of it, Canada may not only deal with the economic gap with a proper management of demand, but also with a management of supply, as it will be explained in the next chapter. The theory of the economic gap, as it becomes a theory of growth and general equilibrium, should provide the basic elements for a coherent mixture of both policies.

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93 J. M. Smith, Canadian Economic Growth and Development from 1939 to 1955, Ottawa, Royal Commission on Canada's Economic Prospects, May 1957, p. 36.

94 Conseil économique du Canada, Sixième exposé..., op.cit., p. 180.

CHAPTER 3: THE FORMATION OF A GAP

Interplay of Supply and Demand

An economic gap occurs when the economy fails to blend all its available inputs in an output that maximizes social welfare. A variety of causes may be responsible for this failure, and they may come from within or without the national system. A high rate of growth may decrease because it is unsustainable or due to temporary circumstances, and a higher rate of growth may be unattainable because some factors of production are left idle. The growth of output may turn sluggish because of bottlenecks in supply or deficiencies in demand. Input underutilization may appear whenever a required complementary of labour, capital or other resources is not obtained. Social and political factors may play, together with institutional inadequacies.

Two mechanisms are at work. One relates to the transformation of inputs into output, and the other relates to the equilibrium between supply and demand. If the two mechanisms could be satisfactorily described, the economic gap would be more easily explained and measured.

The Inputs and the Output

The classical view distinguished as inputs capital, labour and land. Later, entrepreneurship was added. As land was more satisfactorily analyzed as capital, it came to be less considered. When the emphasis turned to new discoveries, technological progress became accepted as a main contributor to growth. More recently, with the studies on the effects of education and advance in knowledge, a new classification appeared in the literature: the distinction between human capital and physical capital[1]. The study of potential output requires that all inputs be accounted for. Yet, for the sake of simplicity, it may be sufficient, at a start, to deal with capital investment and labour, as they embody all the other factors of growth in the economic process[2].

The task is to assess what output can be produced from given inputs. This demands a knowledge of the contribution of each input to production. For the purpose at hand, it is not sufficient to utilize Denison's method[3]: as Abramowitz pointed out, the assumption that the share of income accruing

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1 Adam Smith had already spoken of education and training as capital fixed and realized in a person. See Adam Smith, op.cit., pp. 119-20.

2 It is manpower that is better educated, and equipment that is more sophisticated, and both that are better managed. A cultured leisure man, an unapplied invention, an untouched oil field, have no economic value per se, though in some instances they might represent potential inputs.

3 M. Abramowitz, op.cit., p. 779.

to a factor measures its real contribution to growth can be disputed. Dorothy Walters[4], applying this method to the Canadian economy, found that, like elsewhere, most of the growth in income is due to labour. This means that labour is more expensive than capital. The difficulties in deflating labour costs make it close to impossible to assess meaningfully the contribution of this input to growth, expressed in money terms. It is clear to most businessmen that investing in better and larger fixed capital is more conducive to higher levels of output and productivity than hiring more workers. The rising cost of labour may be, technological changes notwithstanding, a fundamental cause of the ever growing capital deepening[5]. To endeavour to maximize growth by maximizing income, be it wages or profits or rents, would lead to inflation rather than to increases in real production.

It is necessary to consider the inputs in volume terms. Several Keynesian relations can be formulated. Drabble used labour productivity and labour: $Y = \frac{Y}{N}.N$. This approach is oversimplified because it is limited to labour. The growth in output per person working is not due primarily to the

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4 Dorothy Walters, Canadian Income Levels and Growth: An International Perspective, Staff Study No 23, The Economic Council of Canada, Ottawa, Queen's Printer, 1968.

5 T. M. Brown, op.cit., p. 19.

improvement of the skills and effectiveness of labour, but may also be due to capital investment. A similar relation could be employed, based on capital as the sole determinant of output: $Y = \frac{Y}{I}.I$ [6]. This equation has the advantage of showing whether the variation of growth is due to a change in the output-capital ratio or in the investment function. Still, it is one-factor oriented, rather than multi-factor oriented.

The use of such simple equations is misleading. Changes in output do not result entirely from variations in inputs. The same inputs, in a different arrangement, can yield a different output. Due to a changing structure, certain inputs can become redundant. There are instances in which an increase in inputs brings a decrease in output. Thus, it is doubtful that a single macroeconomic relation could ever encompass the working of the economy in all its ramifications. It is possible, though, to have equations that account for the basic trends, or that at least clarify the analysis [7].

There is a direct relationship between the trends in the rates of growth in GNP, in gross fixed capital formation and in labour employed, as it is shown by the following equation,

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6 The usefulness, limitations and validity of these measurements will be discussed in later chapters.

7 For instance, an increment in productivity ratios, like $\frac{O}{N}$ or $\frac{O}{I}$, reflects a more efficient use of the input.

which considers the output-capital ratio and the capital deepening: $Y = \frac{Y}{I}.\frac{I}{N}.N$. A graphic example could be given by charting these elements from the National Accounts; it would be seen that, as a rule, they all rise and fall together.

This formula will be used to explain the formation of excess capital and excess labour. The dynamic element will be the entrepreneur, who invests or does not invest, and who hires or does not hire manpower. The passive element will be output, in the sense that a lack of demand motivates the entrepreneur to curtail production, unless his expectations and commitments are stronger than his decline in receipts. Even if they are not specifically mentioned here, other sources of decision-making are implicitly considered: thus, in the Canadian case, there is evidence that the market monopolistic imperfections[8], the importance of foreign capital[9], government policies[10], affect considerably the rate of growth.

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8 See David R. Kamerschen, "An Estimation of the 'Welfare'Losses' from Monopoly in the American Economy", in The Western Economic Journal, Vol. IV, Summer 1966, pp. 221-36. This analysis is relevant for Canada, because of the similar market.

9 See Roger Dehem, "The Economics of Stunted Growth", in The Canadian Journal of Economics and Political Science, Vol. XXVIII, No 4, November 1962, pp. 502-10.

10 See A. M. C. Waterman, "Economic Policy and the Rate of Growth: Canada, 1945-63", in Australian Economic Papers, Vol. 4, Nos 1 and 2, June-December 1965, pp. 37-56.

Supply and Demand

Actual output does not grow at a steady rate. There is no reason why potential output would: the so-called long-term potential path of growth is a pure mathematical construction (which has some base in the relatively stable growth rate of population). As inputs grow at different rates in different periods, a changing rate of potential growth should be expected. But it is in the realm of possibility to formulate appropriate policies aimed at maintaining a steady growth, or at least at minimizing its variations.

One aspect of this problem is the growth of inputs. Labour arrives to the market at a predictable rate. It is theoretically possible to blend it with such amount of capital as to create output at a steady rate, because investment come under full control of men, and the savings to finance investment grow together with the wages of workers and the profits of businessmen. The other aspect is the advantage of a steady rate of growth. T. Wilson[11] has shown, with a coefficient of variation, that high rates of growth are often accompanied by instability. But a high rate of growth needs

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11 Thomas Wilson, "Instability and the Rate of Growth", in Lloyds Bank Review, No 81, July 1966, pp. 16-32. He used a coefficient of variation, or "discomfort index", made up of the standard deviation divided by the average rate of growth, and tested it with the experience of several industrial countries.

not be one that provokes inflationary pressures or balance-of-payments difficulties; it can be the highest one that is warranted by the growing capacity and productivity. The desirability of a steady rate of growth comes from the fact that a slump affects current output and welfare by decreasing employment, the participation rate, the weekly and hourly output of the workers, and affects also future output by reducing the capital goods for tomorrow, the income needed to demand goods and services, by discouraging confidence, liquidity, readiness to innovate, working habits, and by inducing often lasting restrictive industrial practices. In graphic terms, a steady rate of growth would fill the troughs and raise the average slope of the ascent of the production curve.

But the problem, at first, is not one of steady growth, though it may become so in the end. The question is to learn why, at times, the actual rate lags behind the potential rate, creating excess capacity, while at other times it accelerates more rapidly, leading to inflationary pressures. The immediate answer is that demand becomes inadequate either to use the inputs or to bring them into existence[12]. It remains to be discovered why demand does not meet potential supply.

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12 This is the underlying thesis of Wilson and Lithwick, op.cit.

With respect to the first part of the question, which is the case when the potential rate exceeds the actual rate, some explanations will be formulated in the next section, which deals with the formation of a gap. With respect to the second part, that is, when the actual rate exceeds the potential rate, two cases may happen. In one, the demand has been unduly expanded, usually by government action, like strong public expenditures, less taxation, sudden monetary expansion, which may or may not follow a period of restraint. In the other, supply has been kept from developing, often because of market restrictions, disregard for the real demand (leading to large inventories and bankrupcies), lack of consistence among inputs, tight money conditions, low propensity to invest, poor coordination of business and the education centres, which may or may not follow a period of expansion.

There are many macroeconomic equations of aggregate demand. Higgins[13] suggests a simple one, borrowed from Hansen, that can be modified as: $Y = \frac{1}{\frac{S}{Y} + \frac{M}{Y} + \frac{T}{Y}} .(Ip + Ig + If + X)$, where Y is national income, $\frac{S}{Y}$, $\frac{M}{Y}$ and $\frac{T}{Y}$ are the propensities to save, to import and to pay taxes, Ip, Ig and If are private,

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13 Benjamin Higgins, op.cit., p. 157. Though this equation will not be used as such in this study, it underlies much of the reasoning.

government and foreign investment, and X is exports. This formulation has the advantage of being readily tested with National Accounts data.

This demand equation can be used for the whole economy, or broken down for different kinds of investment or for various sectors. Likewise, the output equations suggested in the preceding section can be applied to the economy as a whole or to different sectors. Thus, by comparing the two, it is possible to discover why and where discrepancies arise.

Excess Labour

The economy is a sort of living mechanism, in the sense that it has to develop to keep pace with the growth of population, and faster if any betterment of the living standards is to be achieved. It cannot stand still. It may heat up or cool down if its growth rate is inappropriate. Unless a severe recession is considered, most idle resources would appear *not* because inputs are rejected, but because new inputs are not employed, or are underemployed. Even in periods of high growth, some inputs may be partly unutilized, because of structural imperfections, lack of knowledge, misjudgment, local concentrations of underdevelopment. A high level of demand does not necessarily bring all the inputs into their

fuller and optimal use, especially when there are rigidities in the supply side, or erratic public and private policies. A loss of output may happen in many ways, which can be understood or pinpointed by examining the behaviour of labour and capital. The other inputs and factors, though significant, will not be discussed in detail, as they are supposed to be embodied in the two main ones.

The relation of output to labour force is not an arithmetic one[14]. Italy had high unemployment and high growth in the 1950s, while Great Britain had high employment and low growth in the same period[15]. A given population may grow at a different rate than its labour force, not only because of demographic factors, like a high ratio of children to elders, but because of a different trend in the participation rate, which may be due to cultural, social and circumstancial reasons[16]. Spare labour would appear because suddenly more people seek jobs. The individual entrepreneur, who cater to

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14 George W. Wilson, "The Relationship Between Output and Employment", in The Review of Economics and Statistics, Vol. XLII, No 1, February 1960, pp. 37-43.

15 R. Caves, Policies for..., op.cit., p. VIII-13.

16 This may depress the output per capita figures, while increasing the output per worker, for example. Or the opposite development may take place.

an unchanged demand for goods, does not see any reason to employ this growing labour force, and unemployment increases.

A country that imports labour aggravates this tendency. The participation rate is higher among immigrants than among the native population[17]. This is potentially beneficial, as it lessens the overall working people-dependents ratio. But if the businessmen are geared to a normally expanding demand from a normally expanding population, they may not be ready to increase their output, to invest, and to hire the new manpower. Therefore, excess labour would appear.

The utilization of labour is not straightly correlated to changes in demand or investment. Also, there are cases when a strong pressure of demand would not induce more investment, because they are restrained by stringent anti-inflationary monetary policies. It is possible to have a high rate of growth with a high level of unemployment, if labour invades the market in strong number because of a high birth rate some twenty years before, like the "war baby boom", or because of a high level of immigration, like in 1957, or because of a

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17 While one third of the native population join the labour force, over half the immigrants seek jobs. See Immigration Statistics, Immigration, and Immigration: Facts and Figures, Ottawa, Department of Citizenship and Immigration, various issues. Because of the lower number of dependents, immigrants have 15 % more labour content than native Canadians. See N. H. Lithwick, Labour, Capital and Growth: The Canadian Experience, in Growth and the Canadian Economy, op.cit., p. IV-4.

substantial increase in the participation rate, like in expansionary years. Automation, coupled with restrictive practices of the closed-shop type, may discourage employment even when demand and investment are expanding. This kind of surplus labour is often a sizeable part of total unemployment, especially among the young. In Canada, in 1963, the rate of investment increased, while the rate of growth in employment declined; in 1965, the growth rate of investment fell, while the growth rate of employment increased.

The relationship of investment to employment is as complex as the relationship of employment to output. An increase in employed labour will usually bring an increase in output, because people are hired to produce. But when demand fails, employers tend to spread the cut-back in production among the workers for a period before firing them[18]. And unless strong and lasting expectations are the case, entrepreneurs will hesitate to hire workers, the two main reasons being the cost of training[19] and the cost of firing[20],

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18 Nand K. Tandan, Underutilization of Manpower in Canada, Special Labour Force Studies, No 8, Ottawa, Dominion Bureau of Statistics (71-513), September 1969, pp. 10-11.

19 Walter Y. Oi, "Labor as a Quasi-fixed Factor", in The Journal of Political Economy, Vol. LXX, No 6, December 1962, pp. 538-42.

20 Joseph W. Garbarino, "Fringe Benefits and Overtime as Barriers to Expanding Employment", in Industrial and Labour Relations Review, Vol. 17, No 3, April 1964, pp. 432-9.

that is, the costs of turnover. A rise or decrease in investment, unless it is substantial, will not mean automatically an increase or decrease in employment. As the economy becomes more capital intensive, and labour expensive, a part of investment is made to replace labour inputs by capital inputs. Technological progress strengthens this tendency. As the labour force becomes more educated, more specialized, more efficient, and utilizes a better equipment, less quantity of labour is needed to produce a given output[21]. Thus, spare labour would appear.

A failure in aggregate demand would affect labour through the investment behaviour of the firms. In an open economy, the shortage of demand can be exogeneous: the more a country sells abroad, the more it is sensitive to economic vagaries in its commercial partners. A low demand would create inventories and excess productive capacity, reducing the enterprise's inducement to hire more labour. Excess labour would result, worsened by the firing of redundant workers.

The Canadian economy is so structured as to be particularly affected by changes in world demand. Good crops in

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21 With better equipment, 50 statisticians of the U.S. Census Bureau do in 1960 the work that 4100 statisticians did in 1950; similarly, Bell Systems can double its servicing of telephone calls with only a 10 % increase in manpower. See Donald Michael, "Un Conquérant silencieux: La Cybernation", in Economie et Humanisme, No 158, January-February 1965, p. 51.

Europe, Asia, Australia and Latin America mean that a large part of Canadian agricultural output, two fifths of which is exported, will remain unsold. Saturation of demand in primary resources would allow these industries to withstand wage pressures and accept long strikes, with costs for the whole economy. Strong international competition would induce firms to rely on capital equipment rather than on labour, whose cost increases after every collective agreement, cutting into profits unless the burden can be shifted to consumers[22]. A better organization of production and a trend toward increasing productivity would create a lower demand for labour (unless aggregate demand is expanded), which will be strongly felt when the labour force increases at a fast pace.

Excess Capital

The behaviour of capital input differs widely from the behaviour of labour input. It is more flexible: the economy can increase or decrease investment many times faster than it can change the level of its labour force, employed

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22 The average percentage annual changes in base rates for all agreements covering 500 or more employees (excluding construction) was 6.7 in 1957, 4.0 in 1958, 4.2 in 1959, 4.6 in 1960, 3.5 in 1961, 3.7 in 1962, 3.3 in 1963, 4.9 in 1964, 5.7 in 1965, 8.3 in 1966, 8.7 in 1967, 8.0 in 1968. See Department of Labour, Collective Bargaining Review, Ottawa, No 1, 1969, p. 62.

or not. It is more controllable: investment can be postponed if demand is slack, if the rate of interest is high, if the market expectations are uncertain, while unemployed workers cannot remain without jobs for too long without society being called upon to rally to their support (through social security benefits, welfare payments, retraining programs, etc)[23]. It is differently affected by time: a capital intensive firm has high fixed costs and lower variable costs, while labour requires periodic payments and wage and salary increases.

A firm wants to have a high output-capital coefficient and a high capital-labour ratio. This increases labour productivity, as $\frac{O}{N} = \frac{O}{K}.\frac{K}{N}$. Deepening of capital can be achieved by increasing investment, by decreasing labour, or by both. Technological progress, and the need to be qualitatively competitive, press for capital deepening through a rate of growth in investment higher than in employment. With diminishing returns to scale, and $\frac{\Delta K}{K} > \frac{\Delta N}{N}$, only innovations can give a non-rising capital-output ratio[24], and innovations mean capital investment. Labour unions and social pressures limit the possibilities to reduce labour by firing workers; but it

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23 In both cases, there are costs: idle manpower becomes less efficient, and old machinery produces a less competitive product, because of poor quality, poor performance and want of innovations.

24 Francis M. Bator, "On Capital Productivity, Input Allocation and Growth", in The Quarterly Journal of Economics, Vol. LXXI, No 1, February 1957, p. 95.

is always possible to step up the attrition rate, or to abstain from hiring too many new employees. In any event, while capital deepening is a factor of the formation of excess labour, it is seldom one of excess capital: usually, new investment are made with the expectation that the added capacity will be used.

The formation of excess capital is generally perceived as a change in the output-capital ratio, because less capital suffices to produce the demanded output, and less new investment is needed. When the firm is in equilibrium, it has its highest output-capital ratio (barring changes in the method of production). If it faces or foresees demand pressures, it will invest to meet the actual or anticipated increases in demand. The new investment will take up-to-date technology, and will be more productive, increasing the capital deepening. But if then demand lags, the output-capital ratio will fall, and there will be spare capital.

When this happens, the firm may still want to use its equipment fully, but will accumulate inventories. If the slow-down lasts for an undue period, the firm will try to restore its former position by curtailing investment, by postponing depreciation, and this will raise its output-capital ratio. As labour is costly, the firm will want to keep also its former capital-labour ratio, and vill endeavour to fire or stop hiring labour. When there will be no more surplus

capital, the economy will probably be in the midst of a recession[25]. This will be so, because in order to fully utilize their capital the entrepreneurs would have stopped investing for several years (except possibly in replacement of capital worn and torn), and that lack of investment would have restricted the growth of employment and income. Domar pointed out also the fact that some capital can be unutilized because no new capital is forthcoming[26]. Another cause of stagnation may be what Dehem called "the internalization of external economies and diseconomies"[27], when big producers want to preserve past investments as capital accumulates, and reject innovations (i.e. new investment) that could render their equipment economically obsolete.

During recessions, entrepreneurs would feel more secure, in the sense that they will have a high output-capital coefficient. But they would soon notice that the contraction of demand hurts sales. They will think that times are changing, and will invest to expand, to meet the expected pressures of

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25 $O = \frac{O}{K} \cdot \frac{K}{N} \cdot N$. If demand is expanding, there would be an increase in the output-capital ratio, the capital-labour ratio, and employment. If demand is lagging, the only way to maintain the output-capital ratio (for a good productivity of capital) and the capital-labour ratio (for lower labour costs) is by a decrease in employment as well as in investment, i.e. a recession.

26 E. Domar, "Further Comment...", op.cit., p. 560.

27 R. Dehem, "The Economics...", op.cit., pp. 507-8.

demand, to make use of technological improvements before their competitors. But the required investment, long postponed, will suddenly turn out to be high, because of the need to catch up, and again the output-capital ratio will start falling, because aggregate demand cannot grow as fast as investment can. Excess productive capacity will again have been created[28].

Disguised Excess Resources

Potential inputs equal inputs fully used, plus inputs partly used, plus inputs unused - plus their optimum blend in the output mix that maximizes social welfare. The inputs unused are estimated with the underlying assumption that the necessary demand to employ them can be generated. This hypothesis is hardly calculable when it refers to the creation of new inputs: nobody can say how many immigrants could really have been brought in, how many acres could have been cultivated, how much capital could have been invested in mines or in electronics, how many hours a week workers would have liked

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29 This section did not purport to explain in detail the economics of a cycle, but to give some insights into the formation of excess capital. Other factors may be predominant: faulty government policies, erratic behaviour of investors, misjudgment of the possible demand. Such factors are important in long recessions and in wars.

to work if times had been better. Had a sufficient demand been generated, or appeared to be in the offing, the whole economy would have been changed. A tentative figure could be suggested, taking account of past experience, consistence in the input mix, and the absorptive capacity of the economy, as well as an estimate of whatever excess foreign labour and capital an open economy would have been able to attract. However, if a model is to be utilized, it is worth recalling that Norbert Wiener once "found mathematical sociology and mathematical economics, or econometrics, suffering under a misapprehension of what is the proper use of mathematics in the social sciences"[30]. If data cannot be accurately and validly measured (as in physical sciences), it is difficult to build mathematical models, except for non-quantitative analyses; if quantified results are obtained, they should be relied upon within the limitations of the assumptions, which include the major difficulty of adding together inputs that are different.

Disguised excess resources exist within an economy even with apparent full employment[31]. An input can appear as a used input, but in fact it is only partly used, for sundry

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30 Norbert Wiener, quoted in Richard F. Ericson, "Organizational Cybernetics and Human Values", in Contents, Vol. 13, No 1, March 1970, p. 54.

31 N. K. Tandan, op.cit. See also Thomas Dernburg and Kenneth Strand, "Hidden Unemployment 1953-62: A Quantitative Analysis by Age and Sex", in The American Economic Review, Vol. LVI, No 1, March 1966, pp. 71-95.

reasons. Underemployment of labour is a case. There is underemployment due to misallocation: good wheat land used as pasture land, engineers employed as technicians[32], economists hired as administrators, in short, the implicit costs of inputs utilized that could be better utilized. Some underemployment, or misemployment, or subemployment, might be caused by racial, ethnic or sexual discrimination. A lack of investment in human resources may be responsible for widespread poverty, which has high economic costs.[33]

There is also underemployment due to demand failures. Part-time workers may be willing to work full-time, but there is no need for more production. A small retailer, a fisherman, a farmer, may be at work, but working unwillingly less than he could, because there is no large demand for his output. This is important, because, especially in the case of the self-employed, it does not show in aggregate employment figures. Because of market imperfections, like a restrictive collective agreement, a worker may be kept from seeking a second part-time job. There are potential workers that do not join the labour force, because of lack of job opportunities, lack of

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32 In the United States, there is an excess of scientific researchers because of inadequate funding. In such cases, the issue is one of allocation of scarce resources. See National Goals Research Staff, op.cit., p. 110.

33 See particularly Conseil économique du Canada, Le Coût de la Pauvreté: Certaines considérations et estimations, (mimeographed), Ottawa, November 1969.

adequate training, lack of information about available employment[34]. There could be disguised excess labour even in periods of full employment, if the supply of skills is larger than their specific demand.

Underutilization of capital is also possible. There are machines and structures that could be utilized around the clock. Theoretically, no new investment would be triggered. But the practice of two or three shifts has not a widespread acceptance[35], largely for social reasons. A company would expand in size not because it operates at capacity, but because it cannot find people to work at night, or because operations outside the "normal" schedule are unlawful. Thus, even with a high output-capital ratio, disguised spare capital may exist.

Because of disguised excess resources, the real potential output would often be higher that the apparent potential output, as it would occur also in periods of full resource utilization (as measured conventionally, from periods of full employment or of high output-capital ratios). A change

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34 See Harold Goldstein, On Aspects of Underutilization of Human Resources, in Gerald G. Somers (ed.), The Development and Use of Manpower, Washington, Industrial Relations Research Association, 1968.

35 Labour leader Howard Coughlin suggests that a four-day week (Monday to Thursday for some, Tuesday to Friday for others, Wednesday to Saturday for the remainder), though reducing the amount of hours worked by man, would increase real output by enabling businessmen to operate their capital for a longer time, to cater to more customers during more hours, by giving more time to workers to shop, and by reducing the crowding of public utilities, especially if hours also are made flexible.

in mentalities, in styles of living, in aggregate demand, in specific demand, in managerial rationality, in work and business practices, in government policies, in labour relations, in resource allocation, would bring the economy to higher levels of performance, with the same inputs being just more fully and better utilized.

Management of Supply and Demand

The formation of a gap is largely due to the faulty behaviour of investment (which in turn may be due to inappropriate government policies, shifts in demand, loss of foreign markets, etc). But this need not be necessarily a lack of investment: too much investment may be responsible for the gap in the following years, by decreasing the output-capital ratio and making the economy less efficient, and by creating excess capacity that dampens investment in future years, with shrinking incomes and demand. This challenges the usual treatment of the gap, which assumes that, one way or another, a sufficient demand can be generated. Demand could be augmented by more investment, but this is somehow unrealistic to expect, because entrepreneurs would not increase investment for the sake of aggregate demand maximization when they are daily faced with excess capital.

The demand equation allows for two ways of increasing demand: either investment grows, or the denominator of the multiplier decreases, or both. When there is already spare productive capacity, the only substantial investment would likely be investment in new fields, new production functions, and probably higher in the foreign and governmental sectors than in the private sector. But this affects the multiplier: more private investment means more imports of machinery (in the Canadian context, at least), and more exports also imply more imports, to avoid pressures on the balance-of-payments[36]; more social investment means more taxes; and more investment, in general, requires more saving, which may lead to less consumption and a slackening of demand. All these factors reduce the boosting effect of the multiplier.

Conversely, policies to increase the multiplier are limited: if consumption is expanded in such a way that the saving ratio decreases, the induced investment that is seeked will not be financed; lower taxes would depress the level of government investment (except in the case of deficit financing); a curtailment in imports would lessen the possibilities to trade and to acquire high quality foreign equipment. Economizing

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36 It is useful, however, to expand the foreign trade: even when imports exceed exports, there are benefits (economies of scale, employment, investment, when the export side expands, and benefits from competition when foreign industries enter the market, as well as the known benefits of the international division of labour).

in the public sector, a better import mix with industry less dependent on foreign machinery, a larger share of profits being saved and reinvested[37], would permit some increases in investment without contracting the multiplier. But the range of choice is limited. The biggest potential increase might well be in foreign demand, i.e. exports and foreign investing, within the bounds of an equilibrated balance-of-payments.

Considering the output equation, the conclusions lead similarly to questions of judgment, trade-offs and foreign demand. A high growth rate of labour increases output, but depresses the capital-labour ratio; and entrepreneurs need capital deepening to be more efficient, more competitive, and less vulnerable to increases in payroll expenditures. More investment increase the capital-labour ratio, but depress the crucial output-capital ratio, unless there is a high growth of demand.

The optimum steady growth of output requires investment to increase faster than total employment, and demand more rapidly than investment. Only then would the economy grow without

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37 The trend toward the practice of self-financing in industry has been criticized on the grounds that companies would invest better money bought on the market than money saved from profits. In any event, Canadian statistics indicate that the personal saving ratio increases in periods of high growth; thus, steady growth at high levels is likely to produce enough saving for private financing of the economy. See Dominion Bureau of Statistics, System of National Accounts: National Income and Expenditure Accounts 1926-1968, Ottawa, August 1969, p. 20, p. 22.

the formation of excess inputs. The labour force, because of its biological base, grows rather steadily, and can be controlled with an adequate immigration policy and programmes of improvements of human resources. Consumer demand is also rather steady, and a better programming of public expenditures could be devised. Investment, however, has an erratic behaviour, which affects the aggregate rate of growth. Periods of high levels of investment alternate with periods of low business activity. Large capital investment is needed to maintain and expand income, employment, productive efficiency, living standards, technological progress, economic development; but its substantial fluctuations have snowballing effects that disturb strongly incomes, employment, price levels[38].

The policy inference is that there is a need to control the level and composition of investment; this can be achieved indirectly by sound policies aiming at a steady growth in aggregate demand, and directly through fiscal policies, long-term monetary policies, permits to build, to import, and so forth. A first step, for the policy-makers, would be to gather information on projected capital spending, and to view them on the background of savings and financial resources available and required, and of the needs of the economy. Attention

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38 O. J. Firestone, Canada's Economic Development, 1867-1953, London, Bowes and Bowes, 1958, p. 13.

should be given to the kind of investment: it is known that large-scale investments have a greater effect on growth that many small projects[39], that some sectors are more productive than others, that some areas would benefit more than others from industrial location. The objective is not to put a brake on investment, but it is to have orderly growth without the negative aspects of the stop-go behaviour of investment.

What is needed is a management of supply, in the same sense that there is a management of demand. The ultimate aim is to expand demand at the same rate than supply, and the constraint is that output should increase without periods of excessive investment that produce unneeded capacity, and which are followed by recessions. A management of supply would achieve a working relationship between increases in labour and capital inputs (in quantity and quality), matched with the required demand.

The machinery to manage demand, with its arsenal of direct and indirect controls, is well known[40]. The tools to manage supply are, by and large, the usual growth policies, in a mix consistent with social welfare maximization. The

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39 Organization for Economic Co-operation and Development, Needs in Specialist Personnel for the Preparation and Evaluation of Investment Projects, Paris, 1969, pp. 11-2.

40 See, for instance, Maurice W. Lee, Toward Economic Stability, New York, John Wiley and Sons, Inc., Chapter 2.

social desirability of an investment differs from its private profitability: entrepreneurs do not consider yet the cost of externalities, they view wages as costs while they are benefits to the economy, and so on. But the social profitability of an investment can be estimated by maximizing the output-capital ratio, by considering employment per unit of capital, social marginal productivity, the marginal reinvestment criterion, the marginal contribution to growth, the foreign exchange benefits, the benefit-cost ratio in a social perspective[41]. The social advantages of investing in human capital are self-evident, for the improvement of man is an end in itself. Nonetheless, this improvement can be made within broad considerations that take into account the needs of the economy for people knowledgeable in whatever skills are required, and that consider the opportunity costs of health, retraining, transfer programmes. If it is assumed that people work because they need income, but that they are better off with increased leisure, the management of supply may be such that increases in output and productivity be derived from rising output-capital and capital-labour ratios, allowing for a steady decline in time worked, as people wish it.

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41 Organization for Economic Co-operation and Development, Needs in Specialist Personnel..., op.cit., pp. 76-85.

It is obvious that, mainly because of the characteristics of investment, policies on demand and policies on supply are often a single one. This makes it easier for attempts to avoid the formation of any economic gap, but adds to the burden of government responsibility[42]. For the purpose of analysis, these general considerations should be refined by studies of specific sectors: for example, excess capacity occurs more often in durable than in nondurable goods industries[43], probably because the investment requirements are greater. The study of investment should distinguish among long-term social investment in overhead capital, business investment of immediate effects (machinery ready to be used) and lagged effects (expansion to meet increased demand over many years, or structures that take years to be completed, or research and development). Concerning labour resources, as means are still scarce, it is necessary to estimate and compare the cost and the need for, say, Ph.D. programs or retraining programes, traffic safety or cancer research, and so forth, and the comparative social and economic benefits. Specific regional circumstances also should be considered.

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42 This section shows that, as it is often the case in economics, the variables of gap analysis come to some extent under government control. Therefore, policy implications are naturally the outcome of the theoretical inquiry.

43 This has been, at least, the American experience. See D. Creamer, Recent Changes..., op.cit., pp. 32-3.

CHAPTER 4: A FRAMEWORK OF ANALYSIS

Relevance of Gap Analysis

The study of the gap formation indicates that some signals precede the widening or closing of the gap. They can be identified as changes in the rates of growth of labour and capital, variations in the output-capital and the capital-labour coefficients, and changes in demand (largely embodied in the multiplier and the investment function, but also in the growth rates of the components of GNE)[1]. The relationships among the variables are far from mechanistic. As Keynes put it, entrepreneurs do not make decisions "as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities", but "as a result of animal spirits - of a spontaneous urge to action rather than inaction"[2]. The problem of the economy is that those "animal spirits" are usually unruly, even in a system of bureaucratic large organizations that benefit from technical expertise and financial know-how, and that they get excited or tired at the same moment in a given business community, especially when well integrated.

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1 This list is far from exhaustive. There are signals in the depreciation rate, the level of inventories, the rate of immigration, the interest rate, etc. But these are linked to the major factors and ratios quoted above.

2 John Maynard Keynes, The General Theory of Employment, Interest and Money, London, Macmillan and Co. Ltd, 1964, p. 161.

Keynes' remark illustrates the fact that the economic system is "alive", made up of people that get enthused or depressed, that make mistakes and right decisions, that engage willingly in wrong trades or profitable endeavours, that are stubborn or flexible when faced to changes, that follow economic sense or emotional whims. A smooth, gapless, steadily growing economy might well be an unattainable goal; it even might be argued that, in practice, it would not maximize human happiness. Because entrepreneurs and workers are human beings, and not programmed machines, they lose sometimes in their gambles concerning their professions, their investments, their location, their products, their commercial partners, their governments, their ambitions. Thus, the economy is unlikely to ever work at its potential level.

But even if producers, consumers, governments, were willing to abide by economic laws, it is unlikely that the right decisions would always be made, because there is not enough knowledge available. The best computer, equipped with a sound program, would still be unable to solve the problems of aggregation that impair macroeconomic models: gross figures of manpower and fixed capital investment do not reveal what output can be produced; values in constant money do not account for differences in kind, and tedious figures of physical units, well-nigh impossible to use in practice, would have to be complemented by considerations of psychological motivations and real ability of the workers and salaried. If aggregate

figures are used to calculate the loss of output, either by sophisticated production functions or by a rough method like Okun's or Creamer's, the result would be misleading, for it will not take into account the cost of hiring the unemployed, of reallocating resources, retraining those whose skills are obsolete, improving the health of the sick, educating and moving the poor, nor the financing and the benefits of investment projects required to use the new inputs. The filling of a gap has direct and opportunity costs and benefits, and it is unrealistic to assume that the unused or underused inputs would produce an output similar as the one that an identical amount of used inputs does produce[3].

Little would be achieved by attempting to measure exactly that remote potential level in any year by simple extrapolation of data: the result would not explain the gap, nor would it teach how to avoid further losses in future years. The relevance of economic gap analysis is the identification of sources and areas of waste and failure. The first step consisted in observing how the gap begins at the level of the major inputs[4]. The second step will be to see it develop,

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3 This is not to say that the economic gap cannot be measured. However, its complexity is such that a simple model can only give a rough estimate of its extent.

4 The next two chapters, which deal with conceptual and statistical limitations of gap analysis, will suggest refinements of the approach that is kept as simple as possible in this thesis.

because the GNP gap is not a matter of one year, but of several years, and even longer, if it is considered that the economy has never reached its potential level[5]. To that effect, the framework of economic growth as growth proper, development and progress can be used[6]. This logical treatment will also be in line with the very development of economic analysis, as Hla Myint[7] described it, from the classical concern with resource expansion, to the neoclassical inquiries into the optimum use of inputs, to the modern theorizing on welfare.

Gap in Growth

Unused Resources. Actual output could be increased to a level closer to potential by the sheer injection of more inputs into the economic process. A necessary qualification, however, is needed: under certain circumstances, more inputs mean equal or less output because they are redundant, create bottlenecks, diseconomies of scale. If more demand cannot be generated,

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5 To assume the contrary, that is, that the economy has performed sometimes at its potential level, would mean that at certain times there were no excess resources whatsoever, no misallocation of resources, no market imperfections, no potential benefits from any source, and so forth.

6 This framework is partially borrowed from O. J. Firestone, Industry and Education: A Century of Canadian Development, Ottawa, University of Ottawa Press, 1969, pp. 90-6.

7 Hla Myint, Theories of Welfare Economics, New York, A. M. Kelley, Bookseller, 1965, Chapter 5.

new inputs would become excess inputs. Thus, the closing of a gap requires a mature economy able to create new production functions as new inputs arrive[8].

There is a considerable volume of labour that is not usually put to work. An estimate of it can be given by comparing realized participation rates in areas and periods of strong economic activity, with actual participation rates in the year and area under study[9]. Information about available manpower and jobs can increase employment, especially when job vacancies exceed the number of unemployed; if there is a mismatch between the skills of the unemployed and the jobs available, the government can successfully launch training programs[10], reducing the structural unemployment. There is also the case of the so-called "hardcore unemployed", which have been identified as adult males with a sixth-grade education, a police record, a need for dental work, glasses or medical treatment, various domestic, housing and work-habit

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8 This is not to say that less developed economies have no output gap or should not attempt to close it. On the contrary, the gap is probably larger in such countries. But it requires long-term overall growth policies to deal with it, while in mature and diversified economies the gap is more manageable, even when allowed to expand for several years.

9 For the Canadian case, see Nand K. Tandan, op.cit.

10 In Ontario, 77 % of labour shortages are in fields in which training exists, but employers and unemployed are not aware of that. See G. R. Forsyth and J. R. Nininger, Expanding Employability in Ontario, A Report of the Ontario Economic Council, 1966.

handicaps, and a history of having been routinely screened out in the past by employment offices[11]. Because of government and community pressures, manpower shortages or altruistic reasons, several large corporations (Boeing Co., Eastman Kodak, Westinghouse, Bankers Trust Ltd, General Motors) engaged in programs to hire those "unemployable", with some success. The main difficulty appears to be to motivate the hardcore and to train them in working life behaviour[12]. With adequate measures, the labour force and the level of employment can be successfully expanded, so that even an annual rate of 2 % of unemployment could be feasible.

A considerable boost to production can be given in an expansionary way, by putting to work inputs that already exist. The use of the unemployed labour and the excess industrial capacity speeds up the rate of growth during recoveries, and increases the total ability of the economy to produce goods and services. The determining factor is the activity in the secondary sector, as manufacturing generates the effective demand leading to employment expansion in the tertiary sector[13].

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11 Stephen Habbe, "Hiring the Hardcore Unemployed", in The Conference Board Record, June 1968, pp. 18-22.

12 Leonard Nadler, "Helping the Hard-Core Adjust to the World of Work", in Harvard Business Review, March-April 1970, pp. 117-26. This question of motivation and behaviour is a major factor that determines productivity.

13 Walter Galenson, "Economic Development and the Sectoral Expansion of Employment", in International Labour Review, Vol. LXXXVII, No 6, June 1963, p. 507. An increased output of goods would require added manpower in transportation, storage, wholesale and retail trade, financing, etc.

New Resources. A fuller measure of the gap should include the possibility to create and import new inputs. An open economy may make use of excess labour and capital abroad. This means that the economic gap does not consist only of lost GNP in a closed system, but of lost output because immigrants and foreign capital were not attracted, skilled manpower was not trained, investments were not made.

There are restrictions. Inputs should be created (or imported) in a mutually consistent manner, that is, with proper consideration given to the kinds of skills and kinds of equipment, and the capital-labour ratio. A sudden volume of expansion of any single input would lead to spare resources, unless there was already excess capacity of the other input. Mutually consistent inputs should be consistent with the rest of the economy, so as to avoid industrial crowding in sectors or areas. The absorptive capacity of the economy is to be reckoned with: though managerial skills can be imported or formed, it takes time to expand the commercial and the social infrastructure of a country[14]. Entrepreneurs and employees need some time to evaluate their range of expectations, to

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14 Attempts have been made to establish the limitations in growth, like the capital, the labour, the foreign trade limits. See Hollis B. Chenery, Approaches to Development Planning, in E. A. G. Robinson (ed.), Problems in Economic Development, New York, Macmillan and Co. Ltd, 1965. Such attempted models are mainly analytical, as complex economic relationships cannot be adequately quantified.

get used to a new environment. The import of labour and capital can be limited by social, cultural, political, economic (i.e the balance-of-payments) requirements. But there are also times, especially in younger countries with a "frontier spirit", when the economic units are in a strongly optimistic mood, and when growth can accelerate with large imports of manpower, capital, know-how.

Inputs cannot be doubled or trebled overnight, and the excess resources of the whole world cannot be drained by a single nation. Nonetheless, an allowance must be made for that amount of resources that could have been imported or created without putting undue pressures on the economy. This amount can be estimated by reference to historical periods in which considerable quantities of inputs have been successfully introduced in the economic circuit.

Finally, two areas remain for inquiry. One consists in the Indian and the institutional populations, which are currently left out of the economic inputs, but that could make valuable contributions that would raise the level of social welfare. The other consists in the inputs that are destroyed, but could have been saved with appropriate measures, at least partly: equipment and structures accidentally destroyed, forest fires, traffic casualties, loss of life and limb due to unsafe working environment, disabling or lethal diseases that could have been prevented, and so forth. A more careful

and rational organization of life, production and work has costs, but an economy that had been working at potential could have afforded them. The conclusion is that an economic gap may exist even when all the existing inputs are employed, because of the loss of output that the potential inputs would have produced.

Gap in Development

Fuller Use. Output per unit of input can be increased by a fuller and better use of resources[15]. Lack of full use is difficult to determine, because the increase in output is not proportional to the increase in inputs[16]. An important reason is the kind of input. For example, an extra maintenance worker adds less to production than an extra machine operator, and an uneducated manager is likely to do a poorer job than a competent MBA, and an investment in industrial equipment adds

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15 For a theoretical treatment, see Tibor Scitovsky, Welfare and Competition: The Economics of a Fully Employed Economy, Chicago, Richard D. Irwin, Inc., 1951, Chapter VIII.

16 A methodological inquiry into productivity improvements shows a considerable variety of factors. See J. Vanderheyden, "Operations Productivity Audition", in The Business Quarterly, Spring 1970, Vol. 35, No 1, pp. 38-46. As productivity is influenced by any factor which affects either output or employment, a list of over fifty general, organizational, technical and economic factors is given in International Labour Office, Measuring Labour Productivity, Geneva, 1969, pp. 13-4. For practical views and empirical evidence, refer to the business literature, like Personnel, The Management Review, The Harvard Business Review, The Conference Board Record, Administrative Management, Canadian Personnel and Industrial Relations Journal, various issues, which periodically deal with this problem.

usually more to production than an investment in sanitation, though the latter may be as necessary as the former to ensure an effective functioning of the economic system. Also, at least for the postwar period, immigrants had a higher productivity than native workers[17]. The sluggishness of demand is an important factor, inasmuch that some workers produce less than what they are able to because there is no demand for everything they could produce.

An obvious example of the failure in using fully the inputs is given by the amount of poverty among the employed (poverty of the unemployed is part of the gap in growth). If the poor were better employed, they would have higher revenues, they would buy more goods and services, they would contribute to the public budget instead of living from it. Other indirect losses of output can be attributed to poverty, which are related to the transfer payments of government: society has to support its poor, and this puts a claim on resources that otherwise would have been used to promote more productive and desirable objectives. The cost of poverty has been estimated by the Economic Council at something between $ 922.9 and $ 2199.1 million in 1961[18]. Another example is health. It has

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17 T. A. Wilson and N. H. Lithwick, op.cit., p. 13.

18 The Council compared the potential output of employed, unemployed and non-participant poor, with different assumptions for education, training, experience, employment targets. See Conseil économique du Canada, Le Coût de la Pauvreté, op.cit., pp. 8-11.

been estimated that over one half of the American population had chronic conditions (heart condition, arthritis, rheumatism, orthopedic impairments, nervous disorders, hypertension, visual problems, asthma, hay fever); 17 % of the labour force had a limited activity, and so did half the non-participants (a quarter of which could have been fully employed)[19]. This poor health is most often due to a lack of physical life, lack of adequate treatment, poverty (and malnutrition) and the deterioration of the environment, physically and psychologically (stress, noise, etc).

The underemployment of employed inputs can be estimated in reference to periods of full capacity use, allowing for distortions in comparison due to a different resource mix. But to extrapolate from such years may have an upward bias, because of the effect of the catching-up in the use of inputs. The output-capital, capital-labour and output-labour ratios could serve as broad indicators. The fullest use of an input could be measured with a technological bias: the lost output would be the difference between physically possible production less actual production. Difficult to conceive clearly in the

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19 Carl Rosenfeld and Elizabeth Waldman, "Work Limitation and Chronic Health Problems", in Monthly Labour Review, Vol. 90, No 1, January 1967, pp. 38-41.

capital sector[20], it is a still more imprecise concept in the labour sector: obviously, few people expect labour to work under productivity pressures at all times, till physical exhaustion. Thus, a trade-off between high performance and a more "humane" rhythm of work has to be considered. This is one aspect of the difference between social and economic welfare, which will be discussed later.

This expected productivity level should be applied to the unused but existing resources to arrive at a measure of the gap. But this would affect only actual expansion. A more complete measure of the gap should include the inputs that could have been created, by import or previous investment in human and physical capital[21].

Better Use. A machine can be fully used to produce meatballs, the market for which is saturated, but it could also be used to produce good catfood, an area of shortage. A man can be fully employed as a civil servant, but he could be employed more effectively as a university professor. A management science

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20 As noted in the previous chapters, physical capacity is generally underrated. Furthermore, the possibility of round-the-clock use of capital goods have to be considered.

21 Potential output requires that sufficient demand be generated. It matters, to productivity, whether the extra demand is generated by investment in proper areas, that increase the efficiency through capital deepening and improvement of inputs, or whether it is generated by less taxation or higher wages, which may have inflationary effects.

graduate can be fully employed as a junior executive, but he could be more efficient as a company vice-president. Or viceversa. Even when resources are fully utilized, output could be at a higher level when there is misallocation of resources, underemployment, lack of labour mobility, cartels, a "revised sequence", bureaucratic rigidities, price wars, an inefficient scale of operations.

Lack of a better use of inputs is an important component of the economic gap, and much harder to pinpoint than optimum productivity. It is usually discovered afterwards, when failures become evident or when new ideas, suggestions, lead to economies. The question is: what would the GNP be if all resources were adequately utilized, with the perfect blend of inputs and products?[22] In the absence of an answer, a constant parameter could be considered, derived from a long-run series of improvements in fully employed resources; it would play the role of an increment in productivity.

Here, again, the calculation should be made for existing inputs, and for inputs that would have existed had the decision-makers made the economy run at its welfare-maximizing level for the period in question. Two conceptual

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22 Only then would economic welfare be maximized. For a critical presentation of the optimum conditions of exchange, production, saving and investment, see I. D. M. Little, A Critique of Welfare Economics, London, Oxford University Press, 1960, pp. 130-162.

problems would have to be tackled. The first one concerns measurement: a better use of inputs does not necessarily increase GNP[23]. The second problem concerns identification: who is going to say that somebody could certainly be better employed elsewhere, or that a product has such implicit costs that it should not be produced?[24] As economic gap analysis becomes an inquiry into the economics of welfare, the growth-theory approach is no longer fully adequate.

Gap in Progress

The Meaning of Progress. If the aim of an economic system is to maximize social welfare, and not just production or efficiency, economic progress cannot be left out when examining the GNP gap. Many conceptual and practical problems are then introduced, akin to the difficulties in defining and assessing economic progress.

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23 However, a better use of resources, if only by reducing frustration, would certainly have a positive effect on social welfare.

24 A "test of the market" is not reliable, for the market is not perfect. A promotion or a raise may indicate that a man was not used at his best, and accumulated inventories may indicate that a product was not wanted; but this may also indicate that the man's union was strong, or that the firm's marketing process was faulty. A good may be wanted, like weight-reducing food, which are said by many physicians to be ineffective, but it would still be better to use the resources wasted in producing that food in research on proper weight-reducing diets.

Mere economic growth could be promoted by making the unions more productive-minded, by controlling management so that it concentrates more on expansion and less in prestige or security, by increasing incentives and inequalities, by abolishing taxes on investment, capital gains and profits, by destroying rashly low-productivity sectors, firms and industries, by limiting the growth of services, by promoting a meritocracy[25]. But such a programme would conflict with other social objectives. It is likely that the maximization of economic welfare is not the aim of society[26]. A consequence of this is that GNP is no longer a proper measuring rod, for it deals with goods and services only; even if GNP could measure social costs, it would not provide a measure of psychic income, which is what welfare is about, in a large part.

Automation provides a relevant example of the discrepancy between economic and social welfare. As, for various reasons (i.e. to be up to date, to benefit from innovation, to expand the market, to reduce waste and costs, etc), an industry engages in widespread mechanization, the workers,

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25 T. Wilson, "The Price of Growth", in The Economic Journal, Vol. LXXIII, No 292, December 1963, pp. 610-13.

26 One could define economic welfare so as to assimilate it with social welfare, or one could speak only of welfare or general welfare. For the purpose at hand, social welfare is understood as comprising other elements than choices on goods and services, which are the subject of economic welfare.

primarily as a social response, ask for contractual provisions that will enable them not to suffer from these changes[27]. Several ways are found to promote income and job security[28]. But these ways reduce labour mobility and introduce in the market rigidities and imperfections that "can contribute significantly to economic inefficiency and to the development of a high cost economy"[29].

Social progress and economic progress do not go hand in hand, and it is often necessary to curtail one to expand the other[30]. Insofar as the economic gap is concerned, this means, mainly, that the avoidance of repeated and costly output gaps would allow the economy to afford social progress sooner than otherwise.

The Problem of Leisure. Work is a discommodity[31], in the sense that people prefer not to toil, but do so in order to get income and have a command over goods and services, which are

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27 David Phillips Ross, The Economics of Privately Negotiated Technological Change Provisions, in G. G. Somers (ed.), op.cit.

28 Both are ultimately the same. Thus, seniority, a job security clause, is less emphasized when there is a scheme of income maintenance during lay-offs, an income security clause. This development is normal, as a job is a means to get income.

29 John P. Francis, "Manpower Implications of Technological Change in Canada", in Labor Law Journal, Vol. 14, No 8, August 1963, p. 665.

30 See, for instance, E. J. Mishan, op.cit., as well as some of today's literature on pollution and externalities.

31 See Kenneth E. Boulding, Economic Analysis, New York, Harper and Row, 1955, Chapter 27.

the commodities. A large increase in leisure can be obtained by liberating the non-work obligated time. Household aids, automatic equipment, faster transportation, more rational urban arrangements, less unenjoyable social, religious, political involvements[32], are instrumental in this trend. Yet, ultimately, increases in leisure have to come from decreases in the hours of work, and decreases in the number of people at work (i.e. via longer schooling and earlier retirement). In a sense, there is a loss of output when sons are at universities, wives are at home and parents are retired. But there is a great increase in progress, because there are more people at leisure that can devote their time in building a better life for themselves and for others.

By and large, work is fastidious, unenjoyable, displeasing[33]. In "modern" jobs, as muscular effort disappears, the pressure on psychic energy increases: information, memory, car, attention. This not only makes it more difficult for men to change from the "cerebral" workplace to the "spontaneous" home life[34], but it spoils the enjoyment of leisure, as people

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32 Less involvement increases leisure time, but it may decrease welfare by creating a sense of alienation. See U. S. Department of Health, Education, and Welfare, op.cit., pp. 88-93.

33 See Morvan Lebesque, "Il s'agit du bonheur", in Janus, No 7, 1965, pp. 13-21.

34 Jean Fourastié, "Combien coûteraient les 40 heures", in L'Expansion, No 23, October 1969, p. 86.

approach it in a hectic, compulsive, timed, partitioned, too rational way. As leisure becomes more accessible, work becomes an undesirable burden. It not only lacks meaning for the common workers[35], but also for the professional employees[36]. In this perspective, for social progress to advance, not only leisure should increase, but work should decrease.

Leisure brings down the volume of labour inputs, but it also depresses the level of productivity[37]. Less output per time means working in a more relaxing way. Long coffee breaks, a slow pace of toil, better working conditions, flexibility in the schedule, more expenditures in the environment and in aesthetic improvements, and people are (hopefully) happier. But efficiency does not necessarily increase, and the economic gap in output terms widens.

Over the long term, leisure is a dominant feature in growth. In Canada, over the period 1926 to 1961, 39.4 % of productivity gains have been allocated to voluntary leisure,

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35 Robert Dubin, Industrial Worker's World: A Study of the "Central Life Interest" of Industrial Workers, in Erwin O. Smigel (ed.), Work and Leisure, New Haven, College and University Press, 1963.

36 This is already a noticeable trend. See Robin Barlow, Motivation of the Affluent, in G. G. Somers, op.cit., pp. 236-43.

37 A decrease in hours worked improved productivity when labourers toiled for hours so long that they became tired, unhealthy, frustrated. This is no longer the case in most industries. See Georges Desgagnes, Implications économiques d'une Réduction des Heures de Travail, an M. A. thesis (microfilmed), Quebec, Université Laval, July 1967, pp. 24-36.

while the average annual hours of work declined by a yearly - 0.80 %[38]. However, even when the scheduled work time remains stable, there is increased leisure in the expansion of vacations, rest periods, statutory holidays, unjustified sick leave and personal leave, which together in 1967 cost 11.57 % of the payroll[39]. There is a continuous pressure to increase the paid time that is not worked. In today's Canada, much progress can be reaped as leisure from the reduction of non-work non-leisure time, and it seems that people feel that time is not ripe for outright widespread leisure: the work week remains relatively long, the participation rate in the labour force is increasing, and there are complaints that the average income does not suffice to keep out from the constant need of maintaining what people consider an acceptable standard of living. Besides, leisure implies high public and private expenditures in appropriate infrastructures. But if there was no output gap, society would be able to afford more leisure sooner, as more goods and services would be available, and less resources "wasted" in fighting poverty or unemployment.

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38 T. M. Brown, op.cit., pp. 98, 84.

39 The Thorne Group Ltd, Fringe Benefit Cost in Canada (1967), Toronto, 1968, pp. 5-6.

The implication for theory is that leisure has to be considered apart from the gaps in growth and development, as an element of the gap in progress. Morgan suggested a rough measure of well-offness as enjoyed leisure per family, by taking 24 hours, less 12 hours for sleeping and self-maintenance, less work time, less time unenjoyable (illness, unemployment, etc), divided by the number of adults[40]. In practice, the conceptual framework of leisure and progress does not appear to be refined enough to provide adequate basis for measurement.

The Issue of Social Costs. In a challenging article[41], Scitovsky argued that to be money-minded helps growth, because this mood permits a more rational behaviour of sellers and buyers, greater mobility (as jobs and locations are linked to monetary rewards), it forces the manufacturers to adapt to consumer's standards (price) rather than their own (craft, quality); in short, money, as a measure of society's valuation, allows for a good interaction of individual valuations. But this, says Scitovsky, has also drawbacks: money measures things that

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40 James N. Morgan, "The Supply of Effort, the Measurement of Well-being, and the Dynamics of Improvement", in The American Economic Review, Papers and Proceedings, Vol. LVIII, No 2, May 1968, p. 35.

41 Tibor Scitovsky, "External Diseconomies in the Modern Economy", in The Western Economic Journal, Vol. IV, No 3, Summer 1966, pp. 197-202.

should not be measured, and man neglects values other than those money can express. As a result, there is a tendency to undervalue costs and benefits not measurable in money or simply not disbursed.

Since Pigou's inquiries in marginal social product analysis, and mostly within the neo-classical framework of Walras, Pareto and Marshall, economists like Bator, Bergson, Kaldor, Scitovsky, made some breakthroughs in this field[42]. Yet, their effort aimed at a better distribution of costs, as they were reluctant to engage in normative economics[43]. It was left to non-economists to challenge, in the name of human progress, the abuses in "growthmanship"[44]. Lately, however, following Mishan, Rostow, Galbraith and others[45], economists regained interest in the question of the opportunity costs of output. Most of the recent work on the subject concentrated on pollution as a model of externalities, though this is by no means the only case of diseconomies.

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42 See Hla Myint, op.cit., and I. D. M. Little, op.cit.

43 See Ronald Coase, The Problem of Social Cost, in William Breit and Harold M. Hochman (eds.), Readings in Microeconomics, New York, Rinehart and Winston, Inc., 1968. Coase stands as an example of this approach.

44 Per example Vance Packard, The Waste Makers, New York, Pocket Books, Inc., 1965.

45 E. J. Mishan, op.cit.; John Kenneth Galbraith, The Affluent Society, New York, Mentor Book, 1958; W. W. Rostow, with his view of a "sixth stage of growth" which would be characterized by the "search for quality".

Garbage and solid waste affect waters, soils and air. Sewage and solid waste pollute lakes, streams and rivers. Air pollution damages crops, livestock, rubber, textile fibers, it corrodes metals, attacks and soils most subtances, and damages health. Traffic problems provoke accidents, noise, frustration, death. If the polluters were obliged to pay for their damages[46], GNP would increase. Besides, by including external costs, GNP would measure more accurately economic reality. But the question is not, in terms of social progress, to obtain such payment: it is to reduce pollution and waste as much as feasible. To illustrate: a bush fire provides jobs to firefighters, but it would have been better to have no fire; cars have a strong economic importance, but their externalities (noise, pollution, accidents, frustration) are such that it may be worthwhile investigating whether a different urban arrangement could reduce their use and importance; air pollution may hasten the rate of obsolescence of a building and increase the rate of replacement investment, but it would have been better that the building did not deteriorate, and that the investment had been directed elsewhere.

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46 See, for instance, Norman F. Ramsey, "We Need a Pollution Tax", in Science and Public Affairs, Bulletin of Atomic Scientists, Vol. XXVI, No 4, April 1970, pp. 3-5. He suggests that a national tax on pollution should be devised so as to discourage pollution and provide money to improve and clean up the environment and to subsidize research on the matter.

With the same technology, the higher the level of output, the larger the externalities. The use of energy leaves residuals: ash, flyash, sulfur dioxide, carbon monoxide, etc. Production adds more: slag, particulates, inorganic wastes, processing losses, chemicals dissipated (cleaners, bleachers, antifreeze, etc), scrap, waste paper, demolition wastes, etc. Ayres and Kneese point out that consumption goods are not totally consumed, but leave residuals: garbage, trash, junk, sewage, etc[47]. They suggest that waste disposal should be made an integral part of production and consumption, and placed within the framework of general equilibrium analysis[48]. The problem can have different solutions[49]. Taxes or price increases to cover waste disposal may equate social cost to private cost, bringing closer together social and economic welfare. They can also serve to ration things and show where the need is greater. They can even put out of business inefficient firms. But pollution can also be viewed as a social overhead cost: polluters should then not be individually penalized, as their activity, though entailing social costs, is beneficial to the whole society[50].

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47 Robert U. Ayres and Allen V. Kneese, "Production, Consumption and Externalities", in The American Economic Review, Vol. LIX, No 3, June 1969, pp. 284-85.

48 Ibidem, pp. 291-95.

49 For a discussion of alternative means of pollution control, see National Goals Research Staff, op.cit., pp. 75-6.

50 See Stefan Valavanis, "Traffic Safety from an Economist's Point of View", in The Quarterly Journal of Economics, Vol. LXXII, No 4, November 1958, pp. 479-83.

At this level, the analysis of the economic gap bridges economic growth with welfare economics, and even with statemanship. The field is rather new, and it involves as a prerequisite some quantification of social indicators[51]. A tentative conclusion is that a lesser gap would have permitted society to afford, say, anti-pollution measures sooner. The main conclusion, though, would be to point out the need to estimate whether the foregone growth, in a given mix, would have decreased or increased social welfare.

The Question of Change. Leisure is but one aspect of progress. The problem of externalities can be solved. There can be substantial progress without any increase in growth, productivity or leisure, but with a change. The essence of economic progress is change (change in consumer tastes, industrial location, regional activity, sectoral distribution, methods of production, etc); Lithwick even suggested that barriers to

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51 See above, pp. 48-51. A matrix of goals and activities has been formulated by Terleckyj, with the purpose of measuring social change. See Nestor E. Terleckyj, "Measuring Progress Towards Social Goals: Some Possibilities at National and Local Levels", in Management Science, Vol. 16, No 12, August 1970, pp. B-765-78. With the assumption that ends are discovered as means are evaluated and used, Hoffenberg suggests that an overt introduction of goals and values is not necessary. A non-normative approach is then possible: instead of measuring goals, social indicators would be used within a "science of muddling through", which is not in need of any consensus. See Marvin Hoffenberg, "Comment on 'Measuring Progress Towards Social Goals: Some Possibilities at National and Local Levels'", in Ibidem, pp.B-779-83.

change be considered as social costs[52]. The government invests less in defense and more in national parks, with no increase in disposable income, and people are happier (provided there is no war forthcoming, of course). A company produces better razor blades, at the same cost, with the same capital and labour, and people are happier. A high quality movie may cost the same than a bad one, but people are happier when watching it.

One part of the problem is related to the quality of the goods. There is a relative lack of quality in many goods and services. In goods, this ranges from television sets to heart pacemakers, from cheap products to luxury items, from cars to pipes[53]. This is not only due to efforts to keep costs and prices low, nor to frequent model changes, but to lack of quality controls. In services, the picture is modified. Except in those services that can be easily mechanized (i.e. transportation, utilities, some trade and finance), a better quality service means more time-consuming personal relations between buyer and seller, that is, more inputs for equal output. In other words, better services depress productivity in the

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52 N. H. Lithwick, Labour, Capital and Growth: The Canadian Experience, in T. N. Brewis et al (eds.), Growth..., op.cit., pp. IV-15-6.

53 See "La Révolte des Consommateurs", in L'Expansion, No 23, October 1969, pp. 177-8, from an article in The Wall Street Journal. Quality is relative. Sometimes poor quality means that the goods are badly manufactured; in other cases, it may mean that consumers are more difficult to please.

tertiary sector. Another part of the problem relates to the conditions of change one step further, when all goods and services are already of good quality. Within the same limitations of GNP, GNE and their components, the mix of inputs and outputs can vary. Other books can be published, other labour can be employed (i.e. more women and less elder people), other means of transportation and distribution can be devised.

Such changes in output do not imply a better use of resources, nor a fuller one, nor more inputs, but a change that increases social welfare, and this is a crucial element of progress. Yet, like leisure, it is an element difficult to deal with. It is probable, to be optimistic, that a higher rate of growth would spur change, but it is not necessarily so.

As it was noted, welfare economics permeates modern thinking in growth theory. What was refered to in the abstract framework of the optimum conditions of production and exchange, is now discussed in terms of aesthetics and morals. Galbraith suggests that public and private investment should be directed towards improving the environment[54]. Rostow envisions a sixth stage of economic growth, in which people would not be concerned with growth per se, but with ameliorating the quality

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54 John Kenneth Galbraith, The New Industrial State, Boston, Houghton Mifflin Co., 1967, Chapter 20: Further Dimensions.

of living[55]. There is no easy way to adapt conventional economics to these kinds of problems: new conceptual and statistical tools have to be devised. Already in 1936, Chamberlin proposed that product changes, and changes in the product, be considered in economic analysis, besides price and quality changes[56]. Little has been done on this problem, except maybe in the study of price indexes and productivity measurements[57].

A great deal of research is needed in the field of economic progress. Until more is known about it, only tentative and inadequate models of the economic gap can be formulated. But considering that growth is a prerequisite for progress, that people have to be well off to afford to be well off differently, unachieved growth is a sign of unachieved progress.

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55 Walt W. Rostow, public conference, University of Ottawa, fall 1969.

56 Edward H. Chamberlin, "The Product as an Economic Variable", in The Quarterly Journal of Economics, Vol. LXVII, No 1, February 1953, pp. 1-29.

57 "Higher quality that comes cost free does not require more resources, and in this sense is not really measurable in economic terms", says William I. Abraham, National Income and Economic Accounting, Englewood Cliffs, Prentice-Hall, Inc., 1969, p. 125. See pp. 123-6 for a critical treatment of the shortcomings in measuring quality changes and new products in "real" terms.

CHAPTER 5: REQUIREMENTS OF A MODEL

The Use of a Model

A model can be built out of a theoretical or an empirical abstraction from the real world, a logical argument, and testing. In theory, it is possible to define optimum proportionality of factors, turnpike theorems, golden-age growth paths, Golden Rule Paths, optimum saving and capital-output ratios[1]. Econometric models cannot account, however, for the totality of the exogeneous factors that have a decisive influence on the economy, nor for their interrelationships. A model should therefore be used within a given set of assumptions, which hopefully account for the more significant trends outside the variables of the model. Growth is acknowledged as deriving from resource outlays, that is, labour and capital, and from a large residual which is called technology by Holmes[2], structural change by Lithwick[3], productivity by the Economic Council[4], and which includes all

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1 See T. M. Brown, op.cit., pp. 21-31.

2 R. A. Holmes, "Factor Inputs, Technological Progress, and Economic Growth in Canada", in The Western Economic Journal, Vol. IV, No 3, Summer 1966, p. 250.

3 N. H. Lithwick, Labour..., op.cit., pp. IV-13-5.

4 Conseil économique du Canada, Sixième exposé..., op.cit., p. 15. As Denison has shown, this residual can be still subdivided in other components.

these causes. Such a rough explanation of the growth process disguises the fact that the workings of a developing economy are not perfectly understood. Nevertheless, the use of a limited and quantified model appears to be warranted, as long as its assumptions and the sources and reliability of its data are clearly stated.

Climatic and geographic sources of growth should not be disregarded. The effect of the institutional framework in which economic agents operate has to be considered. Attitudes cannot be deemed constant, especially when it is known how they affect labour productivity, demand, and, more important, the propensity to invest (as well as, sometimes, government policies). The trends in consumer demand, in public expenditures, in fixed capital accumulation, provide essential insights into the causes of growth and stagnation. The development of management sciences, of economic understanding, the availability and utilization of inventions, the strength of entrepreneurship, the political conditions, determine economic trends and performances. Clearly, it would be erroneous to assess potential output without considering these factors. And, as they change, different assumptions ought to be made for the measurement of every economic gap[5].

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5 The low rate of increase in investment in 1960 was probably due to poor expectations, while that rate was low in 1967 because of the high level of investment in the three previous years. Depending on the case, the "solution" of the gap may be given by expanding capital investment, or public expenditures, or the participation rate, etc.

Most estimates of potential output indicate that the optimal growth rate in Canada is in the order of 5.00 % per annum[6]. This may be explained by the similar limited framework of analysis adopted by economists who concentrated on Cobb-Douglas production functions, extrapolations from years of full employment, long-term estimates of productivity. An approach of a wider scope, which encompasses the multiple ways in which resources are not utilized at their best, is likely to arrive at different answers.

Remarks on the National Accounts

The National Income and Expenditure Accounts provide a unified system of concepts and statistics, and, on this count, they represent a meaningful body of data which facilitate the study of economic behaviour. As comprehensive as they are, the Accounts have limitations that bear on the analysis of the output gap. Even in their revised form, they do not measure adequately the productive contribution of government and nonprofit institutions; they omit internal

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6 See T. M. Brown, op.cit., p. 93, and T. A. Wilson and N. H. Lithwick, op.cit., p. 217. The annual compound growth rate of GNE in constant (1961) dollars was 4.2 % for the period 1926-1968, and 5.1 % for 1948-1968. See Dominion Bureau of Statistics, System of..., op.cit.

activities of the household[7]; they do not consider the negative externalities of growth[8]; they do not measure intangibles like the accumulation of knowledge, disamenities, improvements in welfare[9]; they treat research and development as intermediate goods and services; they do not show in constant prices losses or gains from changes in the terms of trade[10]; they do not measure the effect of government policies that do not entail outlays[11]; they do not indicate what more and better know-how adds to the value of old investment goods; they do not measure the effect of a rising level of exports on economies of scale; and so forth. The treatment of self-paid workers is unsatisfactory. Price indexes have an amount of subjective judgment and relativity, and comparisons "in real terms" are biased when the product or its quality change. Gross National Product statistics are estimates, subject to

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7 See Paul Studenski, The Income of Nations, Part Two: Theory and Methodology, New York, New York University Press, 1958, pp. 15-28.

8 For example, the effect of industrial production on air pollution, depletion of assets, deterioration of the environment, and so on.

9 In a "perverse" but logical way, the social cost of, say, a larger police force to fight a rising crime rate, adds to the measured level of GNP.

10 See Organization for Economic Development and Co-operation, "A New System of National Accounts", in OECD Observer, February 1970, p. 30.

11 O. J. Firestone, Canada's..., op.cit., p. 131.

error and constant revisions[12]. Finally, they measure increases in output, not in welfare, and it is a "heroic" assumption for the model to state the equality of both concepts.

Data on labour force, employment and unemployment are gathered by 600 enumerators that interview some 35,000 households in Canada, which makes a relatively low sampling ratio: 0.67 % of the total population. The standard deviation, or risk of error, becomes the larger the more sophisticated the field of inquiry is. The reliability of the results depends on sampling theory, available funds, administrative convenience, nearness of a census, statistical expertise, soundness of judgment, weighting factors, quality of the questionnaire[13]. Nevertheless, the Labour Force Survey is the best currently

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12 The equality of GNP and GNE provides a self-checking system. The degree of inaccuracy, measured by the residual error of estimate, was 2.70 % in 1926, 1.40 % in 1936, 0.67 % in 1946, 0.60 % in 1956, 0.13 % in 1966, and 1.33 % in 1969. Many of the figures of the National Accounts are extrapolated, derived from miscellaneous data, "guesstimated", or are residuals, which are revised as better information becomes available. The figures for 1967 and 1968, published in 1969 (Dominion Bureau of Statistics, System of National Accounts, op.cit.), have been revised in 1970 (See the DBS Daily, Tuesday, May 26, 1970, pp. 4-10).

13 Dominion Bureau of Statistics, Canada Labour Force Survey, Methodology, (71-504), Ottawa, 1965, pp. 31-2.

available source of information on the labour force[14]. However, as its scope is limited, the investigator has to rely for specific measurements on miscellaneous research works.

Estimates of capital flow and stock in constant dollars are often ambiguous and not totally reliable[15]. For the purpose at hand, figures on fixed capital formation do not distinguish social overhead capital from other investment, and, more important, they do not say whether an investment is adding to capacity, is replacing obsolete equipment, or is embellishing the environment.

Monetary figures on productive capacity may be misleading, because more or less intensive use of capital affects its capacity and not its value; physical units could theoretically be used, but this proves most difficult in practice[16]. Consumption (hence the level of saving) is not only a function

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14 The 1961 Census results have been compared to the Labour Force Survey. Adjusting for the time of the Survey, the Census produced a figure of 251,000 "persons looking for work", while the Survey gave a figure of 400,000 "unemployed". However, careful methodological study indicates that the Survey's data may be more accurate, as the Census' procedure tended to overestimate the number of employed. See Sylvia Ostry, Unemployment in Canada, Ottawa, DBS, 1968, Appendix A, pp. 71-76. The same study reveals that the Survey has an 8 % range of random variability, which is said to be acceptable, and a sign that no hidden bias or distortion exists in the design of the Survey.

15 Dominion Bureau of Statistics, Fixed Capital Flows and Stocks, Manufacturing, Canada 1926-1960, Methodology, (13-522), Ottawa, February 1967, p. 41.

16 E. F. Beach, "A Measurement of the Productive Capacity of Wealth", in Canadian Journal of Economics and Political Science, November 1941, pp. 543-4. Colloquially, the question is whether money values permit to add "apples and oranges" meaningfully.

of income, or of a rise in income, but of wealth[17]. Likewise, the decision to invest is partly a function of the capacity of the stock of capital. But there are few data available on wealth, and the estimates of capital stock are unsatisfactory[18]. The "average economic life" and the "straight-line depreciation" are not accurately measured, and weaken the whole "perpetual inventory method".

Net fixed capital formation equals gross fixed investment less depreciation. But gross fixed capital formation less capital consumption allowances and miscellaneous valuation adjustments does not equal net fixed capital formation[19]. The figures given in the National Accounts include depreciation, plus capital outlay charged to current expense, less non-capital

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17 Thomas F. Dernburg and Duncan M. McDougall, Macro-Economics, New York, McGraw-Hill, Inc., 1960, pp. 294-6.

18 This can be shown by a comparison of fixed capital stock estimates, end-year net stock, manufacturing and construction. Source: DBS, Fixed Capital..., op.cit., p. 131.

Estimate:	Lithwick	Hood-Scott	DBS-I	DBS-III	DBS-V
Capital stock in 1937:	2211	1877	2010	2310	1643
Excess of larger estimate over the others:	4.4 %	23.0 %	14.9 %	----	40.5 %
Capital stock in 1950:	2488	2652	2645	3052	2176
Excess of larger estimate over the others:	22.7 %	15.0 %	15.4 %	----	40.2 %
Total increase of the stock:	12.5 %	41.28 %	31.5 %	32.1 %	32.4 %

The discrepancies arise because different estimates of the life span of the capital goods are taken.

19 Dominion Bureau of Statistics, National Accounts, Income and Expenditure, 1926-1956, (13-502), Ottawa, 1957, p. 111.

outlays charged to capital account, plus claim portion of business and residential insurance, plus scrap and salvage allowance, plus amortization, development, write-offs, deferred maintenance, and miscellaneous charges to reserves, plus bad debt allowances[20]. In fact, even capital consumption allowances alone sometimes overstate or understate actual depreciation[21], so that the real extent of wear and tear of capital goods in the economy is not known. Furthermore, figures on capital consumption are not given in constant dollars. As capital consumption allowances aim at reporting wear and tear and economic obsolescence, but not willful loss nor accidental destruction, and as the technical efficiency of a capital good is likely to decline less than its market value, it might be better to use gross figures to estimate the rate of utilization of capacity[22].

Despite these deficiencies, the use of National Accounts and related statistics is warranted by the advantages of remaining within the same framework of measurement. In this

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20 DBS, National Accounts..., op.cit., pp. 111-3. To illustrate: capital consumption allowances and miscellaneous valuation adjustments for the years 1956, 1961 and 1966 were $ 4020, $ 5182 and $ 7414 million; by excluding insurance claims and stock and bond commissions, these figures become: $ 3894, $ 5000 and $ 7094 million. Source: data made available by the National Accounts Division of the DBS.

21 O. J. Firestone, Canada's..., op.cit., p. 98.

22 DBS, Fixed Capital..., op.cit., pp. 9, 12.

system, several aggregate figures are available: gross national product, net national income, gross domestic product, gross national expenditure, the consolidated accounts, and so forth. The benefits from using deflated figures, even though the deflation procedures are not always satisfactory, are such that GNE will be the usually employed concept in this analysis. GNE proves most useful because it represents demand, and demand is the determinant of actual growth and, indirectly, of potential growth. Besides, it equals GNP. In any case, it is always possible to transform one aggregate into another[23].

A Proposed Model of the Gap

The preceding chapters described the formation of an economic gap and analyzed it at three levels: as a gap in growth, as a gap in development, and as a gap in progress. The gap in growth could be closed by putting to work the unused resources, and by bringing new inputs in the economic process. The gap in development, which amounts to a gap in productivity, depends on the feasibilities of improving the efficiency of the inputs and of making a better use of them. The gap in progress, which is a complex concept, refers to trends in leisure, to social costs of growth, to externalities, and to changes that add to the welfare of people.

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23 Economic Council of Canada, Fourth Annual Review, op.cit., p. 90.

The economic gap equals potential output less actual output. As, for the purpose at hand, actual output means real GNE, a measure of potential output would implicitly give the size of the economic gap. Potential output could be estimated by the use of the supply equation previously introduced:[24] $O = \frac{O}{I}.\frac{I}{N}.N$. If k represents the output-capital ratio, and l stands for the capital-labour ratio, the equation can be written as $O = k.l.N$.

N equals actually employed labour. Potential N, or N', equals (1) actually employed labour, plus (2) the people that do not but would participate in the labour force if their work ability was demanded, plus (3) the foreigners that would have come in Canada if there had been an incentive or a lack of restriction on immigration, plus (4) eventually part of the institutional population, plus (5) possibly a "reasonable" number of people that have died by illness or accident and whose death could have been avoided[25]. An estimate of the potential output is then given by $O = k.l.N'$.

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24 See above, pp. 71-2.

25 See above, pp. 103-04. These are largely matters of judgment. As more elements of the gap are introduced into the model, the certainty of the final measurement diminishes.

In this equation, k and l are fixed. It could be assumed that the utilization of unused capacity, the new national and foreign investment, and to some extent the avoidance of accidental loss of assets, would maintain the output-capital and the capital-labour coefficients at their actual level in any year[26]. But if there is a gap in development, and an increase in productivity is expected, the following equation could be used: $\frac{O}{N} = \frac{O}{I}.\frac{I}{N} = k.l$. Whether capital becomes more productive, or there is a capital deepening, $\frac{O}{N}$ would rise. An estimate of potential output would then be given by $O = k'.l'.N'$.

A more comprehensive measurement of the gap would refer to some consequences of an expansion in the use of inputs, in production, in consumption, in income. Thus, an increase in income would affect the demand for leisure-oriented goods and services and for time to enjoy them, and possibly productivity and the sectoral structure of the economy. The participation rate could increase, as married women enter the buoyant job market to supplement their husband's income[27], but it could also decrease, as husbands take an increase in

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26 Such a development is likely, for the expansion of employment and income would increase savings, hence investment, and favour induce investment, while the performance of the economy would attract foreign capital.

27 Part of this increase might be in part-time work, which would depress the output per employed person figures, if not the output per hour worked figures.

pay as an occasion to take their working wife off the labour force. An increase in industrial production would affect actual and potential inputs as well as social welfare, through what Mishan has called the "spillover effects" of growth[28]. The limits of this work make it impossible to include such complex, controversial and imperfectly analyzed relationships in a simple model. Some have been discussed, though briefly, in the section dealing with the gap in progress[29], and will be mentioned as ways to widen the model. The purpose of this chapter is to explain the model just sketched, to describe the assumptions that restrict its scope, and to discusss the quality of the concepts and statistics that underlay it.

Supply Gap and Demand Gap

Growth is the outcome of interplay between aggregate supply and aggregate demand. The economic gap can be rooted in either side: actual supply may be smaller than potential supply, and actual demand may be smaller than potential demand. A proper management of supply would bring supply to its potential level, and a proper management of demand would raise demand

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28 E. J. Mishan, op.cit. He refers to externalities of production.

29 See above, pp. 109-122.

likewise. There would be a structural gap if bottlenecks existed in the supply side[30].

It is sometimes difficult to identify the sources of the gap. There are data problems: no statistics are gathered, in Canada, on industrial capacity, or on job vacancies[31]. Such statistics would be important in gap analysis. There are also conceptual problems. The state and kind of the inputs should be investigated. It would seem justified to concentrate on capital, which is more meaningful than labour as a determinant of output: it has known (though imprecise) income effects with the multiplier, and, if idle, it limits investment, while unemployment has lagged, diffused, complex effects on labour force growth[32]. But this could be ambiguous, for new capital can have small income effects and large capacity-creating effects, in the case of automated equipment; or it can have large income effects and small capacity-creating effects, in the case of aesthetic or replacement investment. To concentrate on manpower would be justified when considering potential output as the one that maximizes social welfare, but the

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30 To illustrate: job vacancies may equal the number of unemployed, but differences in skills, problems of mobility, restrictive union or management practices, may make the unemployed not employable in these jobs, with no possible matching of all job applicants with job opportunities.

31 In 1965-1969, job vacancies exceeded unemployment in Sweden, U. S. (except in 1965), U. K. (except in 1967-68-69), Germany (except in 1969) and Netherlands (except in 1967-68); unemployment exceeded vacancies in France, Austria, Norway. No data exist for Canada, Japan, Belgium, Denmark. See OCDE, Main Economic Indicators, November 1969.

32 Evsey Domar, "Comment", op.cit., p. 559.

amount of institutional, emotional, cultural factors that determine labour and its output would cast many shadows of doubt over the results[33]. A conclusion of Denison's work is that increases in growth come from over thirty different sources, each calling for a specific analysis[34].

The output of a given blend of inputs would vary with the type and extent of disturbances, the amount of research and scientific work, the size of financial resources, the state of experience and confidence[35]. Due to a better knowledge and also government influence, says Burns, "the economy no longer runs a free course"[36]. The business cycle is the aggregate outcome of different series (i.e. income, employment, prices, imports, profits, bonds, bankrupcies, etc) that move differently, affect each other, and are interfered with. On one hand, this makes forecasting difficult, and is of relevance when gap analysis is concerned with future potential. On the other hand, it indicates that an assessment of the extent of a supply gap on the basis of the two major inputs requires a definite assumption regarding productivity.

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33 Hamberg's model, which attempts to link increases in labour with increases in capital, is of little use in practical analysis. See D. Hamberg, op.cit. For the period 1948-1968, the coefficient of correlation between increases in capital and increases in GNP is 0.5775, and it is 0.5318 between increases in employment and increases in GNP. This means that 33.35 % of the increase in GNP can be attributed to increased capital, and 28.28 % to increased employment. See Appendix A.

34 See above, pp. 40-42.

35 O. J. Firestone, Growth..., op.cit., pp. 112-3.

36 Arthur F. Burns, The Business Cycle in a Changing World, New York. National Bureau of Economic Research, 1969, p. 119.

A decline in the rate of growth of output reduces employment and productivity[37]. A low level of aggregate demand affects all sources of growth: labour, technology, innovations, and especially capital formation[38]. A lack of investment opportunities in regard to saving further aggravates the failure of demand[39]. In Canada, together with inappropriate government policies, the recurrent problem is one of inadequate demand[40].

Viewed over the short term, the economic gap can be supply-induced. It would be both tedious and unfruitful to make a gap model dependent upon all the miscellaneous causes that provoke a structural gap. For the sake of simplicity, and on the basis of the evidence just quoted, it appears that a more general assumption can be made, valid for the long term but also for shorter periods, linking the economic gap mainly to demand. The assumption is as follows: a proper[41] expansion of demand should be enough to bring into existence a full use

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37 This question will be discussed later in Chapter 6.

38 T. A. Wilson and N. H. Lithwick, op.cit., pp. 160-7.

39 T. M. Brown, op.cit., p. 46.

40 A. M. C. Waterman, op.cit., p. 44. These inappropriate policies range from sudden ill-timed changes in public expenditures, to anti-inflationary demand-reducing policies in periods when the level of unemployment and the size of inventories, among other signs, do not indicate excess demand, but rather the contrary.

41 By "proper" it is meant an expansion of demand that is related to growth factors, like investment, rather than short-live and possibly inflationary expansion of consumer demand.

of inputs, in the best way possible, that is, in a way that produces an output which maximizes social welfare. Whatever the origin of the gap, it is then assumed that a "proper" expansion of demand would have kept it from occuring. To quote Wilson and Lithwick: "the most important prerequisite for the realization of the buoyant growth prospects of the Canadian economy is a strong and steady rate of growth of aggregate demand"[42].

The Structure of the Economy

Some economists, like Okun, analyze the gap by viewing the economy as a whole[43]. Others divide total output into sectors. B. J. Drabble uses agriculture, public administration and community services, and commercial nonagricultural economy[44]. Wilson and Lithwick divide output into governmental, agricultural and non-farm non-residential sectors, and residential-rent industry[45]. Elliott-Jones considers the farm,

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42 T. A. Wilson and N. H. Lithwick, op.cit., p. 225. Myrdal argued that the specific demand of programs dealing the the unmet needs of the poor and unfavoured, in the United States, would suffice to spur the American growth rate. See Gunnar Myrdal, Challenge to Affluence, New York, Vintage Book, 1965.

43 See A. M. Okun, op.cit.

44 B. J. Drabble, op.cit., pp. 6-7.

45 T. A. Wilson and N. H. Lithwick, op.cit., pp. 28-9.

private nonfarm, and government sectors[46]. Such breakdowns are useful when estimating potential output, for sectors and industries differ in their labour trends, type of employment, productivity, capital-output ratio and capital deepening.

The main structural changes in Canada are as follows: there is a decline in agricultural production and a rise in personal, community and business services as a proportion of total output[47], and there is a shift of employment from goods-producing to service-producing industries[48]. Each sector of the economy has a specific production function. Output would not be the same if the unused resources are directed, say, towards mining, public service, or textiles[49]. There would be input-output effects: an expansion in services is likely to increase the non-residential construction industry and add

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46 M. F. Elliott-Jones, op.cit., pp. 43-4.

47 As a percentage of GDP, primary industries declined from 23.5 % in 1926 to 9.1 % in 1968, while community, business and personal services, which were 12.12 % in 1926, rose from 9.3 % in 1941 to 17.6 % in 1968. Secondary industries oscilate around 30.75 %, goods-related services around 34.34 %, and public administration and defense around 6.91 %. Source: National Accounts.

48 See Special Committee of the Senate on Manpower and Employment, Report, Ottawa, Queen's Printer, 1961, pp. 47-8. Employment in trade and Services was 14.9 % in 1881, 22.2 % in 1901, 25.5 % in 1921, 27.0 % in 1941, 30.9 % in 1951. See J. M. Smith, Canadian..., op.cit., p. 13. Employment in all service-producing industries was 56.3 % in 1963 and 60.3 in 1968. See DBS, The Labour Force, (71-001), June 1969, p. 2.

49 An investment in manufacturing would probably be labour-saving, but would expand employment in trade and services. On a sectoral perspective, capital and labour do not vary together. For an analysis of the relationship between output, employment, investment and productivity, and its effect on sectoral distribution, see W. Galenson, op.cit.

to the demand for land, while an expansion in manufacturing would likely increase investment in machinery and equipment and add to the demand for natural resources and unmanufactured goods. The level of overall productivity will also vary. In some industries and jobs, equipment is the main factor of productivity; in others, it could be training, or the quality of materials used, or motivation[50].

However, as the economist does not interfere with the choices of goods and services, he should not take upon him to decide on matters of education and training of manpower, choice of careers, location of firms, choice of techniques and investment, government policies on development. Insofar as potential output is considered, it is assumed that the unused resources would follow the given sectoral distribution (with account taken of the historical trends, if the model is sufficiently disaggregated), even if this does not maximize output[51].

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50 George Cukor, Planning Methods for Skill Requirements and Productivity Change, in United Nations Industrial Development Organization, Planning for Advanced Skills and Technologies, New York, 1969, pp. 97-8.

51 For example, output would increase if marginal farmers became miners, but it is their choice to remain on the farm. A complex model could take into account actual and potential skills and ranges of choices, but this is out of reach in this study.

Some Implications of Potential Output

The assumption that an economy working at its potential level would have the same structure than when it works at its actual level, while simplifying the analysis, could be challenged. This section deals with developments that are likely to happen in a fully-employed economy, but that cannot be considered within the limits of a simplified model of the economic gap.

The content of the production "represented" by the gap cannot be, realistically, extrapolated from the realized output. If the market is saturated with black and white television sets, the added demand will be directed towards other kinds of goods and services. J. M. Smith argues that, because of potential growth from reallocation of resources and changes in the input-output mix, economic capacity cannot be determined[52]. Moorsteen suggests that different input indexes can be compared in reference to output indexes in order to compare efficiency[53]. But such indexes cannot be used in dealing with new products or the changed technological conditions that new investment would make possible.

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52 J. M. Smith, op.cit., p. 2.

53 Richard H. Moorsteen, "On Measuring Productive Potential and Relative Efficiency", in The Quarterly Journal of Economics, Vol. LXXV, No 3, August 1961, pp. 451-67. Laspeyres' and Paasche's indexes can only be used to see whether given inputs which produced a given output could have produced a larger output.

A rise in the level of economic performance would increase immigration and decrease emigration, as the country would become a more interesting place where to live. This would have some effects not only on the size of inputs, but on their efficiency: both immigrants and emigrants have on the average more valuable skills than the labour force in general[54]. Besides, however controversial and unsettled this argument is, there is some reason to believe that production and productivity vary usually together, as non-use of capacity restrains productivity increases[55]. In any event, the potential input-output mix would probably differ from the actual mix.

The closing of the gap, by increasing the level of production, may add to the deterioration of the environment, to urban congestion, to psycho-somatic diseases, to the frustrations of inequality in the midst of affluence: as output expands, the dilution and assimilative capacity of the environment decreases[56]. Social welfare would be affected by the difficulties of preserving a state of clean air, low noise level, quiet, privacy, once taken for granted, but which become scarce goods with economic value[57].

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54 N. H. Lithwick, Labour..., op.cit., pp. IV-5-6.

55 See R. E. Caves, Policies..., op.cit., pp. VIII-8-11. See also G. Cukor, op.cit., p. 98. The correlation coefficient between increases in output and increases in productivity is 0.9112. See Appendix A. The question will be discussed later.

56 R. U. Ayres and A. V. Kneese, op.cit., p. 287.

57 E. Mishan, op.cit., Chapter 5.

If the economy was consistently running at its potential level, some trends towards increasing costs would accelerate. An example is given by fringe benefits. Work is changing, in its content, its meaning, its function. Less and less motivated to work, workers want a satisfying environment that makes more palatable the "irksomeness" of labour. Fringe benefits, which are regarded as rights as soon as they are given or won at the bargaining table, indicate a growing tendency towards a new concept of work relations: (1) the entrepreneur is viewed as responsible for the immediate and future welfare of the employee, and (2) the compensation for the work done is made not only in cash income, but also in various noncash benefits that cost over 25 % of payroll today, would cost over 50 % by 1985, and would be larger than cash income at the end of this century (unless trends change)[58].

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58 As significant examples of the literature on fringe benefits, see Felician F. Foltman, "Implications of Fringe Benefits in the 1970s", in Arizona Review, June-July 1968, pp. 1-5; Abraham Weiss, "Fringe Benefits in the 1970s: A Labour View", in Arizona Review, May 1968, pp. 5-10; James D. Hodgson, "Fringe Benefits in the 1970s: An Industry View", in Ibidem, pp. 1-4; T. J. Gordon, A Study of Potential Changes in Employee Benefits, Riverview Center, Middletown, Connecticut, Institute for the Future, 1969 (Gordon's work is the most relevant study on the subject); J. H. Foegen, "Far-Out Fringe Benefits", in Personnel, August-September 1967, pp. 65-71; and Arthur J. Deric (ed.), The Total Approach to Employee Benefits, New York, American Management Association, Inc., 1967.

Another example is given by the changing role of the enterprise. As affluence increases, the large corporations are given a responsibility in non-profit endeavours.[59] Some refer to externalities: pollution control, some urban renewal, research. Others relate to the expected behaviour of a "good corporate citizen": fight against regional disparities, hiring of "hardcore" unemployed, help to the arts. Others derive from national health and welfare plans that impose some contributions to employers. As a result, the production process is modified. These costs are often shifted to the consumer. But this is not strictly an inflationary effect. While buyers used to pay, in a good, some labour, some raw material, some profit, they now pay also the superannuation plan, the disposal of wastes, the extended holidays, the increased public services, the general welfare[60].

A further example is provided by what the OECD Staff calls noncommodities, that is, goods and services not sold on a market, the cost of which are largely met by taxes and gifts[61]. As the level of affluence rises, there is more demand

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59 See above, p. 101. Refer also to the Ontario legislation on pollution control. Many corporations pay at least lip service to this new concept, while others accept it eagerly.

60 To illustrate: merchants affiliated with CHARGEX give to that credit card system 4 % of the value of the sale. It is likely that many have increased their prices accordingly. Yet that increase in price is not fully inflationary, for it represents the cost of a service (some merchants give a 4 % discount to customers that pay in cash).

61 See OECD, "A New System...", op.cit., pp. 27-30.

for "noncommodities", like the services of universities, hospitals, aid agencies[62]. The effect of this trend on prices and taxes, adding to the wage-fixing of unions and price-fixing of corporations (facilitated by buoyant expectations), adding to the burden of paying for the control of externalities, would distort the price-cost structure that prevails in the actual economic mix. Obviously, such a change in the price-cost structure would affect the structure of demand, then what is produced, and how it is produced. But these side-effects of growth cannot be considered in a model of the type proposed in this chapter.

There are a number of illegal activities in society, like abortions, "hard" pornography, drugs, betting, prostitution, where labour is done, where capital is invested, where scarce resources produce want-satisfying goods and services, where there is a seemingly growing demand, and where considerable expenditures are made. It could be assumed (though this is by no means evident) that an affluent society would tend to be more permissive than a non-affluent society, because it could cater to the welfare of minorities instead of

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62 For an attempt to assess the economic soundness of such institutions, and their effect on the whole economy, see J. P. Newhouse, "Toward a Theory of Nonprofit Institutions: An Economic Model of a Hospital", in The American Economic Review, Vol. LX, No 1, March 1970, pp. 64-74.

concentrating on bread-and-butter issues[63]. If this happens to be true, and permissiveness increases as the gap closes[64], the legalization of the above-mentioned activities is bound to have an effect on GNP[65].

Another effect of an increasingly good economic performance would be that a higher level of production would press more on scarce resources. As new hydro-electric sources are located in remote areas and as oil reserves are depleted, an increase in production, by adding to the claims on energy resources, could hasten the switch towards nuclear power. As appropriate metal reserves decline in quantity and quality, an increase in output would press towards the use of plastic and cardboard containers. These effects would bear on costs and choice of technologies.

These trends are relevant in a study of the economic gap. The mood for change, pleasure, progress, is probably stronger in periods of economic vitality than in recessions. Much research is needed on these trends before they can be

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63 For the view that scientific knowledge and general moral permissiveness work against human happiness, see E. J. Mishan, op.cit., pp. 134-47. He states the opinion that economic growth in the West, over the last half-century and especially the last two decades, had traumatic effects on the population, affecting adversely the social welfare.

64 Better knowledge and quantification of social indicators would be required to study this hypothesis.

65 To illustrate: drugs would add to the output of the food and beverage industries, while possibly adding, with abortions, to the cost of medicare; pornography would enter the printing and film industries, and erotically-oriented companies would add to the economy's production functions; if state-run, these activities would be an alternative source of taxation, like today's Liquor Board Commissions.

adequately included in a model[66]. Specially, the relationship between, say, fringe benefits, education, medical care, and the level of output and its rate of growth, have to be quantified. The purpose of this section was mainly to pinpoint some of the shortcomings of a simplified model of the gap.

Opportunity Costs of Inefficiency

Any economic arrangement of producers and consumers that does not satisfy the requirements of the optimum conditions of production and exchange has opportunity costs. Regional disparities are a case. The bounty or poverty of nature is partly a cause of regional underdevelopment. The location of plants and head offices, the political attention or indifference of governments, the changes in demand for a resource, the "circular causation" process, cultural habits and peculiarities of people, are also important factors. From an economist's point of view, regional disparities are costly because some inputs are left idle, others are not developed, and resources from richer areas have to be diverted from better

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66 For example, a study of the effect of Prohibition and its removal on the economy would throw light on the effects of the legalization of other illegal activities; a study of the effect of today's medicare plans would indicate what could be the consequences of universal dental and psychological care.

utilization in order to help the poorer regions. For gap analysis, this means that the closing of the gap would bring not only new inputs into the economic circuit, but would free resources actually utilized in some relief of income and other differentials between areas and groups. To some extent, the proposed model assumes that the poorer regions, that is, the "marginal" inputs, can be brought to the level of the inputs in more developed areas.

Poverty is another drawback on the economy, which, like regional disparities, has been analyzed by the Economic Council[67]. Poverty has actual costs in terms of relief and transfer payments, and potential costs in terms of the proper health, nutrition, education, mobility, that the poor cannot afford for themselves nor for their children. There might be over-investment in full-time full-year well-paid workers, and under-investment in the human capital represented by peripheral labourers, farmers, fishermen, chronic unemployed, and the poor in general[68].

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67 See Conseil économique du Canada, Cinquième Exposé annuel, op.cit.

68 W. Morse, The Peripheral Worker in the Affluent Society, in G. G. Somers (ed.), op.cit., p. 136.

An unsatisfactory level of health is another area of inefficiency, which bears adversely on the quality of the inputs[69]. Mental and physical health, besides affecting the input labour by reducing its capacity, may also remove it: car accidents, suicide, heart attacks, cancer, are leading causes of death, and largely avoidable with adequate policies[70]. The opportunity costs of the underemployment of students, women and the aged that are willing to work, and, because of discrimination, of some women and ethnic groups, are also sizeable, and put serious limits and complications to the analysis of the gap, because there are no price tags on these costs.

Losses incurred through diseconomies are not as yet adequately measurable[71]. There are "welfare" or "efficiency" losses due to the monopolistic organization of production. Attempts to measure those losses ranged from 1 % to 8 % of national income[72]. The Harberger technique gives a figure of 2 %,

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69 According to a National Health Survey, quoted by Gertrude Bancroft McNally in G. G. Somers, op.cit., p. 140, in 1964-65, the non-participation to the labour force of 84 % of the American males of age 25 to 64 was due to chronic conditions limiting or cancelling their work ability. A. Weiss, op.cit., p. 8, notes that 35 % of the males of age 35 and more are likely to be disabled for at least three months, and 3.5 % permanently.

70 For instance, better social environment, improved car safety, suitable non-cancerous alternative drugs, less pressure on men, more medical research, etc.

71 T. Scitovsky, External..., op.cit., pp. 198-200.

72 Despite advantages of large corporations, perfect competition is the most efficient system of production and exchange. See C. E. Ferguson, Microeconomic Theory, Homewood, Richard D. Irwin, Inc., 1966, pp. 266, 295-6.

while Kamerschen, utilizing after-tax income and fully-adjusted profit rates with industry-by-industry elasticity data, estimated these losses to be 6 % of national income[73].

The changing economic structure, the variations in the blend of inputs and products, the scope of what is measured economic output, the alternative costs of a given production, the losses in efficiency due to an imperfect system, all these factors contribute to the difficulties and limitations of gap analysis. Put into the perspective of general equilibrium and welfare economics, the loss of output is sizeably larger that the economic gap as measured "conventionally", by Okun, Drabble, Brown, Lithwick, Knowles. However, before those unsettled problems are further discussed and analyzed, a model of the gap shall be limited to potential increases in inputs and productivity, and eventually with a few parameters of probable benefits from an efficient full employment of resources.

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73 D. R. Kamerschen, "An Estimation...", op.cit., p. 235.

CHAPTER 6: A LIMITED MODEL OF THE GAP

Expanding the Factor Labour

The economic gap in output results from a gap in inputs and a gap in productivity. The input gap would be closed by expanding the actual volume of inputs to their potential level. Peitchinis[1] defines potential labour force as all persons in the civilian population, of 14 years of age and over, residing in Canada; this excepts the military, Indians living on reservations, and residents of Yukon and the North-West Territories; those excluded are about 3 % of the total population of 14 years and over. It is obvious that this concept cannot be used in the estimation of potential output: nobody expects really all the teenagers, all the women, all the aged, all the disabled, to work, even if they would, by numerical extrapolation of figures at least, almost double the GNP. For the purpose at hand, potential labour force is that part of the population that is able and willing to work[2], and actual labour force is the employed manpower. The

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1 S. G. Peitchinis, The Economics of Labour, Toronto, McGraw-Hill Co. of Canada, Ltd, 1965, pp. 58-9.

2 Ibidem, p. 63. Peitchinis calls it actual labour force. In the context of this work, people that do not join the labour force but would be willing to work if there was a demand for their skills are considered to be part of the potential labour force.

problem is to measure the differential between actual and potential labour force, and to evaluate the effects of a fuller and better employment.

The estimate of potential labour force requires some qualifications. For instance, additions and substractions to labour force are not only a function of demographic factors, but of demand, standards of living, attitudes towards work, resources and needs of the household. The relationship between output and employment is stated as unstable by many businessmen, who face a declining demand without firing people (for reasons of humanitarianism, inertia, costs of severance pay, labour agreements, turnover costs, fixity of the factor, etc)[3], but putting them to non-productive use, or slowing the pace of work[4]. In different times, areas, ethnic groups, age categories, the investment in human resources differ, bringing forth problems of comparisons and aggregation of workers. It is uncertain whether the closing of the gap would induce young people to join the labour market or to pursue higher education, and whether unqualified workers would be retrained on the job or at training centres (hence withdrawn from the labour force).

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3 W. Y. Oi, op.cit., pp. 538-43.

4 G. W. Wilson, "The Relationship...", op.cit., p. 40.

Despite some advantages, especially in comparisons over time, it appears more satisfactory to use straight employment figures rather than manhours. Over short periods, differences are not really significant[5]. The trends in output per person employed and output per manhour are similar[6]. Measures in mahours are useful to study the effect of productivity on hours and wages, but measures in men clarify the relationship between productivity and labour force size, composition, employment trends, policies of full employment[7]. The use of manhours would not add much accuracy for three reasons: (1) the data do not account for large and growing paid unworked time like vacations, rest periods, sick leaves, absenteeism, (2) it is assumed that the average working schedule would not be modified by the closing of the gap[8], and (3) manhour data have less meaning in a service-oriented economy where output does not depend directly on time worked[9].

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5 G. W. Wilson, "The Relationship...", op.cit., p. 39.

6 This was the case for six groups of data (1956-61 to 1961-66); in commercial service-producing, and commercial non-agricultural, industries, the difference was negligible. See Dominion Bureau of Statistics, Aggregate Productivity Trends, 1946-67, (14-201), Ottawa, December 1968.

7 International Labour Office, Measuring..., op.cit., p. 42.

8 Average hours worked decline in a historical trend. See T. M. Brown, op.cit., pp. 84-5, 118. Results would be the same, as output per man-year equals output per manhour per yearly hours worked.

9 It has been argued that the economy would grow from productivity in manufacturing, construction, utilities and transportation, the other sectors being unproductive or inflationary. See Gilbert Burck, "There'll be less Leisure than You Think", in Fortune, March 1970, pp. 86-9, 162, 165-6. The output of government and nonprofit institutions, priced outside the market, complicate the difficult question of measuring output and productivity.

There is also the question of the expected employment level. The Economic Council aims at a level of 3.0 %,[10] Firestone considers 3.5 %[11], Tandan uses 2.2 %[12], and Brown suggests 2 % as a "humane" goal for Canada[13]. For a study of potential output, a figure in the vicinity of 2 % may be acceptable. It is not in line with the Phillips curve, but late experience puts doubts on the accuracy of the trade-offs between wage-price stability and the unemployment rate[14]. The changes brought about by an economy working at its potential level, together with specific, structurally oriented, non-expansionary measures, would bring unemployment down from the actual level.

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10 Economic Council of Canada, First..., op.cit., p. 186.

11 O. J. Firestone, Growth..., op.cit., p. 101.

12 N. K. Tandan, op.cit., p. 31. This is Ontario's best performance. Potential output implies that there would be some diminution of regional disparities, i.e. that most areas would achieve a performance reasonably close to the best area.

13 This is largely a matter of judgment, that refers to what is possible, not to what is likely. The fact that a high rate of unemployment coincides with strong inflationary pressures (which is not always true), indicates that market inefficiencies, bottlenecks in the supply side, restrictive policies, are responsible for a considerable output gap.

14 See Michael E. Levy, "Full Employment without Inflation: An Analysis of U. S. 'Phillips Curves' and 'Target' Unemployment Rates", in The Conference Board Record, November 1967, Vol. IV, No 11, pp. 36-41.

Sources of Manpower

The size of manpower that would be available to work can be estimated, despite the fact that its age and sex distribution, its skill-content, its location, cannot be accurately determined: the measurement should allow for the unpredictability of men. The sources of manpower, over and above the employed labour force, are the unemployed, the nonparticipants that are willing to work though not looking for a job, the part-timers that would accept a full-time job, the underemployed in general, the immigrants, the institutional population and the people whose "deterioration or extiction" could to some extent have been avoided. The inclusion of the last two groups could be contested. This section examines these cases and the limits of their measurement.

The question of unemployment has been tackled by most gap analysts as if it were the full measure of the loss of manpower. It is, in fact, only a first step. As mentioned above[15], demand incentives, political pressures and labour shortages may induce employers to hire the "hardcore" of unemployed. There are several difficulties in dealing with unemployment figures: (1) some unemployed are not willing to

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15 See above, pp. 100-01.

work but use the status of unemployed and the unemployment insurance fund as a way to take a few weeks of vacations between jobs; (2) the aggregate figures do not distinguish between those who are unemployed for one week, one month or six months; (3) it is possible to know from which sector the unemployed come, but less to which they are able or willing to go; (4) it is not known whether an unemployed needs to withdraw from the labour force to be retrained or not. The model allows for some "inevitable" unemployment to cover partly such inadequacies in measurement. In Eastern Canada, there is a considerable functional unemployment, which is not seasonal, for it did not exist in the buoyant postwar years[16]. Some seasonal unemployment would disappear with appropriate technology, as in mining and construction, and with alternate winter jobs. "As far as the economist is concerned, the fact that an individual is productive enough to be employed when the economy is operating at full capacity ought to be sufficient evidence that if he does not have a job one ought to be found or created for him"[17] : this principle, acceptable as a broad guideline, may encounter considerable problems in practice, yet there is no suitable alternative.

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16 A. M. C. Waterman, op.cit., pp. 39-40.

17 T. Dernburg and K. Strand, op.cit., p. 88. From 1964 to 1966, in the United States, 40 % of the unemployed were job losers (because of failures, decreased workload, mechanization), 15 % were job leavers, 25 % were reentrants (often less employable), and 20 % were new entrants. Proportions vary with business activity. See Kathryn D. Hoyle, "Why the Unemployed Look for Work", in Monthly Labour Review, Vol. 90, No 2, February 1967, pp. 32-38.

The unemployment figures are related to the participation rate. The non-participating workers that should be included in the potential labour force are the hopeless[18], older workers with obsolete skills, students and seasonal workers in slack periods, workers on indefinite lay-off in a single-employer town, some housewives, and the like. In 1966, in the United States, 10 % of the non-participants were willing to work, but were not looking for jobs for one reason or another[19]. Except for the males of the 25-64 years range, who "need" to work, participation rates appear to depend on the overall employment situation[20]. While as a whole the participation rate increases for women, it decreases for all the older people, either because of better security and early pensions, or for ill health, less need, personal reasons or discouragement[21]. Morgan found that the participation rate of married women and older people depends on the wealth, income, needs and indebtedness of the household[22]. In Canada,

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18 The "discouraged", who do not file any application with a manpower agency, feel too young or too old for employers, lack training, skills, schooling or experience, believe that no suitable job is available, lack transportation, have language difficulties, consider the pay as insufficient, fear discrimination, have personal handicaps, and so forth.

19 See Robert L. Stein, "Reasons for Nonparticipation in the Labour Force", in Monthly Labour Review, Vol. 90, No 7, July 1967, pp. 22-7.

20 In the United States, from 1953 to 1962, for two persons fired one left the labour force, while for 1000 new jobs, there were 454 new entrants and only 546 less unemployed. See T. Dernburg and K. Strand, op.cit., pp. 74, 80-1, 94.

21 H. Goldstein, op.cit., in G. G. Somers, op.cit., pp. 261-3.

22 J. N. Morgan, op.cit., p. 32.

the participation rate of married women varies directly with low family income, no pre-school children, school-age children to feed, region (it is high in Ontario and the Prairies, low in the Maritimes, Quebec and British Columbia, except for younger women, for whom cultural differences seem to lose their intensity), little assets, large debts, husband as unemployed, urban centers[23]. Taking into account as many as possible of these factors, Tandan concluded that the loss of output from non-participating workers is larger than output lost because of unemployment[24].

The case of part-time employment raises other problems. There is no universally recognized definition of part-time employment. The data overestimates real part-time employment as average working hours decrease[25]. In Canada, close to 13 % of the employed labour force in 1961, and over 16 % in 1967, worked less than 35 hours a week, and 20 % of them less than 20 hours; two thirds of them were women. The number of part-

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23 Byron G. Spencer and Dennis C. Featherstone, "Why Married Women are in the Labour Force: A Microeconomic Study", in Canadian Statistical Review, Vol. 45, No 4, April 1970, pp. 4-5, 104-5.

24 N. K. Tandan, op.cit., p. 31.

25 There is also an ethnic-geographical dimension: 17 % of office employees in Canada, and 18 % in Quebec, work usually 35 hours, but only 5 % in Canada, while 14 % in Quebec, work regularly less than 35 hours. See Department of Labour, Working Conditions in Canadian Industry, 1966, Ottawa, 1967, pp. 106-7.

timers is fairly consistent over periods, suggesting permanent arrangements; in December 1968, the lost manhours due to involuntary part-time work was less than 0.8 %[26]. Part-time work is usually voluntary. Management organizes shorter schedules, and people seek them, because both groups benefit from them[27]. This trend is likely to increase with the changing structure of the economy, as it concentrates in commercial and clerical work and services[28]. In Canada, the productivity of part-timers is higher than that of regular workers: they have a lower absenteeism and a greater work speed, and because of competition and the employer's reluctance to train them, they have to be more skilled in their specific job than regular workers[29]. At a first look, this trend towards part-time work may warrant the use of manhour figures; yet several reasons favour the contrary: the productivity difference, the

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26 N. K. Tandan, op.cit., p. 10.

27 For the more common reasons, see International Labour Office, "An International Survey of Part-Time Employment", in International Labour Review, Part II, Vol. LXXXVIII, No 5, November 1963, pp. 498-502.

28 More specifically, cleaning and similar work, like domestic services (baby-sitting, housemaids, etc), professional services (doctors, therapists, teachers, librarians, nurses, etc), and wholesale and retail sales, packers, checkers, cashiers, etc. See International Labour Office, "An International...", op.cit., Part I, International Labour Review, Vol. LXXXVIII, No 4, October 1963, pp. 387-9.

29 Ibidem, p. 401.

concentration of part-timers in areas where hours have an imperfectly understood relation with output, and the advantage of using employment data when the welfare of people is concerned[30].

Besides the part-timers, there is the case of the "moonshiners". In Canada, in 1960-61, 2.6 % of the employed persons had two or more jobs. 1.1 % of the workers had a salaried second job, while the other 1.5 % were unpaid help or self-employed. Of all of them, three quarters had one full-time job and one part-time job, while one quarter held two part-time jobs[31]. The problem of multiple jobholding parallels the one of part-time employment, with respect to adequate statistical treatment. It may be assumed that the extra hours worked by "moonshiners" compensates for the under-average hours of the part-timers.

There is finally the question of the underemployed, also called misemployed or subemployed, or included in studies of non-participation or part-time employment. It is the most difficult area of the analysis of potential labour. People may be underemployed because they are employed at less than their full capacity; but there is no objective standard of

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30 To illustrate: when two people seek half-time jobs, and one gets a full-time job while the other stays unemployed, the manhours worked are the same as if both had found a half-time job, but social welfare is less, for both persons are unsatisfied.

31 Department of Labour, Economics and Research Branch, Multiple Jobholding in Canada, 1960-61, Ottawa, p. 3.

one's full capacity, though tentative criteria have been suggested[32]. People may work at their full ability but below their real potential because of lack of education and training, but a "highest skill" is difficult to identify[33]. People may work below their recognized potential[34], but may do so voluntarily, while in other cases the educational requirements of a job may be unrealistically too high or too low for the task that is performed. The framework of the International Labour Office distinguishes three sorts of underemployment[35]: (1) visible underemployment, recognizable by unwished short hours due to seasonal, chronical or accidental factors, measurable by a unit of time, but with the difficulty of assessing "normal" hours for self-employed, employers, unpaid family helps; (2) disguised underemployment, affecting persons that work full hours at a low productivity level and low earnings, measurable by income comparison, with the difficulty of assessing a potential or minimum acceptable earning level; and (3) potential underemployment, concerning

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32 Like previous income, I. Q. tests, self-assessment, applications for other jobs, etc. See N. K. Tandan, op.cit., pp.27-8.

33 H. Goldstein, op.cit., p. 264.

34 For instance, 13 % of Americans, 25-year-old and over, with college education, are employed in occupations that do not require college education. See Ibidem, p. 264.

35 International Labour Office, "The Measurement of Underemployment", in International Labour Review, Vol. LXXVI, October 1957, pp. 355-66.

those who work in firms with obsolescent equipment, out-dated technology, inefficient management, of low productivity, that could be put off the market at any moment, and identifiable with difficulty by an assessment of the enterprise, on grounds of productivity, as compared to "model" establishments.

Immigration may be a source of skilled labour: over the past decade, one fourth of the immigrants were part of the managerial, professional and technical categories. The size of immigration varies with policies and possibly with the economic and social outlook: the immigrant labour force was 151,511 in 1957, 34,809 in 1961, and 119,539 in 1967[36]. For purposes of gap measurement, it can be assumed that the potential immigration is a function of the size of the labour force, derived from years of large immigration. However, this may not be an optimum level. To assess that level, it would be necessary to evaluate the effect of immigration on the balance of payments[37], on supply and on demand. Over the long term, immigrants add more to output than to demand (because they have less dependents per head), but in the beginning

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36 Immigration, various issues, and Immigration Statistics, various issues. The size of immigration does not vary directly with years of peaks and pits of unemployment, because the decision to immigrate is usually taken one year or more before the date of arrival in the new country.

37 Immigrants add to imports and to foreign claims (by remittances to relatives abroad, specially), to which an open economy is sensitive.

their capital requirements (house, hospitals, schools, roads, some durable goods) add mainly to demand: these would be met without much difficulty if there is spare capacity in the economy, but would aggravate the situation if there is excess demand[38]. The modest model proposed in this chapter does not permit such refinements, and it is assumed that immigrants would "fit" into the economic process as well as other workers.

The last sources of manpower, especially when future potential is considered (allowing for more changes), relate to the institutional population, and to a decrease in the morbidity and mortality rates. Much thinking and experimental work, together with a stringent methodology (in the treatment of underemployment especially, which relates to these sources), is required before this kind of potential labour can be assessed with any degree of accuracy. These extra inputs could be included tentatively in the model, but bearing in mind the fact that their availability depends on factors other than strictly economic.

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38 See E. J. Mishan and L. Needleman, "Immigration: Some Economic Effects", in Lloyds Bank Review, July 1966, pp. 33-46.

Assessing Potential Capital Formation

The Output-Capital Ratio. Growth theory, from Smith and Marx to contemporary thinkers, indicates that the growth in output is largely dependent on the size of the capital stock, and on the proportion of output that is saved and reinvested. This proportion is represented by the output-capital ratio, or the capital-output ratio. Some scholars have argued that this ratio should not be used, or used with the utmost care. This ratio "involves a degree of abstraction from the key determinants of growth which renders it little better than a mathematical exercise"[39]. Dehem uses the same argument when he says that "no more than the Harrod-Domar trivialities does Meade's model help us very much in understanding growth as a quasi-biological process"[40]. Conceptual and empirical problems affect the reliability of the ratio for comparison purpose[41]. "There are few concepts in current use in analitical economics whose conceptual foundations are quite so

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39 G. W. Wilson, Scott Gordon and Stanislaw Judek, op.cit., p. 328.

40 R. Dehem, op.cit., p. 506. He refers to the very abstract model of J. E. Meade, The Growing Economy, London, George Allen and Unwin, Ltd, 1968.

41 B. Higgins, op.cit., pp. 390-1.

shaky", says Bator[42]. As capital-output ratios vary from industry to industry, any change in the aggregate figure may reflect structural changes more than anything else[43].

These criticisms, however valid, do not dismiss the fact that a proper and careful use of this ratio has provided the economists that used it with valuable insights into the working of the growth process[44]. This tool of analysis, properly defined, can be utilized in a model of the gap, with a few qualifications. When this ratio is viewed as reflecting the productivity of capital, it is subject to the same criticism than the output-labour ratio: it is strongly affected by changes in demand that have little to do with the ability of capital to produce. It involves problems of aggregation, especially when two ratios for different years and different economic structures are compared. It should not be used alone, as increases in output result not only from capital accumulation, but from kinds of investment, technology, quantitative and qualitative changes in the labour force and in natural resources. It should consider the fact that a new investment may need skilled labour, raw materials, semi-processed goods, social overhead capital, expected demand, knowledge of the

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42 F. M. Bator, op.cit., p. 101.

43 R. E. Caves and R. H. Holton, op.cit., p. 337.

44 See, for instance, Simon Kuznets, Modern Economic Growth: Rate, Structure and Spread, New Haven, Yale University Press, 1966, pp. 75-80, 252-62. Most post-Keynesian models of growth are totally or partially based on this ratio.

existence of complementary factors. It is related to the willingness to save[45]. As any ratio, its changes should be assessed with reference to previous changes in the level of its components. The ratio has been rather stable in Canada for the past two decades, and a five-year moving average should suffice to compensate for most of the accidental yearly variations.

It is often stated that the capital-output ratio falls over time. Firestone suggested that capital equipment is used less and less intensively because of depressions, more time not worked, higher productivity of new machines[46]. Klein and Kosobud, studying the American case, found that the ratio may be constant over a short run if capacity output is used instead of actual output (that is, a more intensive use postponing new investment), and fall in the long run, at a rate of decline of 0.33 % semiannually, as a result of technical progress[47]. But Anderson argues that the decline

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45 Saving is not the crucial requirement, as Canadian scholars have pointed out. Brown noticed a surplus of saving, with aggregate demand falling because of a lack in investment opportunities. See T. M. Brown, op.cit., p. 46. Wilson and Lithwick noted that, at least below potential full-employment level, "the propensity to invest is the active determinant of the level of capital formation", with saving and investment (national and foreign) adjusting to it. See T. A. Wilson and N. H. Lithwick, op.cit., pp. 116-7.

46 O. J. Firestone, Canada's..., op.cit., p. 27.

47 L. R. Klein and R. F. Kosobud, "Some Econometrics of Growth: Great Ratios of Economics", in The Quarterly Journal of Economics, Vol. LXXV, No 2, March 1961, p. 180.

of the capital-output ratio in constant dollars is due (1) to a downward bias in deflation procedures (the capital asset deflator rises more than the output deflator)[48], and (2) that the capital-output ratio based on balance sheets declines because of inadequacies in the basic data (as depreciation is affected by income tax laws, as productivity changes of old capital use are not considered, and as there is a lack of proper early censuses)[49]. He even claims, with some case studies and a theoretical argument[50], that the capital-output ratio rises, though slowly, because there are always new investment possibilities, and they have a ceiling on them (the availability of savings, of innovations, of financial resources).

The controversies over the capital-output ratio as a concept reflect partly the statistical difficulties in measuring it. Capital may mean capital stock, or net or gross fixed capital formation. Figures on the stock of capital are

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48 Paul S. Anderson, "The Apparent Decline in Capital-Output Ratios", in The Quarterly Journal of Economics, Vol. LXXV, No 4, November 1961, pp. 615-18.

49 Ibidem, pp. 620.

50 His argument is as follows: as $\frac{S}{O}$ is rather constant and $\frac{\Delta O}{O}$ declines over time, the $\frac{\Delta K}{\Delta O}$ and $\frac{K}{O}$ rise, for $\frac{\frac{S}{O}}{\frac{\Delta O}{O}} = \frac{S}{\Delta O} = \frac{\Delta K}{\Delta O}$. See Ibidem, p. 630.

not totally reliable, as they depend on the estimates of the life of the asset, which is not known[51]. Net fixed capital formation is not known in constant dollars, and in any event it depends on dubious estimates of capital consumption; furthermore, serious problems appear when there is disinvestment. The output-capital ratio derived from gross fixed capital formation appears to be, by elimination, the best measure for this analysis, as it is more easily linked to new employment and to technological change[52].

Other Tools of Analysis. The output-capital ratio, which is really a measure of the proportion of GNE which is invested in capital goods, may serve as a measure of capital requirement. As such, it is in line with Creamer's reasoning, giving an estimate of the unused capacity in the economy[53]. As a measure of labour requirement, the capital-labour ratio may

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51 See above, p. 129. No survey of capital stock in existence or in use is available for the Canadian case, to test the different capital stock series.

52 The coefficients of correlation between increases in output and gross output-capital ratio, output and "net" (gross fixed capital formation less capital consumption allowances) output-capital ratio, and output and increases in the gross output-capital ratio, are all non-significant. They are higher, but non-significant, between increases in gross and "net" capital formation and increases in employment. However, all these output-capital ratios vary similarly, all increasing or decreasing together. See Appendix A.

53 See above, pp. 33-5.

be used[54]. If there is technological change, the capital deepening is likely to increase, with improvements in productivity, especially if the output-capital ratio does not decrease. Despite some conceptual advantages of utilizing capital stock and net figures, the gross fixed capital formation will be taken for the denominator, for the same reason than above. As investment depends on demand, economic prospects, financial resources, state of technology, prudence and intelligence should guide the use of such tools.

On specific occasions, great ratios like the saving-income ratio, the participation rate, the wage-income ratio, the inventory-output ratio, the proportion of government expenditures, the number of dependents per working person, the profit-income and wage-income ratios, the velocity of circulation, provide a better understanding of the working of the economy[55]. The rates of growth of all components of GNP and GNE, and of population, labour force and employment, can also prove useful. Some social indicators, negative (noise, urban crowding, disamenities, pollution, defense) or

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54 The coefficient of correlation between increases in the output-labour and the capital-labour ratios is 0.4745, meaning the 22.51 % of apparent labour productivity increases may be attributed to capital deepening. See Appendix A.

55 See L. R. Klein and R. F. Kosobud, op.cit., and T. M. Brown, op.cit., pp. 216-9.

positive (health, education, leisure trends, mobility), are important in assessing welfare; but the conceptual framework linking them to economic indicators is still lacking. There are also "barometers" of economic conditions, like inventory changes, import and export propensities, or the rate of depreciation, that can throw light on the kind of economic gap that exists in any given year. A change in such ratios shall be analyzed in a sequence, to see whether the change is due to a modification of the denominator, of the numerator, or of both.

In the context of this work, these tools provide the means of assessing the extent of excess, or shortage, of capital. They also may indicate the limit of the economy's capacity to absorb new capital. Different assumptions will be made for the expected behaviour of each ratio at potential output level. As the ratios affect each other, they have to be examined in relation with one another.

A Measure of Productivity

The proposed model of the gap has a built-in productivity ratio[56]. If it is kept constant, the calculated potential output would depend only on the expansion of the

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56 See above, p. 133.

factors of production, with the same productivity than in actual output performance. However, the closing of the gap is expected to bring not only growth, but development, and eventually progress. There is some evidence that a decrease in the rate of growth in output is accompanied by a fall in the output-labour ratio[57], and that a fuller employment of resources increases the rate of growth of productivity[58]. These results are not definite enough to stop the controversy on the matter, but they partly warrant the assumption that production and productivity vary together[59].

Caves and Holton have disputed the soundness of utilizing long-term productivity data for forecasting[60]. If only because of recessions and wars, past productivity trends

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57 Between 1926 and 1969, the rate of growth of real GNP was negative in 1930-1933, 1945-1946 and 1954, while output per person employed fell in 1929-1933, 1945-1947 and 1954.

58 A comparison of the average annual changes in productivity between the periods 1956-1961 (where the rate of growth was generally low and the rate of unemployment high), and 1961-1966 (where the economy performed better), gives the following results: output per person employed increased in commercial industries, goods-producing industries, agriculture, and manufacturing; it decreased slightly in commercial service-producing industries, commercial nonagricultural industries, and nonagricultural goods-producing industries; and it dropped in nonmanufacturing industries (commercial nonagricultural). See DBS, Aggregate Productivity Trends, op.cit. See also above, p. 153, footnote 6.

59 The model relates productivity to an increase in output, not to the unemployment rate, for the latter depends partly on the growth rate of the labour force, which is not determined only by economic forces.

60 R. E. Caves and R. H. Holton, op.cit., pp. 286-305.

understate potential productivity[61]. Structural changes, labour force composition, sectoral distribution, changing products, in short, lack of homogeneity in inputs and output makes it difficult to measure a meaningful productivity and changes in productivity[62]. As the economy becomes service-oriented, the effect of the slow rate of productivity growth in services, which is partly a "statistical hallucination"[63], distorts the whole economic picture. In the proposed model, productivity increases are linked to capital deepening, with the implicit assumption that an increase in the capital-labour ratio represents better technology and the higher education level that accompanies it.

In order to remain within the framework of the National Accounts, the best productivity estimate is output per employed person[64]. It is a rough measure, strongly affected by demand, which disregards problems like the difference between economic and technical productivity, the effect of non-labour inputs (for instance, the labour "embodied" in capital goods, or the quality of materials used), the requirement that the output

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61 T. A. Wilson and N. H. Lithwick, op.cit., p. 219.

62 Royal Commision on Canada's Economic Prospects, Final Report, op.cit., p. 313.

63 T. Wilson, "The Price of Growth", op.cit., p. 613. Among the many difficulties in measuring productivity in services, there is the problem of defining the unit of output, to account for qualitative changes in input and output, to rationalize intertemporal comparisons, and so forth.

64 See above, p. 153.

corresponds to the input (i.e. it attributes to employed labour the output of capital, land, institutional population, etc), the degree of specialization and integration in the production process, and so on[65]. Though the net value of output is conceptually more satisfactory, for the sake of consistency with other ratios, as well as because of difficulties in measuring adequately the value added, the simple output per worker figure will be used, with the understanding that "gross value productivity measurement only yields information - though perfectly valid information - on 'apparent' productivity"[66].

Further qualifications may be added. Despite its bias, for it attributes increased production to a single factor, this measure is also helpful in discussing social welfare[67]. It is not a technological concept, as it does not show productivity as ability to produce only, but ability to produce whatever output is demanded[68]. In economic terms, all inputs

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65 International Labour Office, Measuring Labour Productivity, op.cit., pp. 17-8, 25-8, 30-2. On the subject of labour productivity and productivity in general, see this book and its excellent up-to-date bibliography, covering 242 publications, in pp. 161-72.

66 Ibidem, pp. 34, 34-6.

67 Output per capita is not satisfactory: it is the same for a unit of, say, three adults and one child, and a unit of one adult and three children, while needs are clearly different. Assuming full employment, output per working person is a best measure, which may be supplemented by data on the ratio of employed person and number of dependents.

68 Entrepreneurs face a short-term cutback in demand by asking less production from their employees, and an increase in demand by putting them to work at a faster pace or overtime. Output per input varies, while the "technical" ability of the workers remains the same. See N. K. Tandan, op.cit., pp. 10-11.

are regarded as "disutility" and all output as "utility", and thus there is a rationale for increasing productivity. Mishan argues, from the viewpoint of human welfare, that when a man is the input and when the output is an object (good or service), there might be another choice to be made[69]. This eventuality is considered in the proposed model, insomuch that increases in productivity depend chiefly on capital deepening[70]. For the purpose at hand, an increase in productivity would be added to the estimate of potential output in the measure that it is warranted by an assessment of the economic conditions affecting the economic gap that is examined.

Widening the Model

The formulation of a simplified model of the economic gap implies that a variety of factors, which have a bearing on the gap, must be assumed away. Throughout this thesis, several of such factors have been identified. By and large, they cannot at this stage be formally included in the model,

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69 E. Mishan, Growth..., op.cit., p. 149.

70 "It is well known that labour productivity indicators do not reflect the effectiveness of labour very precisely", says G. Cukor, op.cit., p. 94. Moreover, there is no well established relation between measured skills and productivity, though this is most likely. See Ibidem, p. 98.

either because data on them is wanting, or because further research is required in order to define their relationship with output, employment, capital or productivity. Nevertheless, the treatment of the major inputs and of productivity, in this model, contribute, hopefully, to arrive at a better estimate of potential output than the models discussed in Chapter 2.

A major shortcoming of this model derives from the use of the National Accounts. The problem is not so much the quality of the measurement, which, though sometimes deficient[71], is relatively adequate, but its nature. Gross National Product measures output, not welfare, while the economic gap has been defined as the difference between actual output and that output which, utilizing all the available inputs in an efficient manner, maximizes social welfare. Because of the "perverse" distortions of wage-fixing, price-fixing, the extent of the wants-creating process, the rigidities of a nonperfectly competitive system, political interferences with economic choices, and so forth, the link between

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71 Some deficiencies increase as GNP and GNE figures are disaggregated. For instance, many mobile homes, which are financed and used like residential investment, are still included in expenditures on goods and services; figures on capital formation, especially machinery and equipment, do not specify their import content; and so forth.

economic growth and human welfare is not an identity.[72] The model of the gap would benefit from the inclusion of elements that compensate for these distortions. If the trend towards the quantification of social data continues, with a framework that can be used to assess the state of society with relevant, significant parameters, social accounts could be developed, comparable to economic accounts[73]. Conceptual and empirical studies would reveal the mechanisms that link social and economic factors. Then, it would be possible to examine the economic gap in the light of growth theory and economics of welfare (which would be less abstract than welfare economics)[74]. The Economic Council of Canada intends to develop social indicators that would supplement the information on growth in output[75]. Such indicators would show to which extent an increase in growth brings social welfare closer to its potential level, and would add to the model.

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72 E. Mishan, Growth..., op.cit., argues that negative externalities or private automobiles, air travel and tourism are such that welfare would increase if they were abolished.

73 See Michael Springer, "Social Indicators, Reports, and Accounts: Toward the Management of Society", in The Annals of the American Academy of Political and Social Science, March 1970, pp. 1-13.

74 A step in that direction has been made by the National Goals Research Staff, op.cit.

75 See Arthur J. R. Smith, Notes for an Address to the Toronto Stock Exchange Conference on Economic Growth, (mimeographed), May 27, 1970, p. 10.

Today's concern about pollution, the social cost of growth, externalities, may influence the economic units into including in their calculations those cost-benefit elements that would bring the private costs of production closer to the social costs. In the absence of such development, the model of the gap could be widened by the inclusion of a factor representing the deterioration of the environment and of actual and potential inputs, matched by a factor standing for the benefits of growth. Tentatively, both factors could be assumed to be equal, though this is a most controversial assumption[76]. More research is needed before a statement on this question can be affirmed.

The inclusion of externalities in the production functions of the units would add to the modifications in the cost structure resulting from collective bargaining[77], social welfare programs[78], changes in the state of resources[79], changes

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76 Likewise, some judgment is required to decide at which rate of unemployment does the inconvenience of having a given number of unemployed cancel the annoyance of experimenting a given degree of inflation.

77 Wages rise less than profits in the ascending phase of the business cycle, and faster in the descending phase. See John L. Fryer, "Current Trends in Collective Bargaining", in Canadian Labour, Vol. 13, No 3, March 1968, pp. 30-4. It is not clear whether in a fully-employed economy labour costs would tend to match, follow or precede profit and productivity increases.

78 Social welfare can be paid for by taxes, or by consumers, like compulsory automobile insurance, or by employer, like worksmen's compensation plans, or by both, like some medicare plans. Economic consequences would differ in every case.

79 An increase in output may force mining companies to use low-grade reserves, adding to the costs of processing.

in the size of the market[80], changes in the quality of the goods, in the motivations of more affluent citizens, and so forth. A limited model of the gap assumes that, ceteris paribus, economic conditions would by and large be identical when potential output is produced, than when actual output is produced. In reality, this would not be so[81]. Future research in the subject would indicate how "things would not be equal", and this would widen the range of the model. In the meantime, a parameter of inefficiency cost could serve the purpose of bringing the estimated potential output closer to the level of production that would obtain in better conditions of production and exchange[82].

The Model Re-stated

It is now possible to formulate a model of the economic gap in a formal way. As the data come from the experience of actual output, several qualifications are required. The rates

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80 As the gap closes and the demand for a good expands, an enterprise may benefit from economies of scale or it may need more costly equipment; it may decrease its prices because of more sales, or increase its prices to pay for the better equipment.

81 However, the costs of full employment of resources must be compared to the costs of their less than full employment, like high interest rates and a "bearish" stock market that discourages new and replacement investment, diseconomies of scale due to a shrunken market, low morale affecting adversely productivity.

82 See Appendix B.

of growth and the "great ratios" are not absolute figures but come in a sequence of events. Thus, from a situation of unemployment, employment rises faster than the labour force, and creates a short-run unsustainable growth rate; from a situation of excess capacity, an outburst of demand expands output, and provokes a short-run increase in output per man that is unsustainable; after a period of recession, policies of easy money and low interest rates would step up the rate of capital formation, and this "bunching" of investment would be unsustainable; after a period of large expenses in durable goods, people would turn to services or semi-durables, and it would be erroneous to assume that the temporary high rate of expenditures in durables is sustainable. Furthermore, it should stand to reason that a general model of this sort is not "mechanistic", and that judgment is required to modify it as it is applied to a study of the gap in one year or over a period, in the past or in the future, or when it is used with disaggregated macroeconomic sectors[83].

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83 All the terms, in the model, are in constant dollars, except for the depreciation ratio, where it is assumed that current-dollar distortions in both sides of the ratio cancel each other.

Defining O as actual output,

I as investment or gross fixed capital formation,

and N as actually employed labour force,

then $O = \frac{O}{I}.\frac{I}{N}.N.$

Defining k as output-capital ratio, or $k = \frac{O}{I}$,

and l as capital deepening, or $l = \frac{I}{N}$,

then $O = k.l.N.$

Defining L as actual labour force,

and U as the number of unemployed,

then $U = L - N.$

Defining t as the population that is able to work,

p as the participation rate, or $p = \frac{L}{t}$,

p' as the potential participation rate,

and P as the nonparticipants that are willing to work,

then $P = (p' - p).t.$

Defining f as the immigrants that join the labour force,

i as the rate of immigration, or $i = \frac{f}{L}$,

and F as new immigrants that would join the labour force,

then $F = (i' - i).f.$

Defining L' as potential labour force,

then $L' = N + U + P + F.$

Defining u as actual unemployment rate, or $u = \frac{L - N}{L}$,

u' as potential unemployment rate,

and N' as potential employed labour force,

then $N' = (1 - u').L'.$

Defining O' as intermediate potential output,

and G as economic gap in growth, or $G = O' - O$,

then $O' = k.l.N'$.

The gap in growth is an intermediate gap, which does not cover the gap in development. The analysis continues as folows:

Defining k' as potential output-capital ratio,

Ib as business gross fixed capital formation,

Ig as government gross fixed capital formation,

Ir as residential investment,

In as non-residential investment,

and Im as investment in machinery and equipment,

where $I = Ib + Ig = Ir + In + Im$,

then, if the rates of growth in I, Ib, Ig, Ir, In and Im have been generally substantial in the previous years, and if $k' > k$, there is a likelihood of spare capacity in the economy, and new investment would probable serve to keep k and l constant.

Defining Cp as private expenditure in goods and services,

and Cg as public expenditure in goods and services,

then $C = Cp + Cg$, which is total consumption.

Defining X as exports of goods and services,

M as imports of goods and services,

x as propensity to export, or $x = \frac{X}{O}$,

m as propensity to import, or $m = \frac{M}{O}$,

x' as potential propensity to export,

m' as potential propensity to import,

V as total inventories,

W as nonfarm business inventories,

v as total inventory rate, or $v = \frac{V}{O}$,

w as nonfarm business inventory rate, or $w = \frac{W}{O}$,

v' as potential total inventory rate,

w' as potential nonfarm business inventory rate,

D as depreciation, or capital consumption allowances,

d as depreciation rate, or $d = \frac{D}{I}$,

and d' as potential depreciation rate,

then, when the rate of growth of Cp, Cg, C, has not been excessive in the previous years, and when $\Delta x > \Delta m$, $x' > x$, $v > v'$, $w > w'$, and $d > d'$, there is a likelihood of inadequate demand, such that a development gap exists and an increased investment demand would raise the level of productivity.

Defining I' as potential gross fixed capital formation,

and l' as potential capital deepening,

then $I' = \frac{d.I}{d'}$,

and $l' = l + \frac{I' - I}{N'}$,

therefore O" can be defined as potential output,

where $O'' = k'.l'.N'$,

and $G'' = O'' - O$, or economic gap in output.

This measure of economic gap and potential output does not cover the full extent of the gap. Providing "shadow" figures for other elements of the gap, the model could still be widened.

Defining H as gains from full employment of involuntary part-timers,
A as gains from employment of institutional population,
B as gains from a reduction of underemployment,
J as gains from a reduction of ill health and death,
q as fuller use of human resources, or $q = H + A + B + J$,
y as better use of all resources,
and z as gains from a reduction of inefficiency,
then, with O'''' as a measure of fuller potential output,

$$O'''' = k'.l'.(N' + q) + y.O'''' + z.O''''.$$

However, it is unlikely that today's statistics and conceptual studies on the subject warrant such widenings of the model, which is given here only as an indication of possible developments.

CHAPTER 7: THE ECONOMIC GAP IN CANADA

Validity of Gap Estimates

A study in potential output, like economic forecasting, is bound to be, partly, a mathematical exercise. Such attempts are warranted, nonetheless, by their theoretical significance and also their implications for policy. To some extent, gap estimates are more valid and relevant for their illustration of the movement, the trend, the variations, the behaviour of the gap series, rather than for the numerical results. The latter, however, even if they should not be taken at their face value, are useful estimates of the possible size of the gap. But it would be a mistake to consider the results given in this chapter as "definite" in any sense. They are the outcome of stated assumptions within an analytical framework, which has been discussed throughout this thesis, and they stand in relation to these postulates.

The purpose of this chapter is partly to test the model formulated in the previous pages. This test cannot be conclusive, in the sense that there is no way, as now, to compare the results with exogeneous data[1]. But the model may

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1 A comparison of the results of this model and with other potential output models is made at the end of this chapter, but this does not verify the accuracy of the results, because the assumptions are not similar.

be found acceptable if it gives meaningful analytical findings. It is on the basis of these findings that the plausibility of the model could be assessed. Apart from that, the purpose of this chapter is to describe how the model can be used in gap analysis.

The economic gap has been studied over a twenty-year period (1950 to 1969), which has been chosen because of the availability and reliability of the data, and because this span of time has been of more or less continuing economic growth, uninterrupted by economic catastrophies such as the depression of the Thirties or a major military upheaval like World War II.

The model formulated in the last chapter, as it makes use of the output-capital and the capital-labour ratios, implies an interaction between potential and actual output. If there is a fall in the productivity of capital or the efficiency of labour, there would be a decline in potential output. This is so, because it is assumed that there would be no significant structural change in the economy when it performs at its potential level. Thus, the rate of growth in potential output is more of a mathematical figure than a figure with economic meaning. Later in the chapter, some estimates will be suggested that assume a control over productivity, but the results would be more theoretical than the model purports to be.

Assumptions of the Model

The general assumptions of a gap model have been discussed in Chapter 5. The major ones can be summarized as follows: (1) whatever the nature of the economic gap, whether it is supply-induced (bottlenecks, mismatch of inputs, structural rigidities) or demand-induced (inadequate demand), whether it is mainly a gap in growth, in development or even in progress, it is assumed that an expansion of demand (which includes policies on supply) would suffice to close the gap; (2) in the process of closing the gap, there would be no major structural change in the economy, that is, potential output performance would not affect significantly the input mix nor the output mix; (3) the income generated by the expansion of capacity utilization would suffice to buy the extra output produced, that is, demand would match supply.

Besides these general assumptions, specific assumptions should be made before the model can be used. The basis for these assumptions can be found in Chapter 6, and also in Chapter 4. The following paragraphs state them as they are used in this chapter. As with most assumptions of this kind, some legitimate disagreement may arise concerning the most appropriate values to give to some variables. It is felt, however, that different but "reasonable" alternative values would not have affected the essence of the model.

The potential unemployment rate is assumed to be 2 % of the potential labour force. This implies a high rate of employment, which may be attainable only with the pursuit of effective structural policies that aim at reducing geographical, seasonal and occupational unemployment. Also included would be retraining programs that put the less employable persons out of the labour force, and some expansionary economic policies that keep the employment rate at least at par with the growth of the labour force. The relationship between inflation and unemployment is not clear enough to suggest that only a higher unemployment rate would keep the economy from experiencing demand pressures on prices and wages[2]. Furthermore, a relative shortage of manpower, whether it adds or not to the cost of labour, would induce entrepreneurs to adopt innovations that increase the capital deepening and productivity, which is, in the long run, the main source of growth.

The potential participation rate is assumed to be 58.5 % of the labour force. This figure is in line with Tandan's extrapolations from the Ontario experience in its best years[3],

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2 The implicit price index in GNE rose substantially with a decrease in the employment rate in, say, 1940, 1947, 1951, 1956, 1959, 1966, while it decreased with an increase in unemployment in 1930, 1938, 1949, 1952, 1958, 1961.

3 See N. Tandam, op.cit., p. 31. His average, from 1953 to 1967, is 58.41 %.

and with the finding that one tenth of the non-participants are willing to work, provided the "right" job is offered to them[4]. Unlike the potential employment rate, it has never been attained in Canada, though in some years the actual rates were close to it. However, it could safely be held that the economy has never performed at its potential level, in the exacting sense accepted throughout this study.

The potential immigration rate is assumed to be 2 % of the labour force. This refers to the immigrants that intend to join the labour force, and it is derived from the years in which immigration and economic growth have been substantial. It has been found more satisfactory to link the "optimum" immigration rate to the labour force, and indirectly to the population, rather than assuming a constant figure. This rate has been achieved (and exceeded) at least in 1929 and 1957. Without restrictions on immigration, and with favourable economic prospects, it could realistically be expected as a norm. No attempt has been made to include in the model an estimate of potential non-emigrants, that is, to assess the number of people that would not have left the country if economic conditions had been more favourable.

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4 See above, p. 157.

The potential depreciation rate is assumed to be 50 %. This means that, on a National Accounts basis, for whatever capital is worn and torn, twice as much is expected to be invested[5]. The figure is derived from Canadian experience in periods of substantial economic growth and adequate investment demand, like the early fifties and the mid-sixties. Needless to say, if concepts other that gross fixed capital formation and capital consumption allowances are used, then the rate of depreciation would have to be different[6].

The potential output-capital ratio is assumed to be the five-year moving average of the actual ratio. The rationale is that this figure would lessen the effect of demand forces on the ratio, while preserving its productivity component[7]. The results given by this method is less reliable when hectic variations in investment widen the gap between actual and potential ratios, as it happened often before 1949, in 1951, 1955, 1957, 1963 and 1966, but they have been maintained for the sake of consistency. Handled with care,

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5 In the National Accounts, figures on capital consumption allowances overstate real depreciation. If a reliable measure of depreciation could be used, the depreciation rate would be smaller, because in reality less than half the capital used in the production process is really used up. But this figure is realistic within the framework of the National Accounts.

6 Capital consumption allowances figures are not given in constant dollars. The depreciation rate has been computed with figures in current dollars, with the expectation that the distortions of non-deflated values would be self-compensating.

7 This has been discussed above. See pp. 164-66.

this potential ratio is still a better approximation of the "optimal" ratio than a trend figure that disregards what entrepreneurs consider to be, for a period, an acceptable level of capital efficiency.

The potential capital-labour ratio is assumed to be the actual capital deepening, plus whatever increment, if any, is provided by an investment which satisfies the potential depreciation rate. Though the potential capital-labour ratio would never be inferior to the actual ratio, a decline in the output-capital ratio may imply a fall in productivity in some years. This is in line with the model, for it assumes the above-mentioned interrrelation with actual performance.

Finally, in no case would the model allow for a decrease in actual inputs when, say, the immigration rate is above 0.02, like in 1957, or the depreciation rate is below 0.5, like in 1952, 1953 or 1966. The question of "overheating" is assumed to be satisfied by considering only 0.98 as potential employment rate. It would be inconsistent with this assumption to add further restrictions and to pretend that the economy could not have absorbed the inputs that it did absorb.

Actual Performance of the Economy

The proposed model of the economic gap includes most of the major inputs that are responsible for the gap, while previous estimates of the gap or of potential output has been often limited to unemployment, productivity as a historic trend, and some measure of capital stock in certain cases[8]. This suggests that the results of the model are likely to indicate that the gap is wider than previously believed, and the question arises whether one estimate is more plausible than the others.

To answer this question, prior to the presentation and discussion of the model's results, a brief recall of each year's economic achievements and shortcomings is needed, covering the period 1950-1969. This would point out the areas of success and failure, suggesting how the performance could have been improved, or how the economy rose closer to its potential. For example, an increasing unemployment rate is a sign of a widening gap in growth; an inadequate level of investment demand may indicate that innovations are not made and that a development gap is forming.

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8 See above, Chapter 2.

The assessment of actual performance is made on the basis of the growth rates of the factors of production and of the components of output as measured in GNE, with due allowance made for the effect of volume and previous growth on each year's growth rates. The method indicated in the model[9] has been used to gauge the extent of spare capacity in the years in which it was most significant.

1950. Excellent growth rate[10], largely due to a catching-up required by the low growth rate of the previous six years[11]. Adequate consumer demand. Adequate investment demand, except in the area of machinery and equipment. Poor foreign demand. Unemployment increases, and there are signs of underutilization of capacity. Large inventories.

1951. Good growth rate. Consumer demand is kept strong by government expenditures. Investment demand is inadequate. Foreign demand is good, yet import growth exceeds export growth. Large inventories.

1952. Excellent growth rate, with high productivity and capital deepening. Beginning of an unemployment trend. Adequate aggregate demand, with falling inventories.

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9 See above, pp. 180-1.

10 The growth rate, which in this section refers to output, is called negative (below 0.00), poor (0.01 to 1.99), slow (2.00 to 3.99), good (4.00 to 5.99), very good (6.00 to 6.99) and excellent (7.00 and over). This terminology is adopted for the sake of simplicity and brevity. For statistics and their source, see the Appendix A.

11 The post-war years, despite their high employment rate, had an insatisfactory growth rate in output. Okun's and Drabble's methods view them as year in which potential was attained or even exceeded, which is a result disputed by this model.

1953. Good growth rate. Signs of unemployment of resources. Fall in foreign demand, though other demand forces are adequate, except for government expenditures. Sizeable increase in farm inventories.

1954. Negative growth rate, with a fall in productivity and capital deepening. Unemployment is large and increasing. Aggregate demand declines strongly, except in residential construction. The depreciation rate is high. Considerable extent of spare capacity.

1955. Excellent growth rate, compensating the previous year's poor performance. Men and capital are more utilized, though unemployment remains large and the participation rate is low. Aggregate demand is adequate, except for the public sector and investment in machinery and equipment.

1956. Excellent growth rate. Unemployment declines and productivity increases. Consumer demand is good, with a sluggish government spending rate. Investment demand is high, except in residential construction. Foreign demand is good, but imports are excessive. The depreciation rate is adequate. Large inventories remain unsold.

1957. Slow growth rate, with a fall in productivity. Unemployment increases, and there is spare capacity. Aggregate demand is inadequate, even with strong government investment.

1958. Slow growth rate. The unemployment rate, already excessive, increases. Aggregate demand is inadequate, especially in the investment (except residential) and foreign sectors.

1959. Good growth rate. Employment increases, but unemployment is still excessive. The depreciation rate is high. Consumer demand is depressed by falling public spending. Investment demand is inadequate. The growth in imports exceeds the growth in exports.

1960. Slow growth rate. Unemployment increases, and this trend is aggravated by a rapid growth of the labour force and an increase in the participation rate. Consumer demand remains low. Inadequate investment demand worsens the trend towards an increasingly high depreciation rate. There is a small improvement in foreign demand.

1961. Slow growth rate. Unemployment is excessive. Consumer and investment demand are inadequate, but there is a counter-effect from strong government demand for consumer and capital goods, and a rise in exports.

1962. Very good growth rate, with sizeable productivity increase. There is a fuller use of resources. Aggregate demand remains inadequate, but it increases steadily.

1963. Good growth rate. The unemployment rate keeps falling. The depreciation rate, still excessive, starts declining. Aggregate demand is still inadequate, except in the foreign sector.

1964. Very good growth rate. The fall in unemployment continues, despite a rapid increase in the labour force and the participation rate, as well as in immigration. Except for the public sector, aggregate demand is adequate.

1965. Very good growth rate. The unemployment and the depreciation rates are at an acceptable level, and keep decreasing. Aggregate demand is adequate, but there is a fall in government spending and a deterioration in the balance of trade. Inventories are large and increase.

1966. Very good growth rate. Manpower is more fully utilized, but there is an increase in unused capacity. Aggregate demand is adequate, except for residential construction.

1967. Slow rate of growth, with a fall in productivity and capital deepening. Unemployment starts increasing, together with the depreciation rate, indicating unused capacity. Aggregate demand is inadequate, with the exception of the foreign sector.

1968. Good growth rate, with an improvement in productivity. Unemployment increases, while the labour force expands at a fast pace. The depreciation rate increases, as well as inventories. Consumer demand is low and falling. Investment demand is inadequate, except for residential construction. Foreign demand is excellent and increases.

1969. Good growth rate, with a decline in productivity. There is a fall in unemployment, but it remains large. Consumer demand is good, slowed down by low public spending. Investment demand is inadequate, except for residential construction. The foreign demand falls in relation to an upsurge in imports.

The examination of actual performance of the economy from 1950 to 1969 appears to justify the presumption that the economic gap is a significant and sizeable feature of the Canadian economy. This brief recall reveals that every year there has been some inadequacies in some or all of the components of aggregate demand. Likewise, the labour force has usually not been fully utilized. The economy operated with spare capacity and excess manpower. As a result, there was an economic gap in every year, which could have been avoided, theoretically, with the proper expansion of demand and use of resources.

The question is then to identify the reasons for the gap, to measure its extent, and to analyze its implications. The model of the gap would serve this purpose, for it is built in such a way that a step-by-step and detailed analysis is obtained.

Testing the Model

The proposed model analyzes the economic gap as a gap in growth and as a gap in development. The assumptions have been re-stated earlier in this chapter[12]. The calculations follow the equations given in the model[13], with data from the National Accounts, labour statistics and similar sources[14]. No tables of numerical results are given in this chapter; these results have been charted in figures, in order to make them easier to examine. The tables of results are given in Appendix A.

The gap in growth assumes that there would be no change in productivity, that the capital invested would not affect the output-capital nor the capital-labour ratios, and that the source of expansion would be the increase in manpower, with a reciprocal increase in capital consistent with the assumption that productivity is constant. This gap, added to actual output, gives a measure which is called intermediate potential output.

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12 See above, pp. 186-90.

13 See above, pp. 179-91.

14 See Appendix A.

The gap in development assumes that there would be an improvement in capital deepening, provided the actual depreciation rate is high, that is, that investment demand has been inadequate in a substantial way. The rationale is that the economy would have been expected to invest more in relation to the depreciated capital. This might, in some instances, lower the productivity level, in such a way that the gap in development is negative. This result is explained by a fall in the output-capital ratio, which may indicate a modification in the methods of production and the productivity of capital. This fall in the potential output-capital ratio is the consequence of a sudden rise in the actual ratio[15]. Because the model has a built-in relation with actual performance, which makes it more realistic than a purely abstract model, this seemingly odd result (i.e. a negative development gap) is maintained.

Finally, the total gap is the sum of the gap in growth and the gap in development. Needless to say, this gap is "total" in a limited way, for it neglects many elements relevant to the gap, including the gap in progress, but which are not included because of conceptual and statistical inadequacies.[16]

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15 A high output-capital ratio, apparently expressing a good capital productivity, is more often a sign of low investment level and overuse of old machinery. In 1930-33, as in 1942-43, the ratio was high, but so was the depreciation rate, while there was a negative capital formation growth rate.

16 See above, pp. 174-78.

The Gap in Growth

The assessment of the gap in growth is determined by the estimate of potential employment, with the assumption that with a constant productivity capital must be adapted to available manpower (the contrary would mean that spare industrial capacity is formed). This is calculated at 0.98 of the potential labour force. The potential labour force is the sum of actual employment, plus actual unemployment, plus supplementary participants from the pool of non-participants up to a 0.585 participation rate, plus supplementary immigrants up to a 0.02 immigration rate[17].

The results, charted in Figure 1, depict two gaps: the gap between actual and potential labour force, and the gap between actual and potential employment. They indicate that the rate of growth of potential labour force is smoother than its actual counterpart, largely because of the steadiness of the participation and immigration rates. The labour force gap closes as the two rates increase. The employment

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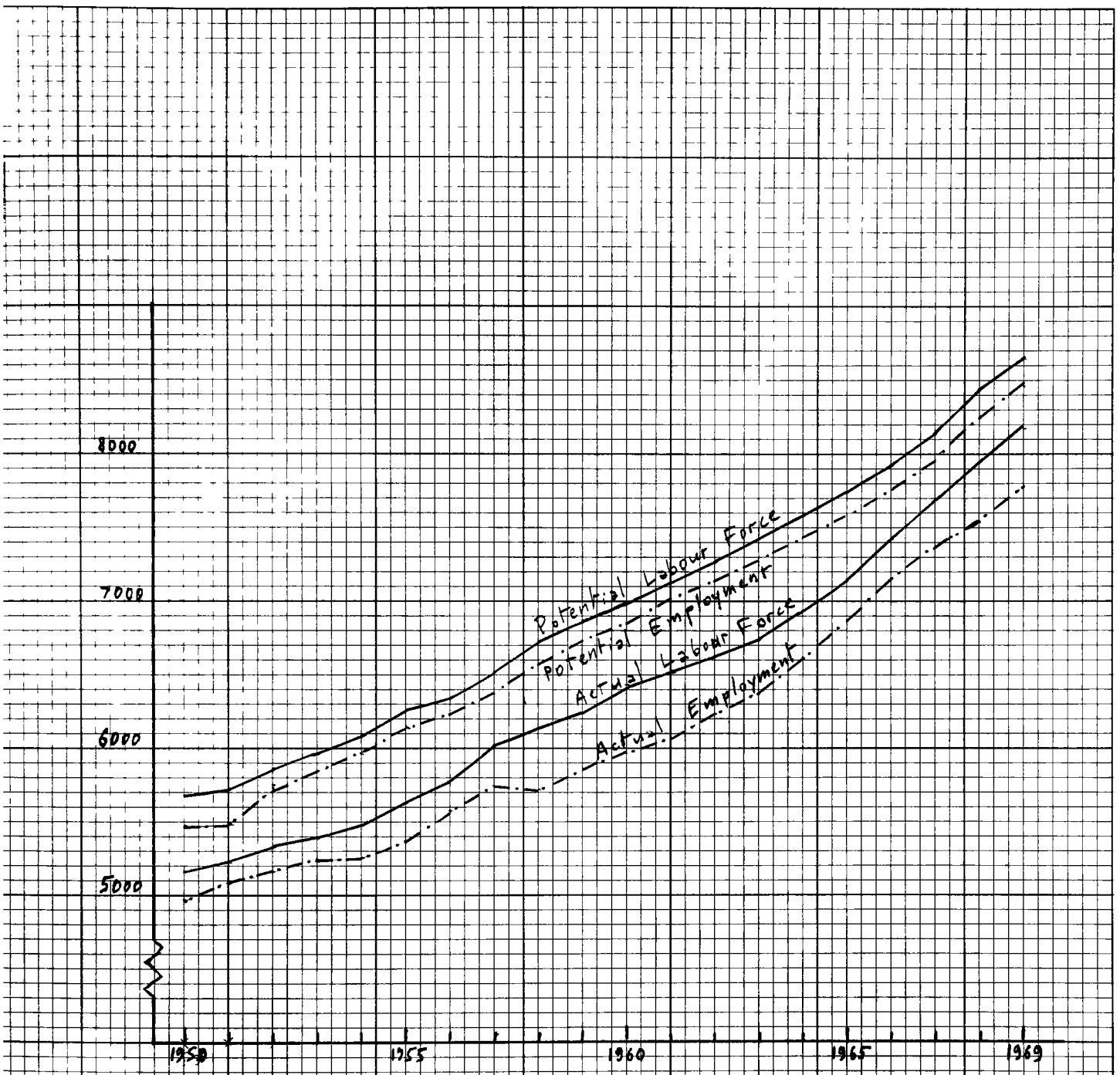
17 The possibility that some people leave the labour force as they become more affluent or as they go to training schools is diregarded. The immigration rate refers only to the immigrants that join the labour force. The likelihood of a decrease of emigration is not considered. By and large, it may be assumed that these eventualities would not affect significantly the result, or would be taken care of by the allowance for a potential unemployment rate of 0.02.

FIGURE 1: POTENTIAL LABOUR FORCE



SOURCE: Tables 2 and 8

gap varies with the unemployment rate, and with the labour force gap. The relationship between potential labour force and potential employment is constant, as $N' = 0.98.L'$. Figure 2 clarifies the situation by a comparison of growth rates, showing lags and leads. The year's growth rate of potential employment refers to the rate of growth in actual employment required in year 't' to attain potential employment in year 't + 1', and it shows the variations in the gap. It is the year's growth rate that carries the bulk of economic meaning, as it shows how the economic gap, as it widens or closes year after year, makes potential employment less or more attainable. The annual growth rate of potential employment, ceteris paribus[18], is the rate of growth as usually understood. If $\Delta N'$ is annual growth rate and $\bar{\Delta} N'$ is year's growth rate, then $\Delta N'_t = \frac{N'_t - N'_{t-1}}{N'_{t-1}}$ and $\bar{\Delta} N'_t = \frac{N'_t - N_{t-1}}{N_{t-1}}$.

The analysis is facilitated by a study of the components of potential employment. The employment, unemployment, participation and immigration gaps are the number of unused

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18 This means that it is assumed that full employment would not affect the birth rate nor adversely the willingness to work. If children are thought of as "consumer goods", it is possible that the birth rate would increase as people can afford large houses, child-care services, etc. But so many social, cultural, medical, religious, factors influence the birth rate that it appears safer to assume that the birth rate would be the same at actual and potential output.

FIGURE 2: EMPLOYMENT - GROWTH RATES

SOURCE: Tables 2 and 8

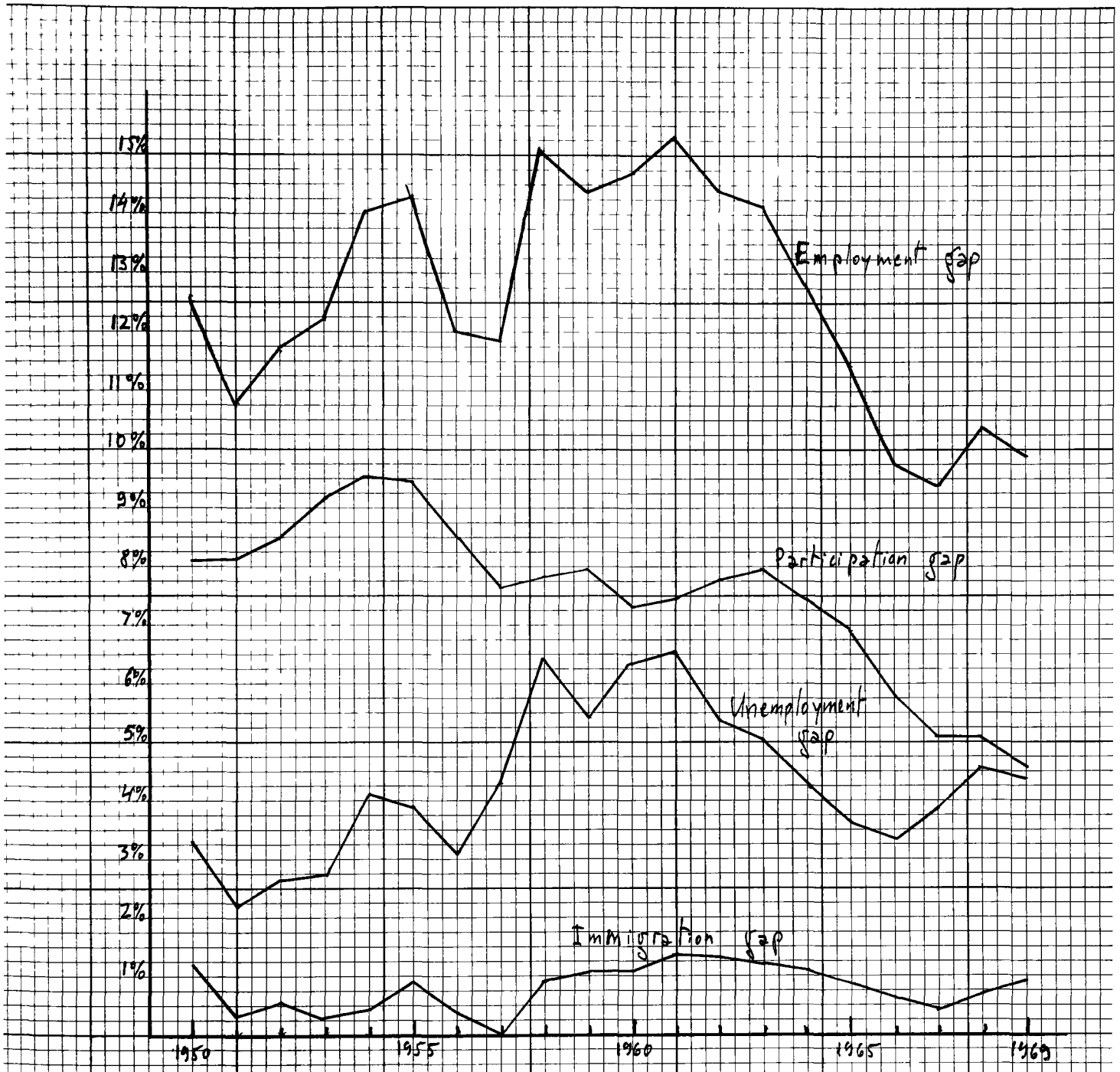
Remark: The year's growth rate is the rate required for actual employment to reach its potential. Other rates are annual growth rates.

labour inputs as a percentage of potential labour force. Figure 3 illustrate the composition of this gap in manpower. It shows that the unemployment gap preceded the immigration gap, and that they varied together. The large unemployment of the late fifties and early sixties, by depressing the labour market, kept the participation gap from declining during that period. The decrease in the employment gap in the sixties was largely due to an increase in participation.

These manpower gaps portray the variations and the reasons in the success or failure of the economy in making use of the available manpower, the size of which is shown in Figure 4. They are a cause, and partly a result, of the economic gap. But their trends have not only an economic significance, as they are influenced (and as they influence) by demographic, ethnic, social, geographical, etc, factors.

By applying these results to actual productivity, an intermediate potential output and a gap in growth are obtained. The levels of actual output and intermediate potential output are depicted in Figure 5. The gap in growth is shown by the space between both curves. It can be seen that the closing of the gap would have required actual output to grow faster especially in 1952-3, 1955-6, 1959-64 and in 1968-9.

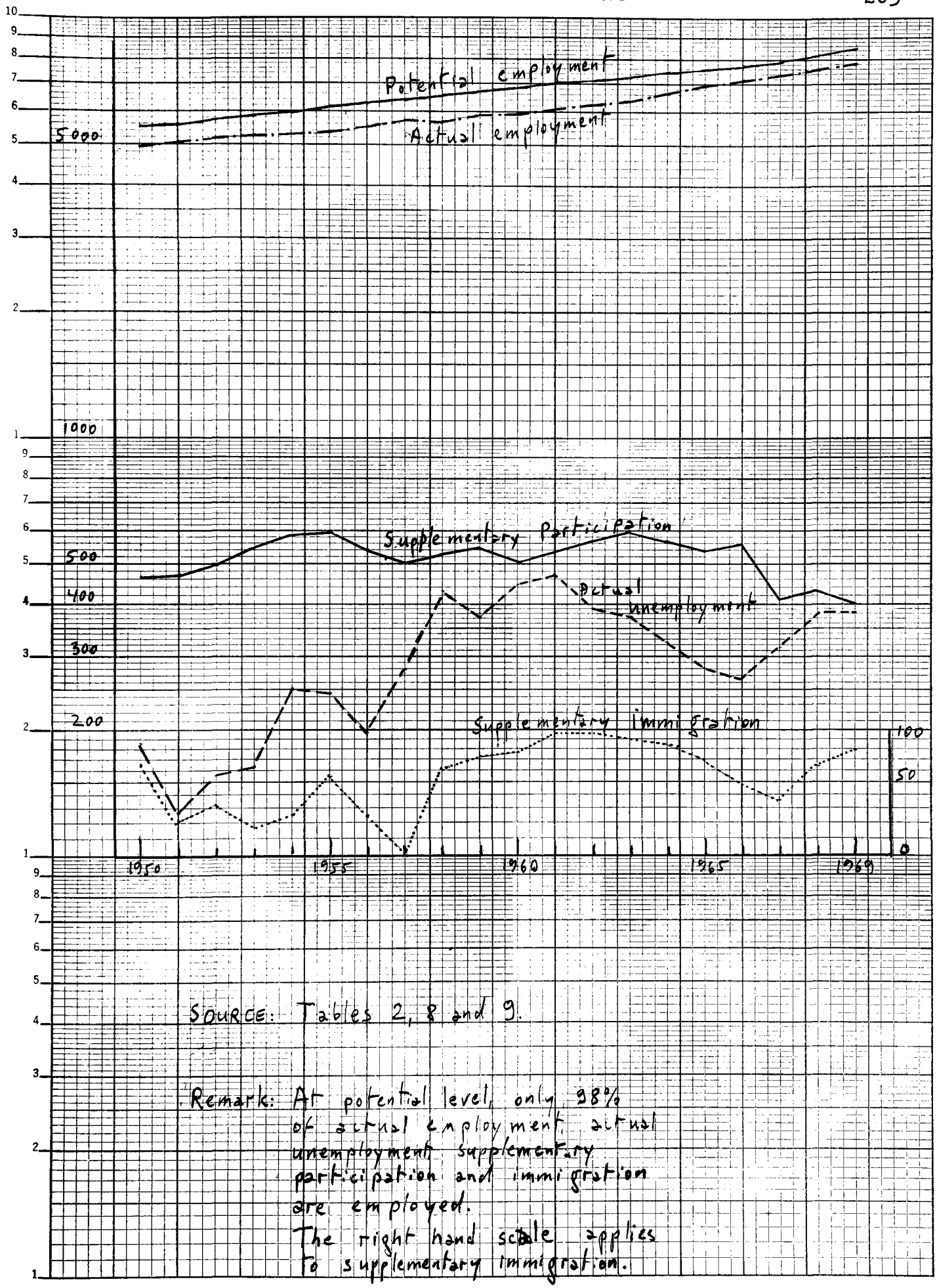
FIGURE 3: MANPOWER GAPS



SOURCE: Table 9.

Remark: The employment gap is the sum of the other three gaps.

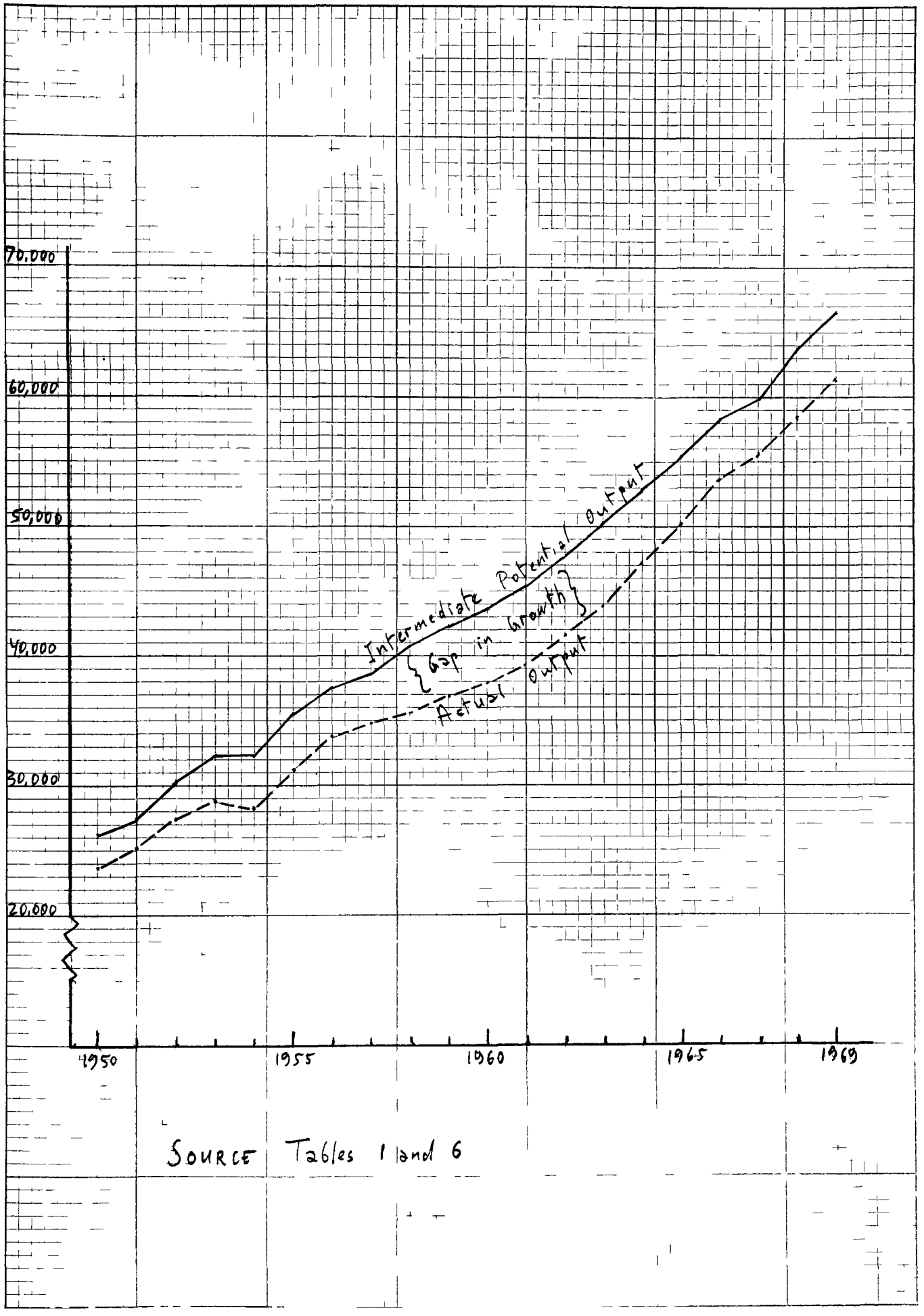
FIGURE 4: POTENTIAL EMPLOYMENT



SOURCE: Tables 2, 8 and 9.

Remark: At potential level, only 98% of actual employment, actual unemployment, supplementary participation and immigration are employed.
The right hand scale applies to supplementary immigration.

FIGURE 5: GAP IN GROWTH



SOURCE Tables 1 and 6

The Gap in Development

The gap in growth assumes that the level of productivity is not affected by a fuller use of resources. However, a contention of this study is that a higher level of investment, insomuch that it increases the capital deepening, would increase productivity, unless the output-capital ratio falls substantially[19]. Productivity is the product of the output-capital and capital-labour ratios. As the output-capital ratio cannot increase sizeably except with an unadvisable decrease in investment, capital deepening represents the main factor of productivity[20]. It is also the major factor of economic growth, for there are definite limits on the growth of employment; anyhow, the objective of growth is rather income per head, or working head, and not the growth level in itself.

The model produces three figures of potential investment: the investment required by the utilization of potential manpower, the investment required to increase the capital

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19 There are explanations for this. If investment is mostly in structures, long-term capital projects, replacement of equipment, and supposing that they affect less the general efficiency than investment in machinery, then the output-capital ratio, or productivity of capital, would fall, depressing the overall productivity level.

20 It has been understood throughout this study that additional deepening of capital implies new technology, innovations, higher education, and so forth. A logical outcome of the model is that the increase in development depends largely on the feasibility of decreasing the depreciation rate.

deepening to the level warranted by the depreciation rate (which is 0.5 at its potential level), and total potential capital accumulation, which is the sum of the two investment series, plus actual investment. These investment series are illustrated in Figure 6.

Every time the actual depreciation rate is higher than the potential rate, there would be a possibility of increasing the capital deepening. According to the data, this did not happen in 1952, 1953 and 1966. In these years, the actual investment level was either high, or followed a period of continuous large investment spending. The supplementary investment may be called innovative, in opposition to the required investment needed to keep the capital-labour ratio constant, and which is somehow a saving minimum.

Because the model keeps an interaction between actual and potential performance, a fall in actual capital deepening may cause a relative decline in the potential capital-labour ratio. This interaction between actual and potential performance conditions the interpretation of the potential growth rates. The year's growth rate of potential investment, for instance, has a high level in 1962 and a low level in 1967, meaning that an increase in investment of 47.70 % in 1961, and of 9.51 % in 1966[21], would have permitted the economy to

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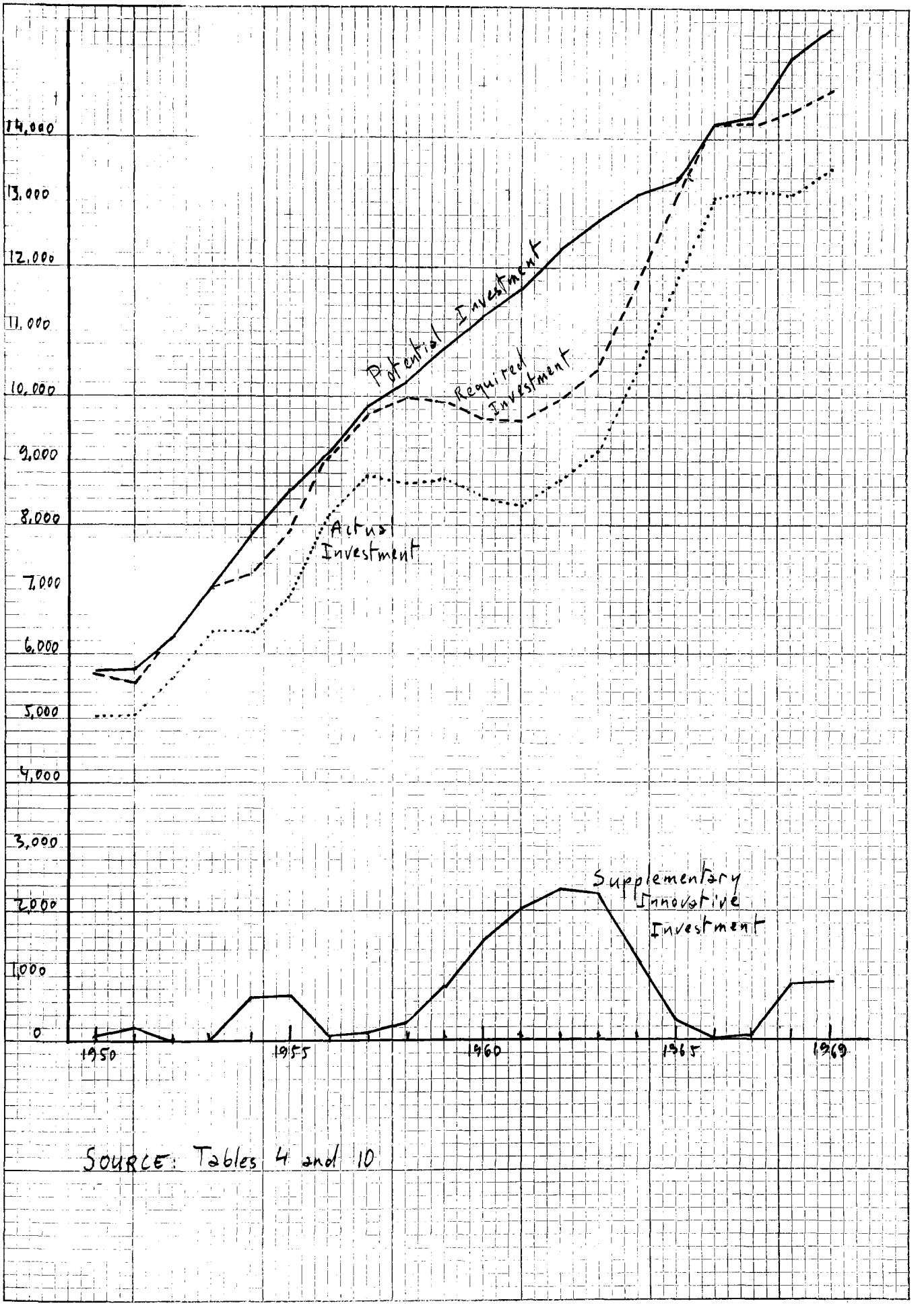
21 See Appendix A for the data. The year's growth rates are portrayed later in this chapter.

FIGURE 6: POTENTIAL INVESTMENT



SOURCE: Tables 4 and 10

reach its potential level in 1962 and 1967. The conclusion should not be that it is better to wait till the gap is low to endeavour to attain the potential level, because the estimated potential investment in 1967, according to the model, does not include the accumulated gaps in output of the previous years, which are assumed to be lost for ever. If there had been a tentative to close the gaps in 1961, the capital stock, the capital deepening, the level of income and saving, would have been in 1967 higher than they were, and the potential investment would have been different.

These investment series give a measure of potential productivity, and hence of the gap in development. As the productivity ratio used in the model equals output per employed person, that is, income per employed person, the potential productivity figures carry also a meaning of welfare.

Figure 7 illustrates the gap between actual and potential productivity levels, which is responsible for the gap in development. In 1951 and 1952, actual productivity exceeded potential productivity, causing a negative gap in development. In other words, the economy would have been unable to finance innovations at a level that would have compensated for a lower output-capital ratio[22]. A comparison

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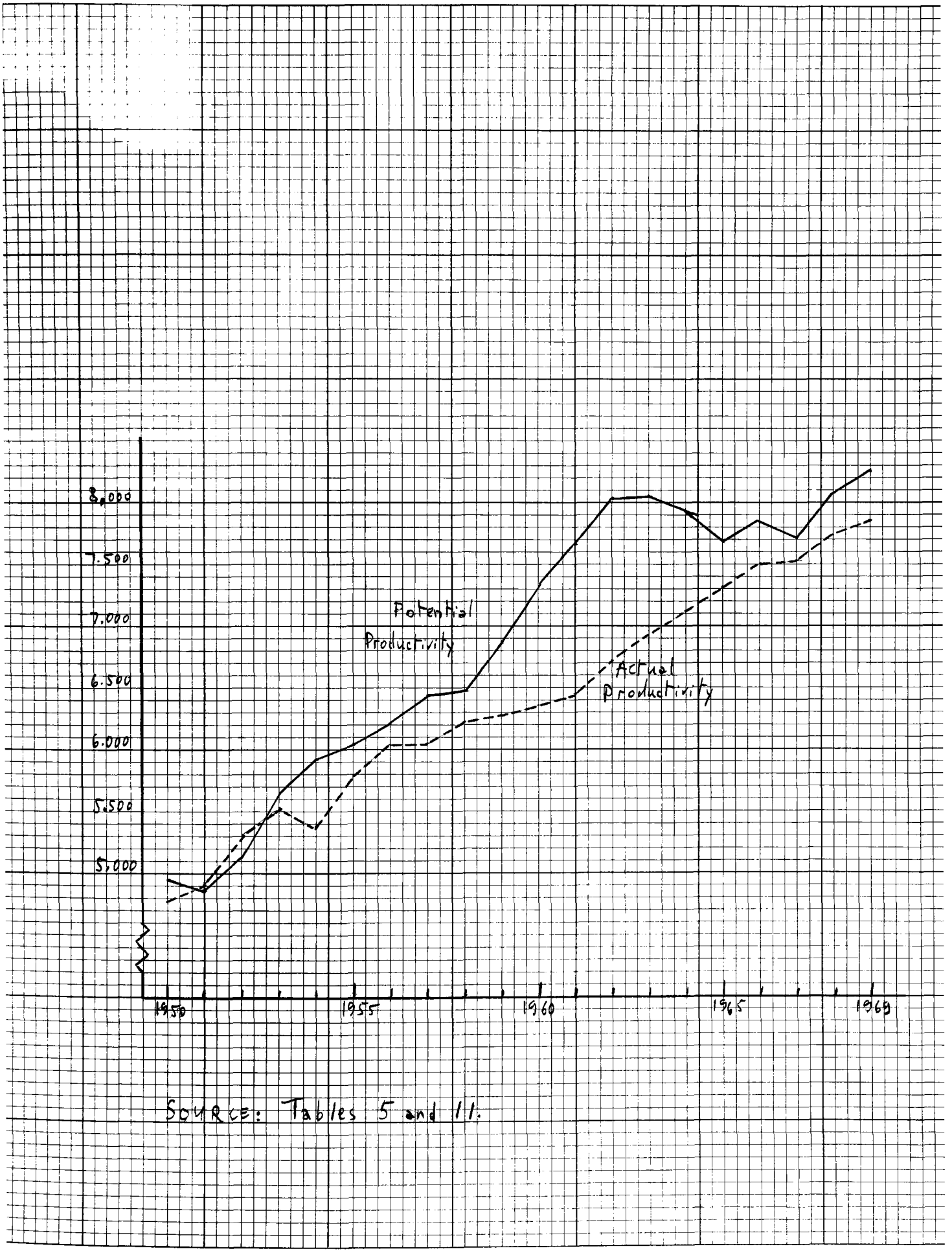
22 As indicated previously, the output-capital ratio may be smaller when the economy performs at its potential level than the actual ratio.

FIGURE 7: POTENTIAL PRODUCTIVITY



SOURCE: Tables 5 and 11.

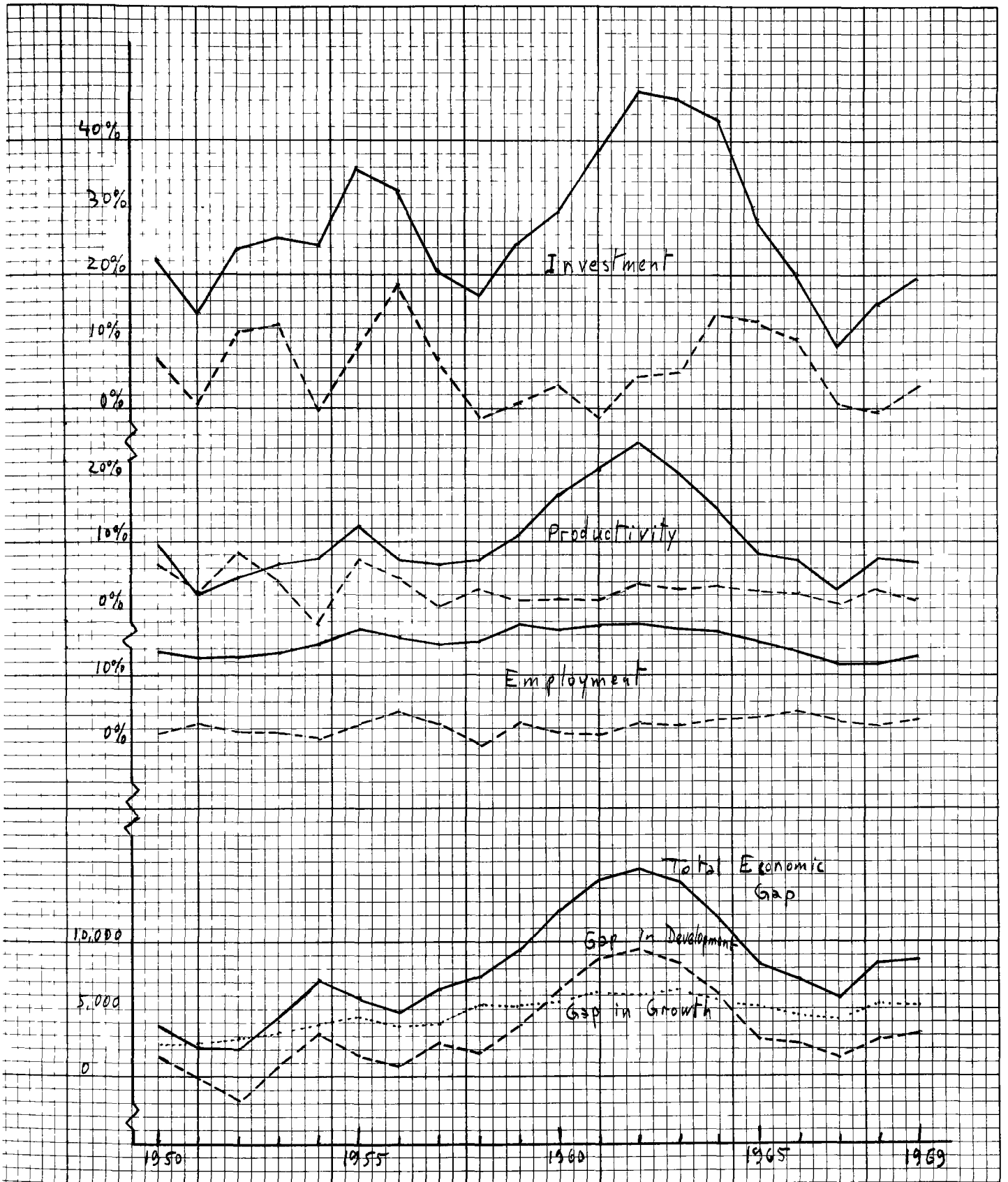
of the annual growth rate with the year's growth rate of productivity, employment and investment indicates how the economy gains or loses ground as the gaps in growth and in development narrow or widen. This is illustrated in Figure 8.

Potential Performance of the Economy

To repeat what has been said earlier, the model's gap in development is an aggregate figure that does not account for structural changes, and which disregards specific measurements of better use of capital and manpower, unless they are covered in the estimates of potential employment and potential productivity. Similarly, the concept of total gap is not really total, for it does not cover what the gap in development leaves aside, and it does not include the gap in progress. The terminology used here stands only in relation to the model formulated in the preceding chapter.

Adding the gap in growth to actual output, a figure of an intermediate potential output is obtained. Adding to it the gap in development, the total potential output is measured. These figures permit to evaluate the potential performance of the economy, and to compare it with the intermediate and the actual performance. The three paths are portrayed in Figure 9.

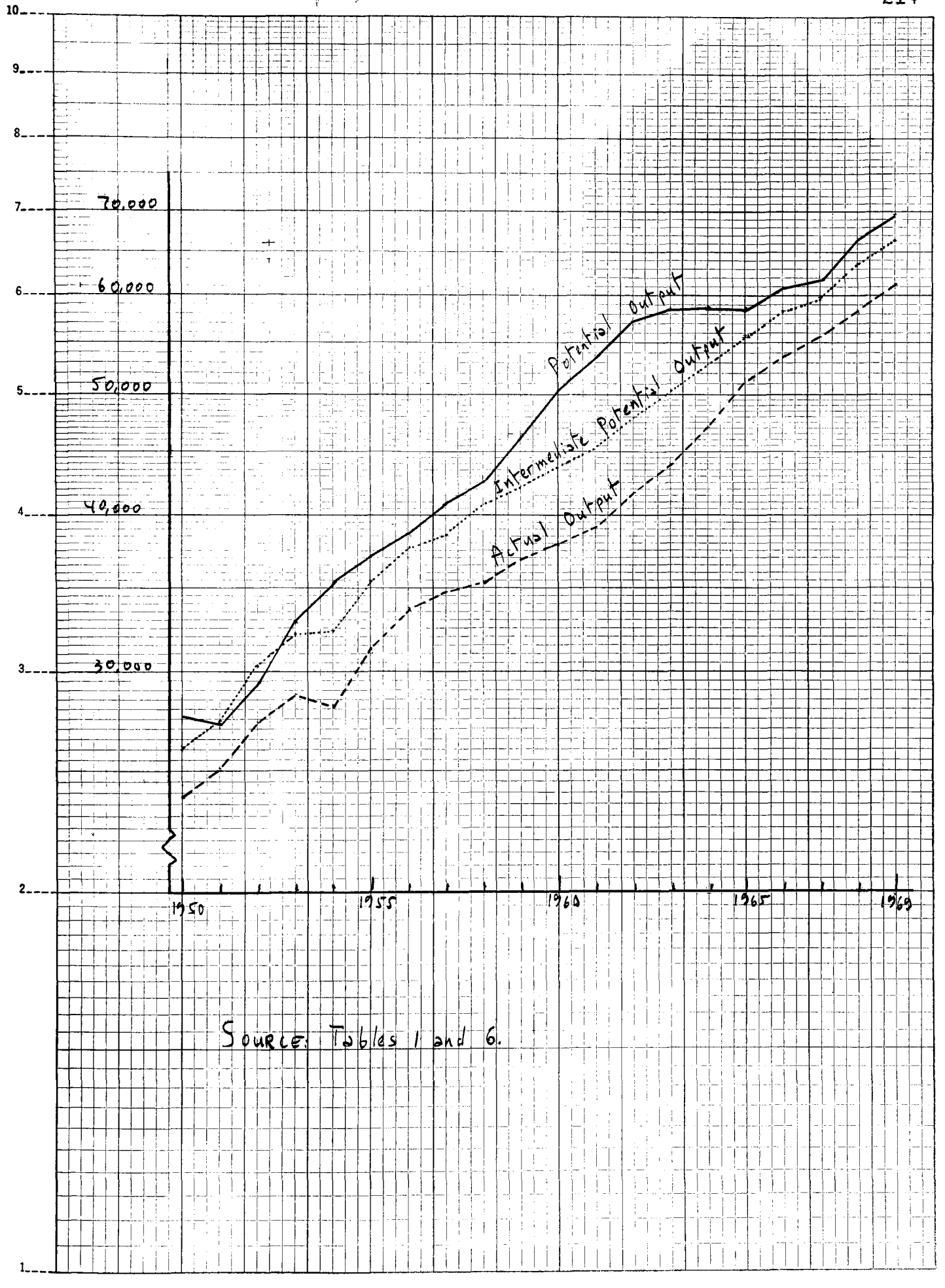
FIGURE 8: GAPS AND REQUIRED GROWTH RATES



SOURCE: Tables 2, 4, 5, 7, 8, 10 and 11.

Remark: Full line (——) refers to year's growth rate, required, and cut line (- - -) refers to annual growth rate, realized.

FIGURE 9: POTENTIAL OUTPUT

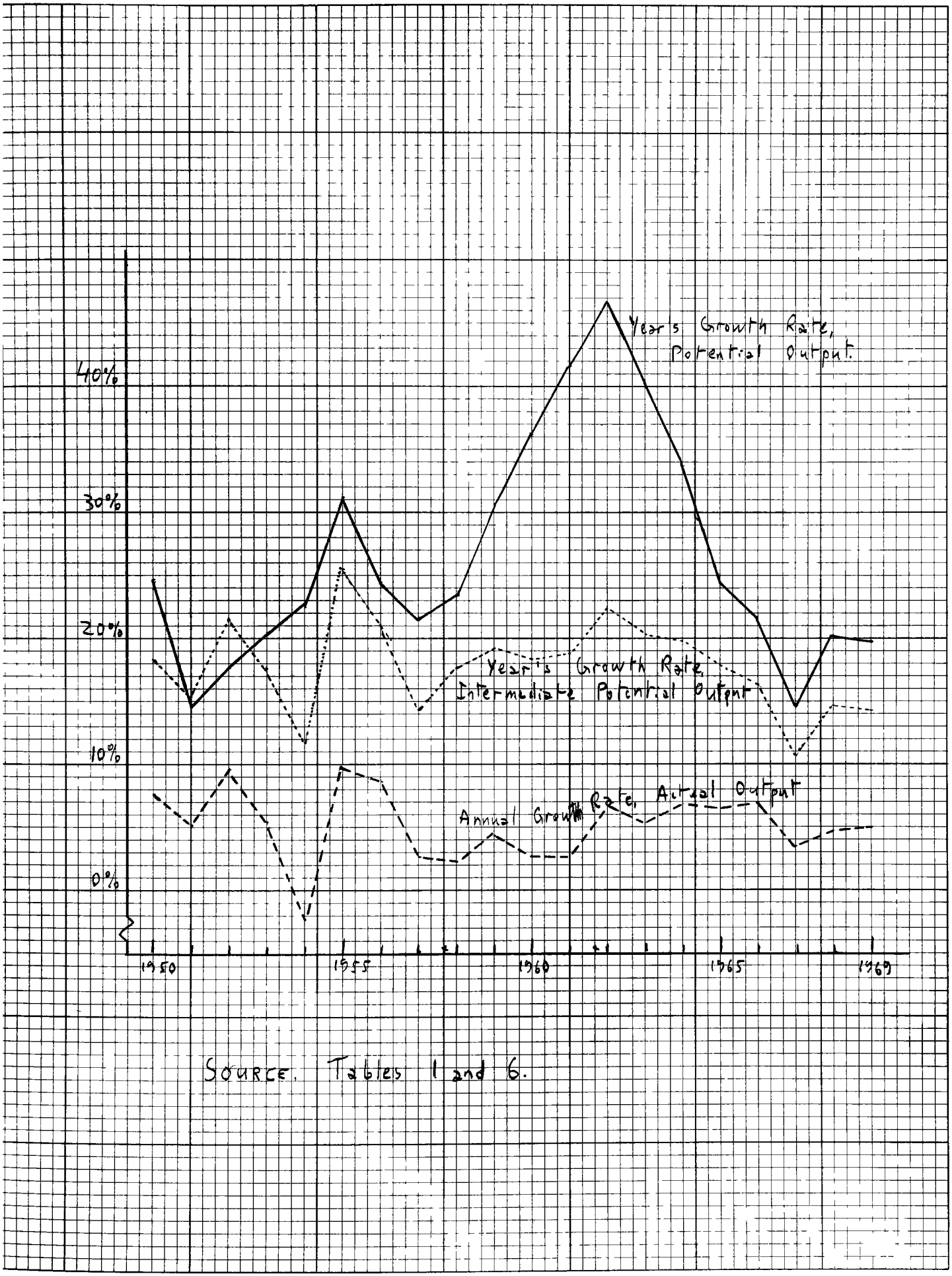


SOURCE: Tables 1 and 6.

These results can be analyzed through the year's growth rates, through the output gaps, and through the performance ratios. The year's growth rate of potential output indicates the variations of the increases in potential output, its level, and the actual growth rate of output. It could be expressed, in a more prosaic and less precise way, in such terms as: in 1955, the economy was $2\frac{1}{2}$ years behind its potential performance; in 1960, it was $4\frac{1}{2}$ years behind; in 1965, it was 4 years behind; in 1969, it was 2 years behind. As mentioned above, this is a study of every year's gap, without allowance for any accumulation of lost output. The comparison of these data is shown in Figure 10.

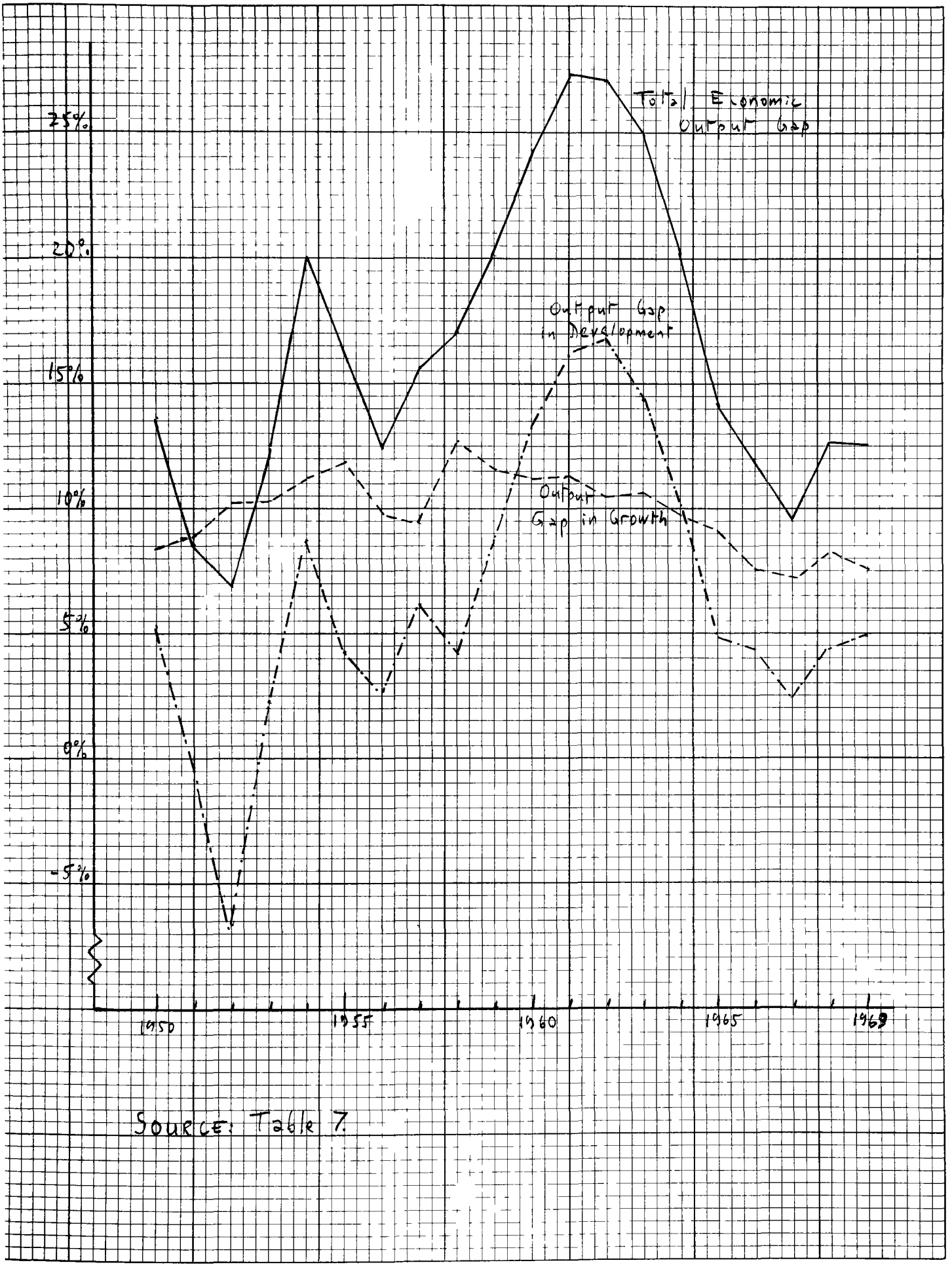
The gap series have been illustrated in Figure 8. Three output gaps can be distinguished, the output gap being the ratio of a gap to potential output: a growth output gap, a development output gap, and a total output gap, which is the sum of the two others. Figure 11 shows that the total output gap is affected by both of them, but that the development gap has a more intense effect. The growth, or intermediate, output gap refers to the utilization of inputs in breadth, while the development gap indicates inefficiency in their use, the conclusion being that increases in productivity are the major prerequisite for the closing of the gap, and that this requires more investment than which is needed to employ the potential manpower.

FIGURE 10: OUTPUT - GROWTH RATES



SOURCE. Tables 1 and 6.

FIGURE 11: OUTPUT GAPS



SOURCE: Table 7.

The performance ratios, depicted in Figure 12, show actual output in relation to intermediate and total levels of potential output. Clearly, the economy performed better in relation to the intermediate potential output, where the differential is due only to the manpower gap (and, of course, the required investment). But the more relevant figure is the performance as compared to total potential output, which includes increases in productivity that would have been possible if all resources had been fully utilized in the most efficient manner.

The results show that the performance of the economy was by no means satisfactory. From 1950 to 1969, the average performance in relation to the intermediate potential output was 89.38 %, and the average performance in relation to total potential output was 83.62 %. The latter figure indicates the potential performance ot the economy, which was as high as 91.48 % in 1951, declined to 80.05 % in 1954 (year in which actual output experienced a negative growth rate), rose to 87.53 % in 1956, then declined steadily till it was only 72.66 % in 1961, rose to 90.32 % in 1967, and started falling again[23].

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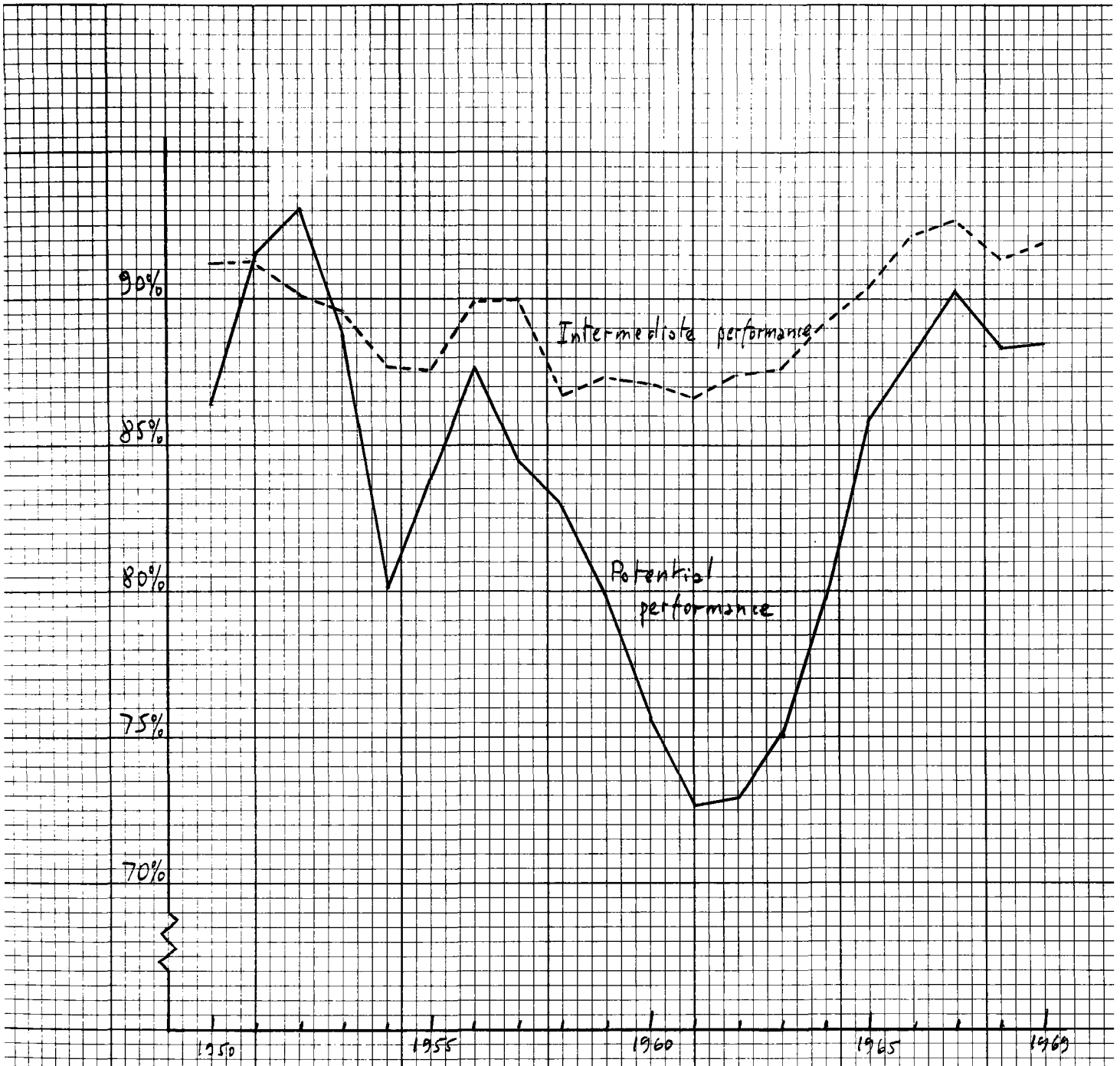
23 See Appendix A for statistical series.

FIGURE 12: POTENTIAL PERFORMANCE



Source: Table 12

Remark: The Performance is the ratio of actual to potential output.

Potential Gross National Expenditure

The total potential output series give two major data: potential output and potential investment. It is possible, with certain assumptions, to construct with them tables of potential Gross National Expenditure. The assumptions are as follow: (1) inventories are kept at 1.0 % of GNE; (2) exports equal imports (therefore, whatever their value, they need not be included in the tables)[24]; (3) total consumption equals output less fixed investment less inventories; (4) public consumption is determined by need rather than by means, therefore potential personal consumption equals potential total consumption less actual public consumption; and (5) public investment is determined by means and policy, and it can be assumed that potential investment would be divided among the private and government sectors in the same proportion than actual investment.

The tables are given in Appendix A, while Figure 13 illustrates the actual and potential components of GNE.

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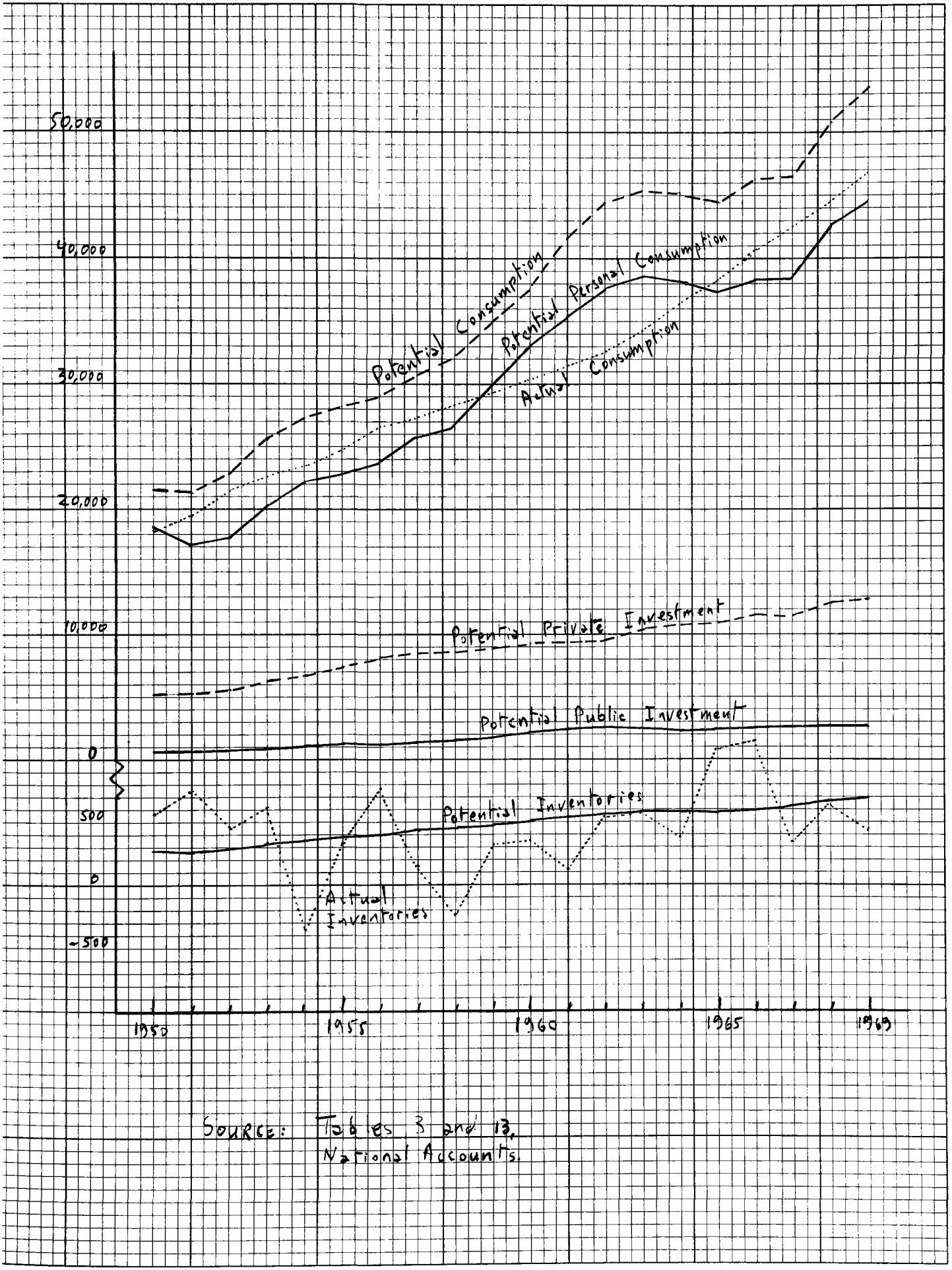
24 Except for two minor exceptions, Canada has been a net exporter from 1933 to 1949. The experience of the past years indicates that an "aggressive" export policy may increase considerably the level of exports, because of the large potential foreign demand for natural resources and manufactured goods that Canada can produce. Therefore, it is reasonable to assume at least a non-negative balance of trade. As for the potential level of exports or imports, it could be, according to Canadian experience, somewhere between one fourth and one third of GNE.



SOURCE: Tables 3 and 13, National Accounts.

The potential GNE tables may be used to estimate, in broad terms, some measure of potential welfare. The gap in welfare requires a special analysis, which has been outlined and discussed earlier[25]. What is suggested here is not in line with such analysis, but follows the assumption that some indication of unattained welfare is given by the consumption gap, supplemented by the public investment gap.

For social welfare purposes, the aim of economic activity is not to provide income or output as such, but consumer goods and services. Capital goods, like income, are "intermediate" goods; in terms of savings, they are foregone goods. Their purpose is to make possible the output of more consumer goods. The consumption gap, that is, the ratio of actual to potential personal consumption, expresses a gap in welfare.

Public investment are partly a spending on "intermediate" goods, like business investment. However, most of it has the public welfare as aim, in opposition to profits. Investment in roads, schools, hospitals, parks, betterment of the environment, help maximize social welfare. As the failure of the economy to perform at its potential level implies a failure of government to invest in public projects

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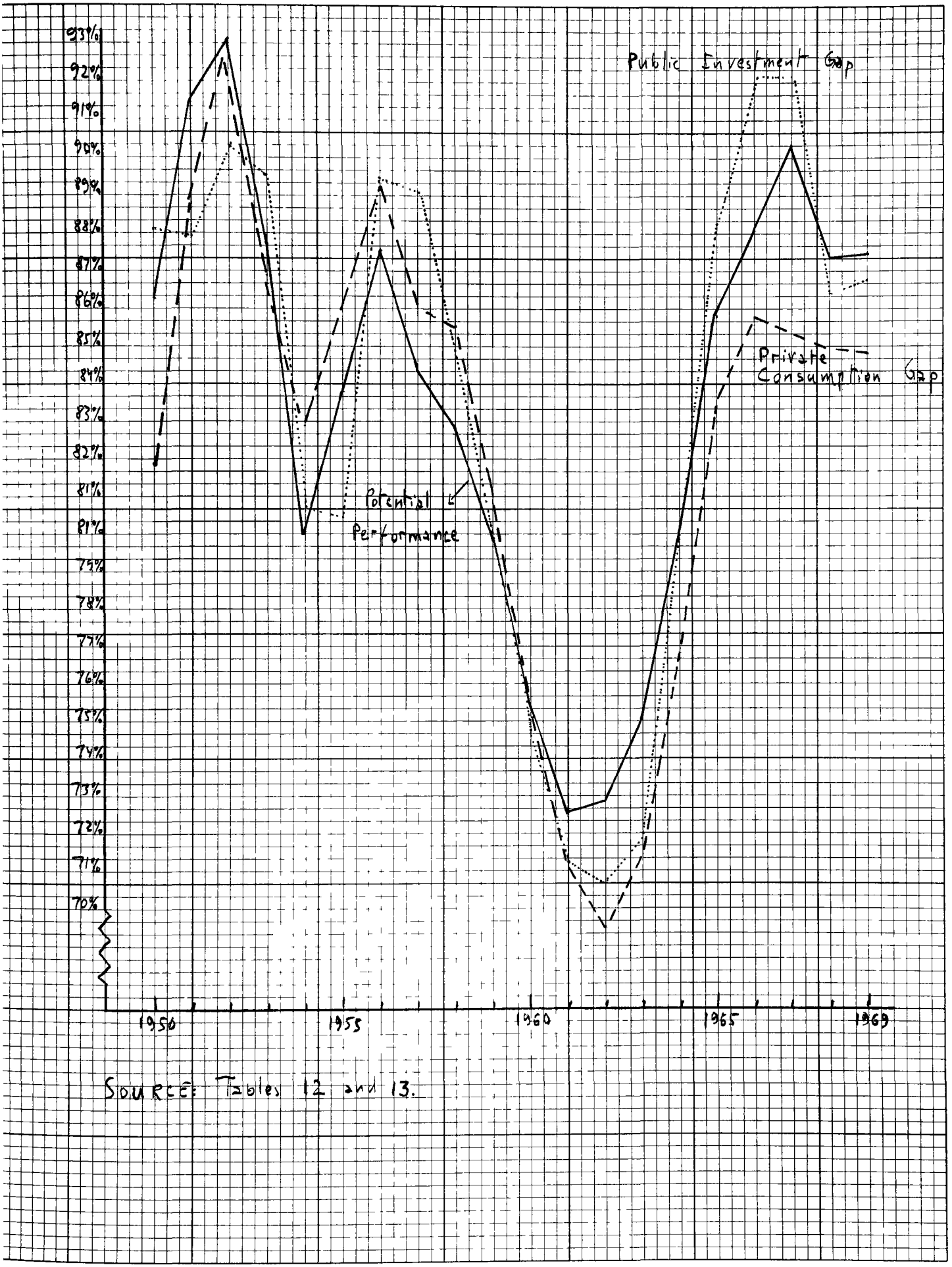
25 See above, pp. 109-22.

as much as it could have, the consumption gap may be supplemented by a public investment gap. It would have been possible, likewise, to include a housing gap, by comparing actual residential construction with potential residential construction. However, this would have required a specific study of housing needs, which was outside the limitations of this thesis. The model allows the gap to be closed with whatever goods and services are desired, within the assumption that no major changes be made in the structure and the input-output mix of the economy. But disaggregated studies require particular assumptions for specific sectors and areas.

Figure 14 illustrates the two welfare gaps together with the potential performance of the economy. They indicate that the welfare gaps vary together, and in line with the performance of the economy. This justifies the assumption that the economic gap, which is concerned with economic growth and measured in output terms, is also a gap in welfare, and that a maximization of social welfare should be made via some maximization of GNP. The results show also that the public investment gap tends to be more intense than the consumer gap, which shows somehow less variation, though this relationship cannot yet be stated as conclusive.

FIGURE 14: WELFARE GAPS



SOURCE: Tables 12 and 13.

The Gap in Selected Years

The model has been applied, tentatively, to the years 1926, 1929, 1934, 1939, 1944 and 1949. The results are given in Appendix A, and they are charted in Figures 15 to 18. These results, however, are not as reliable as the figures for the period 1950-1969. This can be explained. For example, the actual depreciation rate has been excessively high as compared to the last two decades: 0.7025 in 1926, 1.4105 in 1934, 1.1172 in 1944. By using a potential depreciation rate of 0.5, which is sound for the 1950-1969 period, the potential investment, the capital-labour ratio, the productiviy, have been certainly overestimated. The output-capital ratios were high in those years, though the potential ratios followed suit, because of the use of a five-year-moving average to estimate them. Before 1947, no data was gathered on the amount of immigrants that intended to join the labour force. Therefore, it was estimated that 50.73 % of them did so, which is the average rate from 1947 to 1969. The actual participation rate was also high, reflecting needs and attitudes different than in later years. For such periods of "disorderly" economic performance, like the depression and the war, it might be more realistic to consider the gap in growth rather than the total gap as a measure of lost output.

FIGURE 15: POTENTIAL OUTPUT - SELECTED YEARS

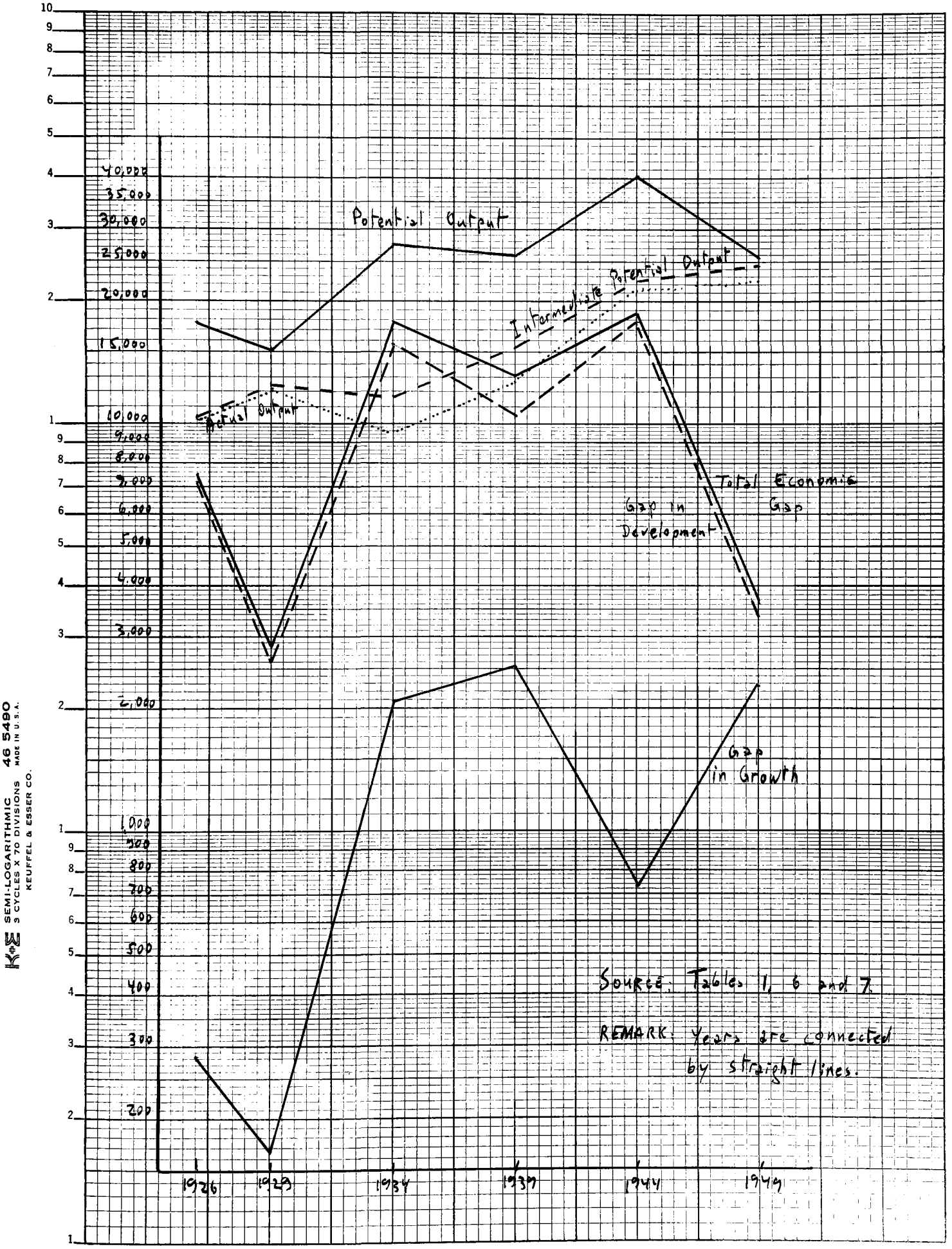
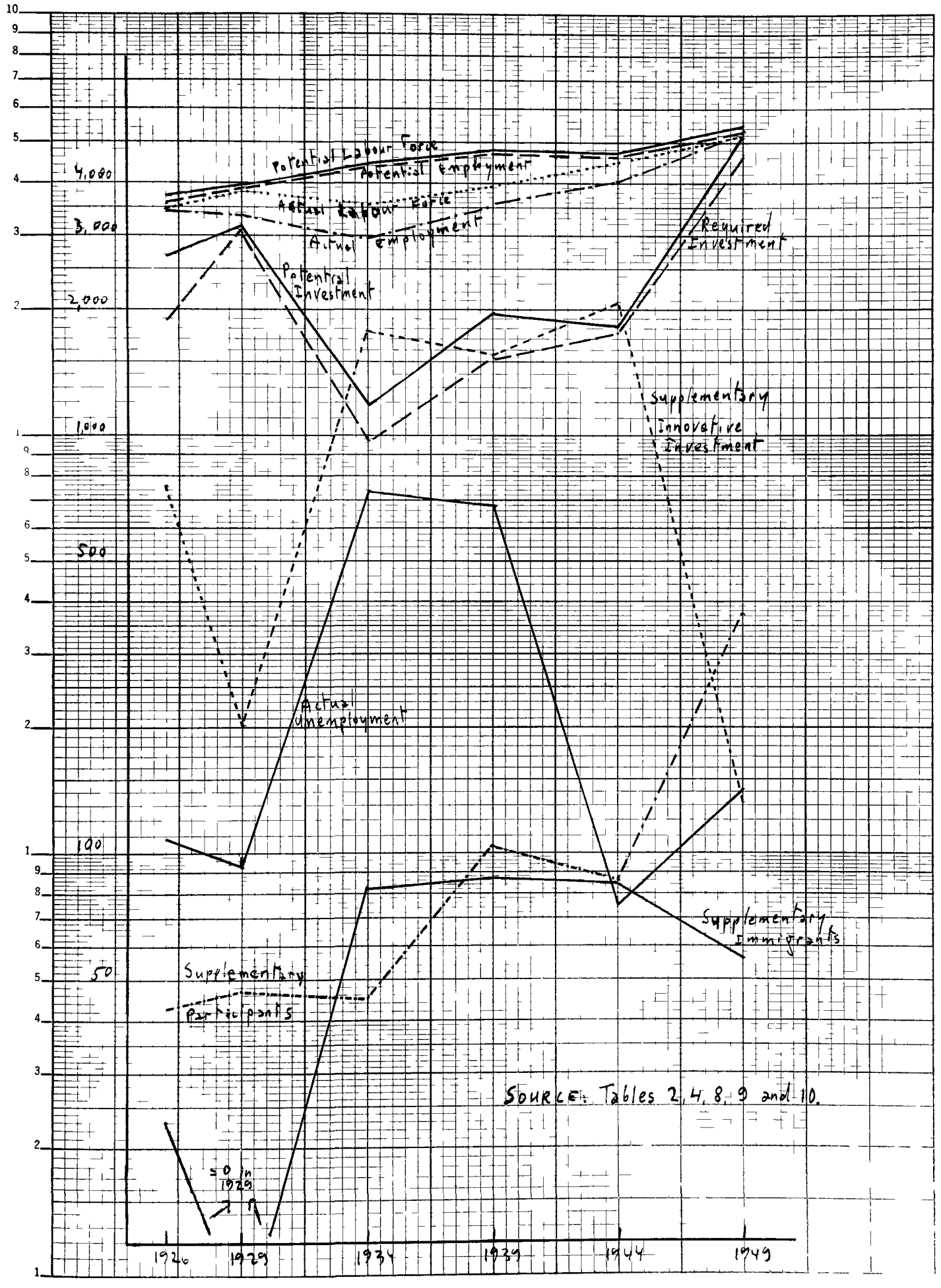
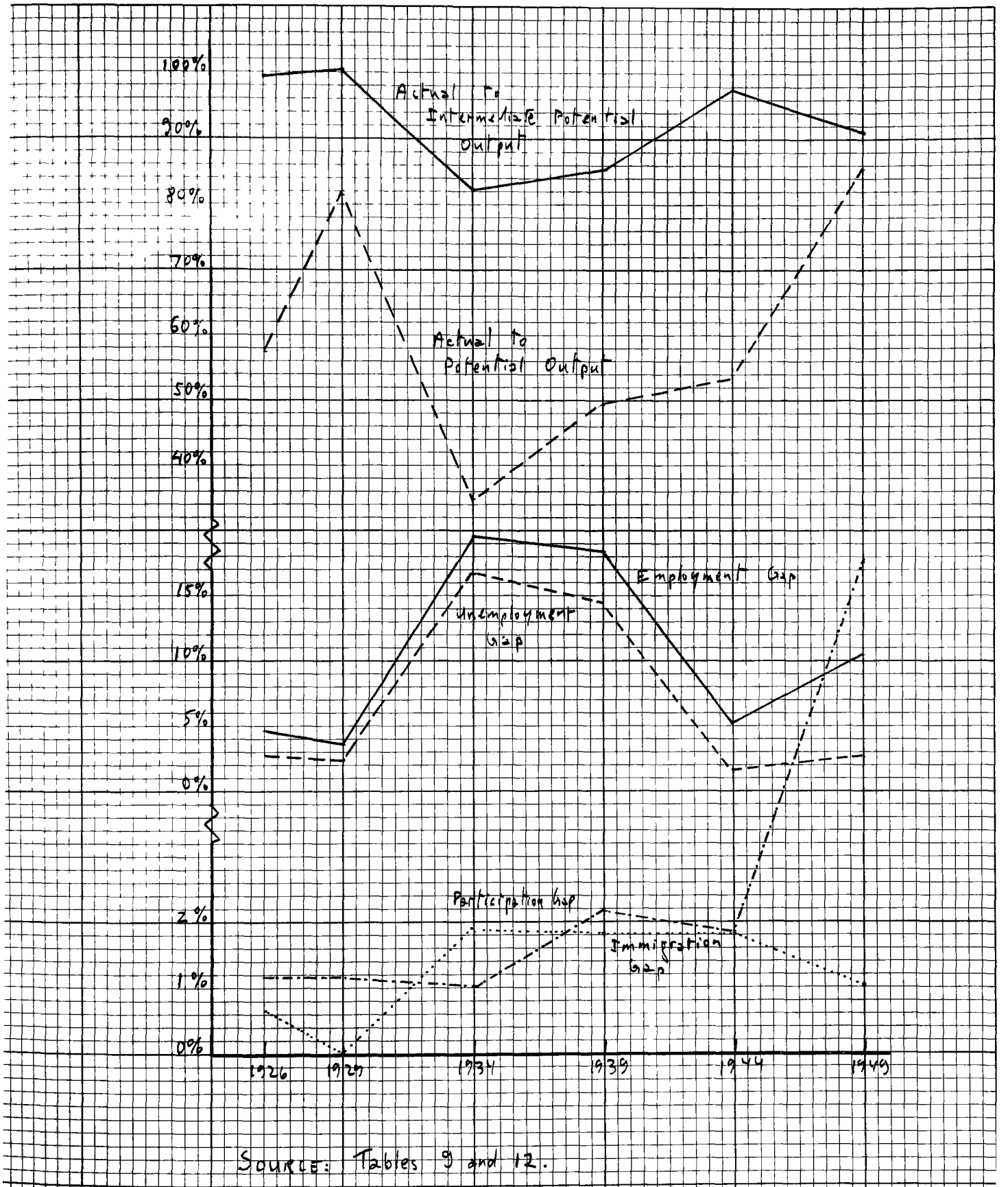


FIGURE 16: POTENTIAL INPUTS - SELECTED YEARS



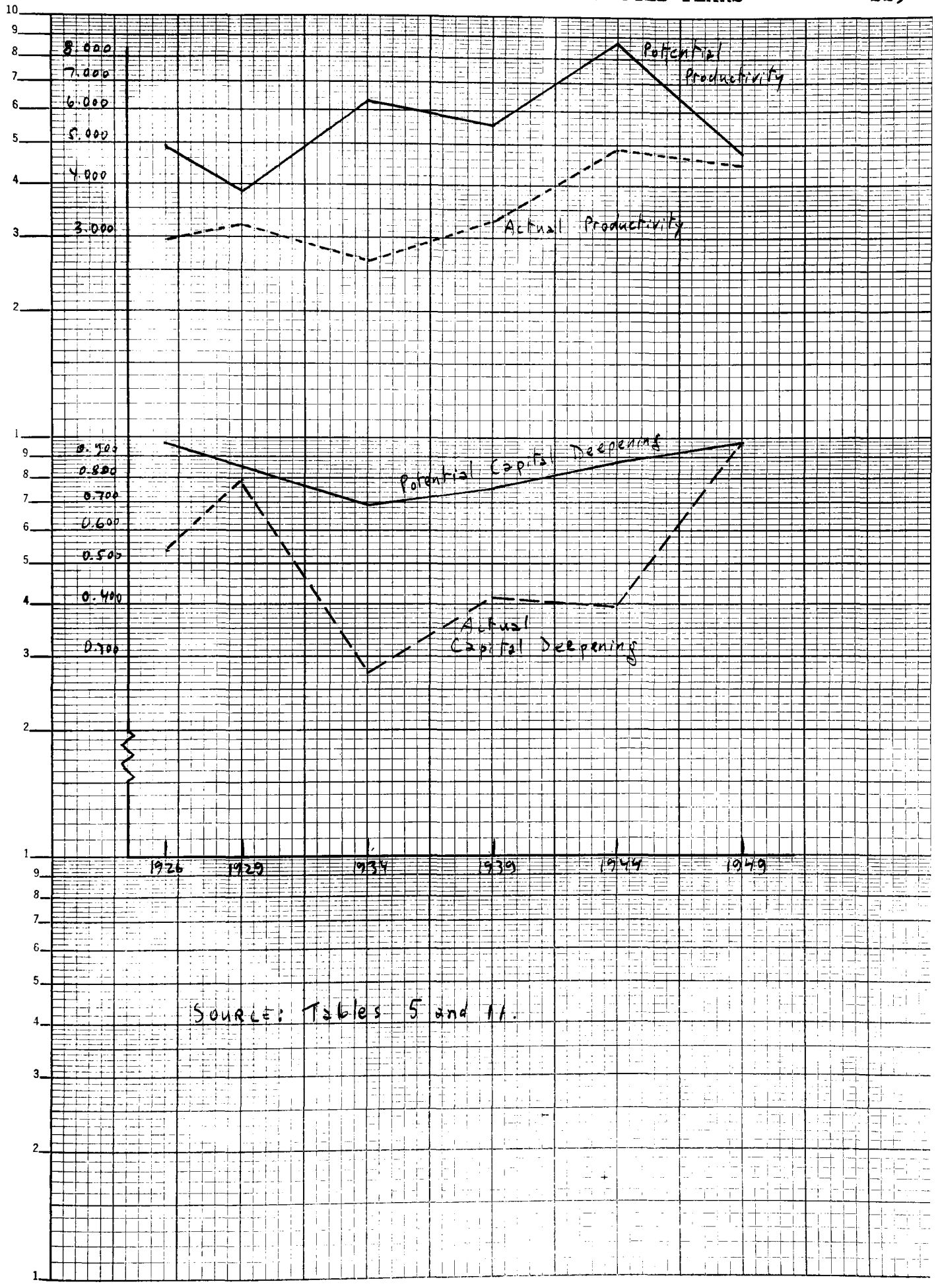
SOURCE: Tables 2, 4, 8, 9 and 10.

FIGURE 17: MANPOWER GAPS AND PERFORMANCE - SELECTED YEARS



SOURCE: Tables 9 and 12.

FIGURE 18: POTENTIAL PRODUCTIVITY - SELECTED YEARS



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SOURCE: Tables 5 and 11.

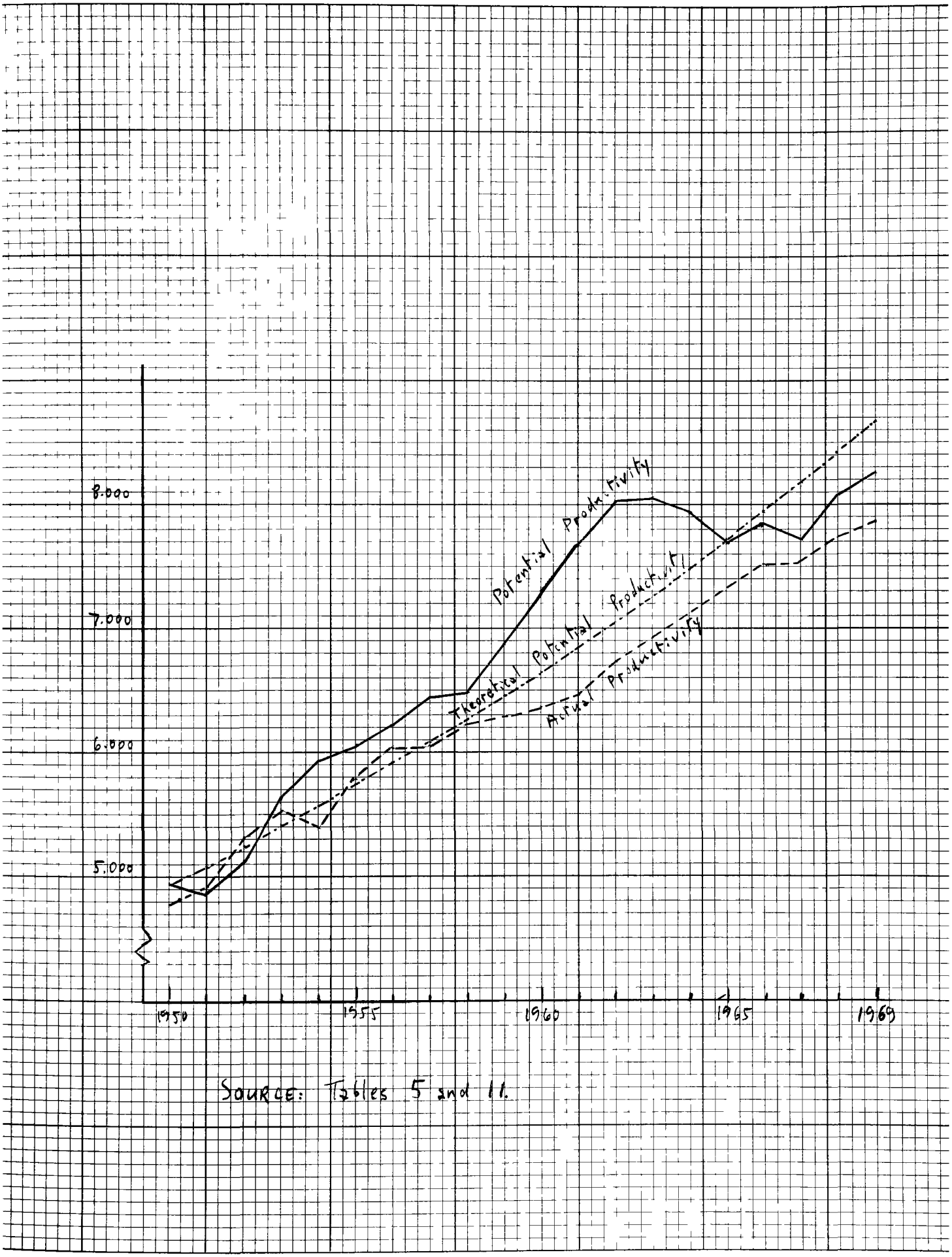
A Theoretical Gap Series

The model of the gap which was used in this chapter has a built-in interaction with actual performance of the economy, mainly through the treatment of the capital-labour and productivity ratios. On a theoretical basis, it is possible to evaluate a potential output within an abstract context of steady growth. It is meant by steady growth not growth in output, but growth in output per employed man, assuming that employed persons, in terms of need, are a better measure than output per capita.

A gap series has been constructed by using potential employment figures for 1950 to 1969, and an annual increase of productivity of 3.00 %, starting from actual productivity in 1950. Theoretical figures of potential investment have been obtained by assuming that the potential output-capital ratio would be the same five-year moving average of the actual ratio.

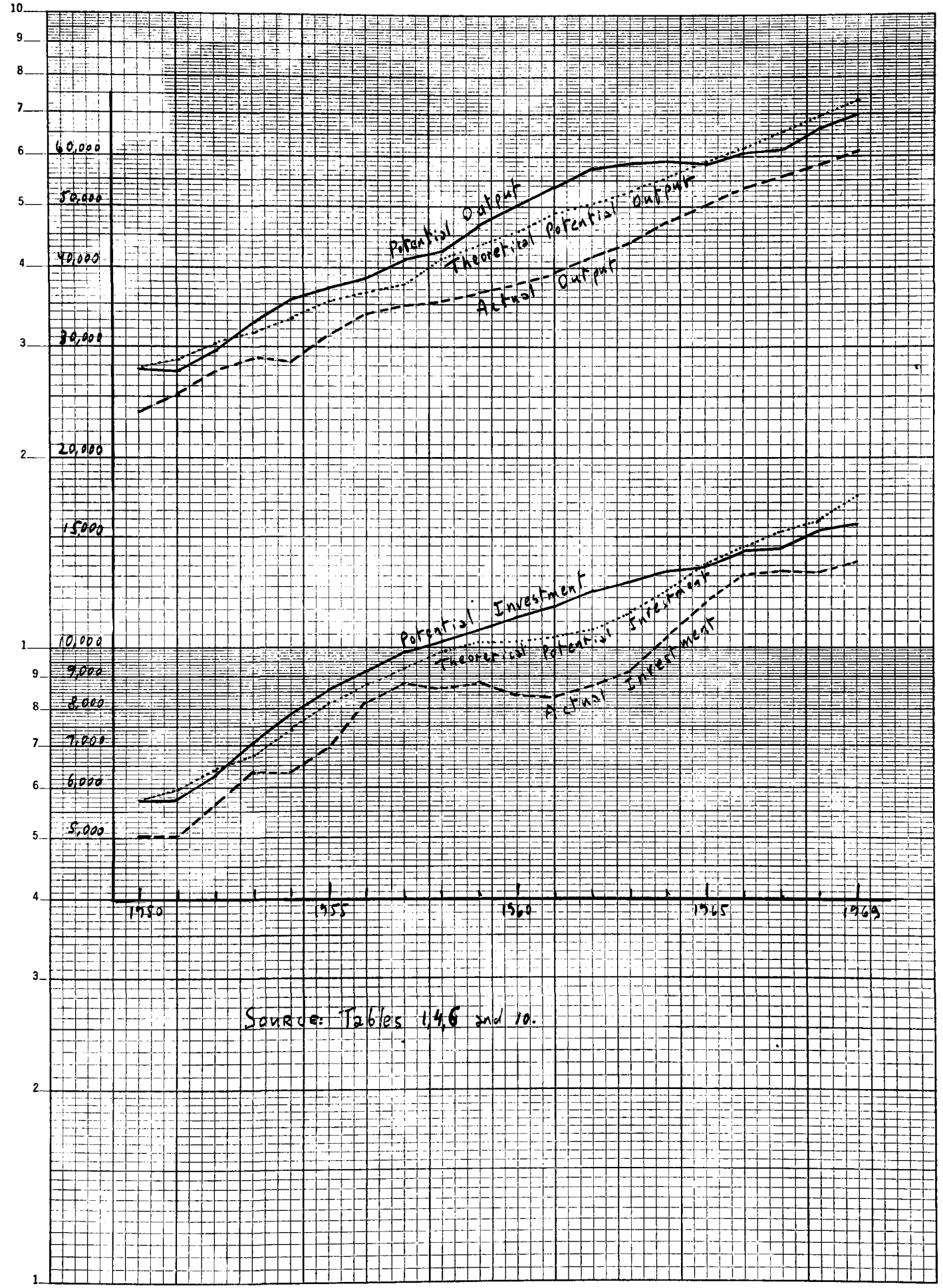
This theoretical series indicates that a moderate yearly increase in productivity, as depicted in Figure 19, would produce a rather high and steady growth rate in output, requiring only a moderate annual increase in investment (below 6.00 % per annum for the period 1950-1969). This illustrates the benefits of steady growth, as shown in Figure 20. In the long run, the theoretical potential output would consistently be higher than both actual and potential output: if the constant productivity had been 4.00 instead of 3.00 %, the whole theoretical potential output curve would have been pushed upwards.

FIGURE 19: THEORETICAL POTENTIAL PRODUCTIVITY



SOURCE: Tables 5 and 11.

FIGURE 20: THEORETICAL POTENTIAL OUTPUT



Source: Tables 1, 4, 6 and 10.

Comparisons with Other Estimates

Potential Manpower. Figure 21 illustrates the employment gap as estimated by Drabble, Tandan, and the model used in this analysis[26]. The figures are not comparable, because the assumptions are different in each case. Drabble considers only the unemployment gap, and Tandan only the unemployment and participation gaps, while the model adds the immigration gap. The unemployment gap used in the model equals the actual number of unemployed, with the 0.02 unemployment rate beeing taken subsequently off the potential labour force; Tandan's unemployment gap equals the number of unemployed less the trend-adjusted number of unemployed in his Ontario base periods. The model's participation gap is derived from a direct extrapolation between actual an potential participation rates, while Tandan uses a more complex method which includes actual population and target participation and employment rates per age-group in every year.[27] Nonetheless, the trends of the series may be compared, with an assessment of the tendency to overestimate or underestimate the figures.

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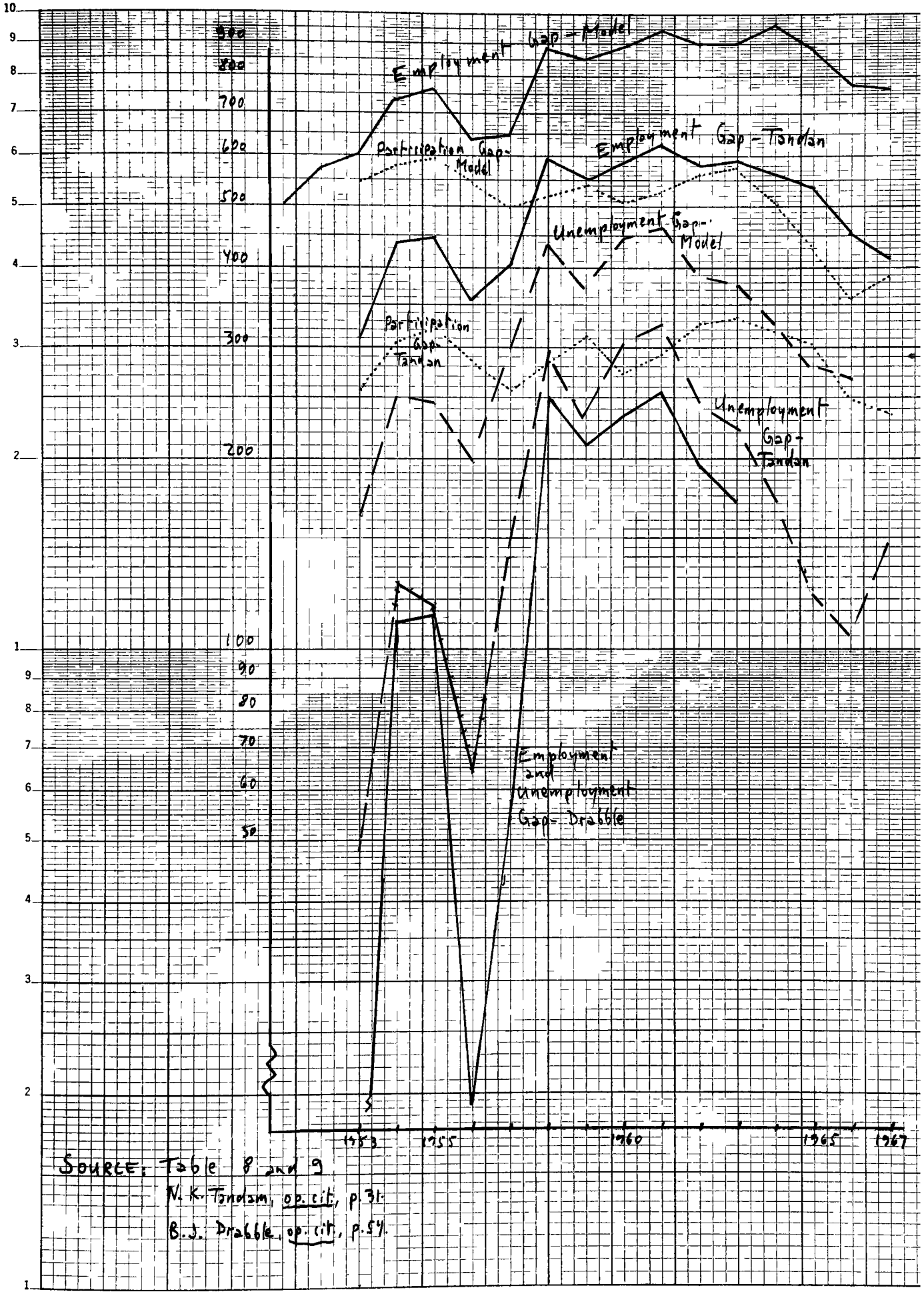
26 For the data, see Appendix A. See also B. J. Drabble, op.cit., p. 54, and N. Tandan, op.cit., p. 31.

27 For Tandan's methodology, see N. K. Tandan, op.cit., p. 29.

FIGURE 21: POTENTIAL MANPOWER - COMPARISON



SOURCE: Table 8 and 9

N. K. Tandan, op. cit., p. 31.

B. J. Drabble, op. cit., p. 54.

Potential Output. Different estimates of the performance of the economy, that is, the ratio of estimated potential to actual output, are given in Figure 22. These results cannot be directly compared, because of the differences in the assumptions. Okun extrapolates potential output from the unemployment rate. Drabble uses the unemployment rate and a trend figure of productivity. Wilson and Lithwick utilize a production function with estimates of potential employment and capital stock. The Peak method is an extrapolation from two years (1956 and 1966) of assumed full employment. The model's potential output is the result of other assumptions, while the model's intermediate potential output considers only the manpower gap, and the model's theoretical potential output assumes a contant rate of productivity[28].

It can be seen that the trends are not dissimilar, and that difference stem mainly from the different assumptions. As to whether one author has more "correct" estimates, this is a question of defining potential output in restrictive or broad terms, which in turn is a question related to the use the series are put to. The results of the model are in line with the comprehensive definition given to potential output, and provide significant findings for the analysis of the gap.

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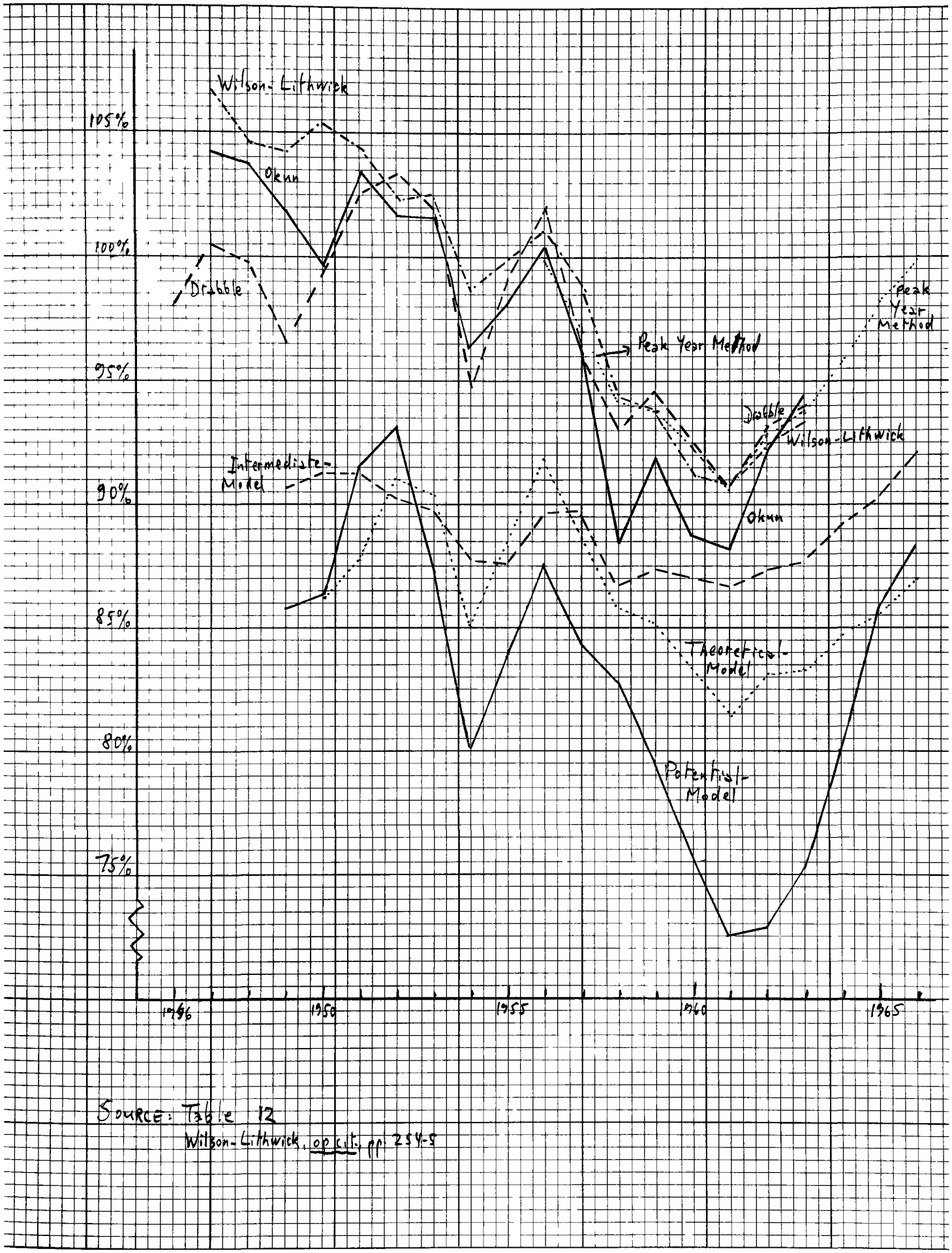
28 For statistics and sources, see Appendix A and T. Wilson and N. H. Lithwick, op.cit., pp. 254-5.

FIGURE 22: POTENTIAL PERFORMANCE - COMPARISON



Source: Table 12
Wilson-Lithwick, op cit. pp. 254-5

CHAPTER 8: CONCLUSIONS

Review of the Findings

Manpower and the Gap. This study shows that the level of unemployment is not a satisfactory measure of the gap, not only because it disregards potential changes in productivity, but also because the potential labour force is larger than the actual labour force. The assumption that the potential labour force should include supplementary participants and supplementary immigrants appears to be proven, to some extent, by the interactions between these components and the unemployment rate[1]. A high level of unemployment depresses both the rate of immigration and the rate of participation[2]. Consequently, better economic conditions, as they create employment opportunities, draw manpower not only from the unemployed, but from the two other groups: more people participate, and more immigrants of working age settle in the country. If the unemployment rate was the only indicator of manpower utilization, an increase in employment would mean a reciprocal decrease in unemployment. The analysis indicates that unemployment may remain large with a narrowing of the gap, when the participation and immigration rates increase.

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1 See above, figures 3 and 4.

2 Okun assumed that the participation rate would be unrelated to the unemployment rate. See above, p. 29.

The rate of growth of potential employment gives a more uniform trend than the rate of growth of actual employment[3]. Both are affected by what are mainly demographic changes; but actual employment responds to variations in unemployment, participation and immigration, while potential employment is a constant proportion of potential labour force. Changes in unemployment depend on relative changes in the growth rates of labour force and employment. The study clarifies this mechanism by introducing the concepts of participation and immigration gaps, which indicate the factors, other than unemployment, that affect the employment gap.

Capital and the Gap. The model considers that, directly or indirectly, at a macroeconomic level[4], increases in output per employed person are due to increases in capital (and demand). Investment has two functions: to keep the level of productivity from falling, and to increase it. The two cases are different: in the former, investment can be simply replacement capital, or new capital as productive as the existing one; in the latter case, investment must be innovative, and promote capital deepening.

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3 See above, Figure 2.

4 Productivity may increase by, say, harder work, better management, less waste. But productivity at a macroeconomic level depends on the incidence of productivity improvements at the microeconomic level, and generally increases in efficiency follow investments that set up new production functions.

The findings indicate that, as expected, the manpower gap could be closed with appropriate investment. But entrepreneurs are more interested in innovations than in full employment[5]. Therefore, full employment of men requires the closing of the development gap. As there is already some innovative actual investment, the required supplementary investment is equal to potential investment less non-innovative investment. As far as potential investment is concerned, innovative investment varies inversely with non-innovative investment[6].

In relation to the total gap, investment appears as a determinant factor, which plays a large role in employment trends[7]. Moreover, it conditions the whole gap because of its effect on productivity. Aggravations and improvements of the gap are closely related to the manpower gap, but more intensively to the development gap, which is really an innovative-investment gap[8].

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5 It is more profitable, for example, to train a specialized worker to use a more sophisticated and efficient machinery, than hiring a common labourer and buying another obsolescent machine.

6 See above, Figure 6.

7 This is in line with the models of Harrod, Domar and other "forerunners". See above, pp. 17-26.

8 See above, Figure 8.

Behaviour of the Gap. The manpower and the development gaps depress the level of output and create the economic gap, which in turn affects adversely the utilization of resources[9]. Both gaps vary more or less together. However, because of the relative "stickiness" of labour and "fluidity" of investment[10], the intermediate gap is less acute than the total gap. For the same reason, the development gap expands more rapidly, but can be closed faster with adequate investment.

The relationship between the gap in growth, which is largely dominated by the manpower gap, and the gap in development, which is determined by investment, bears out the conclusion that the existence of the gap affects adversely the level of productivity[11]. From 1950 to 1969, the average annual growth rate of productivity was 2.86 % and the annual compound rate was 2.7 %[12]; if potential output had been attained, in the conditions of the model, the annual average growth rate of productivity would have been 3.02 %, and the

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9 This is in accord with Domar, who assumed that employment is a function of the relation between potential and actual output. See above, p. 20.

10 This reflects the fact that it is easier to increase the level of investment, say, by ten percent, than the level of employment by, say, five percent.

11 Similarly, Bruton suggested that increases in productivity depend on use of capacity. See above, p. 46.

12 See Appendix A. Actual output rose from 4.78476 to 7.85964, potential output would have risen from 4.94635 to 8.25760, and the theoretical potential output would have risen from 4.94635 to 8.67343.

compound growth rate would have been 2.7 %; but if potential had been attained in 1950, and kept consistently with an annual growth rate in productivity of 3.00 %, without variations, the total increase in productivity would have been larger. This indicates one of the advantages of steady growth. The economy cannot recoup the losses from a "stop-go" performance[13]. If the gap in growth is closed by labour-intensive methods that are not capital-intensive (for they could be both), full employment may be achieved. But only investment can lower the depreciation rate and increase the capital deepening, which is a major source of productivity[14]. The closing of the gap requires innovative investment; if this is not achieved, the economy would work below its potential, even at full employment.

There is a relationship between the growth rate in output and the economic gap, as both are, one way or another, due to labour and capital movements[15]. A decline in the use of resources would lower the growth rate and widen the gap.[16] The

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13 As it has been pointed out by T. Wilson, the important effect of steady growth is that it raises the slope of the output. See above, pp. 73-74.

14 Capital deepening is innovative and raises the level of productivity automatically (in the contrary case, it would not have been made). For a theoretical treatment, see Ingvar Svennilson, Economic Growth and Technical Progress, in OECD, The Residual Factor and Economic Growth, Paris, 1964, pp. 104-07. See also Joseph A. Schumpeter, Business Cycles, Vol. 1, McGraw-Hill Book Company, Inc., New York, 1939, pp. 87-102.

15 See above, Figure 10.

16 As noted previously, Okun's "k" increases with the gap. See above, p. 56.

significant finding is the tendency of the gap to strengthen as it lasts longer. A short-term failure in the use of resources would form a deep gap which would be rapidly closed, at least to the average performance level of the economy[17]. This happened in 1954. The growth rate in output was low from 1957 to 1961; as a result, and despite the fact that the growth rate remained substantially high from 1962 to 1966, the gap widened and stayed much below the 1950-1969 average of economic performance, which was 83.62 %. It was not until 1965, after three years of continuing growth and a high level of investment demand, that the economy performed as well as in 1956 in relation to its potential. Similar results are found when the manpower gap is examined: the longer people are left idle, the more difficult it is to reemploy them.

This review of the findings deals only with the most relevant in aggregative economic studies. The findings concerning the depreciation rate, the behaviour of the potential output-capital ratio, the consumption gap, are not considered here, because their implications for theory and for policy would require more detailed analysis.

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17 See above, Figure 12.

Implications for Theory

The study of the economic gap has implications for both theory and policy. They cannot be absolutely separated, for policies depend (hopefully) on analytical findings. In fact, it has also been argued that the opposite may happen, and that economic theory is often a way to rationalize interests and political programs. Thus, the history of economic thought could be fitted in a history of political and economic interests[18]. This interrelation of policy and analysis can be explained by the fact that several modern economic theorists have an academic life as well as life in politics or in the public service[19], like Galbraith, Rostow, Burns, Friedman, and especially the less well-known economists that produce studies for Royal Commissions, testify before Committees of the Congress, advise decision-makers, and influence programs and policies according to their personal (and perfectly honest) commitments. Another explanation could be that the economist, who in principle should not leave the scientific field, is in reality, because of his knowledge,

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18 See Reinhard Blum, "The Interrelationship Between Economic Policy and Economic Theory", in The German Economic Review, Vol. 8, No 1, pp. 11-20.

19 See Michael Springer, op.cit.

a best person to give advise on economic policy, and his value judgments are then required[20]. Macroeconomics is concerned with the behaviour of aggregates (employment, saving, consumption, investment, output, etc) that are largely influenced by government, and it is natural that macroeconomic analysis would have as a side-product some suggestions as to how that influence should be directed to solve aggregative problems.

Whatever the reason why policy and theory are closely related and influence each other, the question is to distinguish between scientific knowledge and other involvements. Blum suggests that, for example, growth theory has evolved as a means to rationalize the will (and need) to grow, while "how to grow" policies are affected by private and public interests, likings and commitments[21]. This section on analytical implications deals with matters which can be discussed at a purely scientific level, while the next section on policy implications considers inferences for policy-makers rather than for academic researchers.

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20 See T. Scitovsky, Welfare..., op.cit., pp. 62-3.

21 R. Blum, op.cit., pp. 25-8.

Labour economics would benefit from being viewed within the framework of the economic gap, as this analysis shows that employment is to some extent a function of the gap. The relationships between unemployment, labour force participation and immigration, as they refer to the level of employment (and to investment), can be analyzed in a unified manner. As levels of productivity are influenced by the gap, there would be some interaction between the gap and the kind of employment and underemployment. The knowledge of manpower would become more meaningful with this methodology.

A further advance in knowledge is given by the study of investment in relation to employment, specifically capital deepening as it bears on productivity. With a stable output-capital- ratio (which means largely that a relatively constant proportion of output is saved and reinvested), productivity can increase only through capital deepening. This requires innovative investment (non-innovative investment would merely increase employment), which implies more know-how, higher education, better training. Gap analysis permits to tie these elements together in a coherent whole.

This is a major issue in growth theory: the identification of the sources of growth. There has been some suspicion that Denison overestimated the effect of education and underestimated the effect of capital accumulation in his

explanation of growth[22]. According to the present analysis, economic development is the result of investments that embody technical progress, which means that new investment is more productive than average or inherited capital stock. And it stands to reason that technologically advanced equipment requires more educated manpower than older equipment[23]. This tentative conciliation of the views of economists that are concerned more either by investment in human resources or investment in physical capital indicates that gap analysis might be an appropriate tool to study the elusive "residual" factor of growth.

As an economy grows rapidly, bottlenecks on the supply side may become a major problem. This study could not deal with specific bottlenecks, as the gap model relied on large aggregates. But these general observations can be made: a fall in overall investment launches a development gap; an increase in unemployment constraints the rising trends in labour force participation and immigration; and the longer the gap is allowed to grow, the more difficult it is to close

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22 See OECD, The Residual..., op.cit., pp. 263-69.

23 Education may play a predominant role in some service industries. However, even in services capital investments are required, with a link between advanced technology and advanced education, like in computers, in medical equipment, in laboratory machinery, and so forth.

it. This would confirm the hypothesis that bottlenecks are related to a decline in the level of aggregate demand. Then they keep demand from increasing, through a "circular causation" process[24]. More refined models would permit the identification of particular bottlenecks, and analyze how they relate to the overall gap.

Keynes had defined bottlenecks as areas in which the inelasticity of supply blocks further expansions in output and induces price pressures[25]. In relation to actual output, they occur at relatively high levels; but in relation to potential output, it is consistent with Keynes' views to consider that they appear at relatively low levels of production. When bottlenecks are reached, that is, when the supply of a specific input is short, this does not mean that potential output has been attained, but that further expansion of demand should be growth-oriented. Appropriate investment in men and equipment would make the supply more elastic, producing a better complementarity of the factors of production. If investment demand is not directed towards the solving

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24 For example, a recession would provoke short-sighted restrictions and distortions in education, training, investment, innovations. At the end of the recession, in some areas innovative investment would meet a lack of specialized workers, while in other areas qualified technicians would not find equipment adequate to their skills.

25 J. M. Keynes, op.cit., pp. 300-01.

of bottleneck situations, then buyers' demand would cause prices to rise. This applies to the labour market, where wages would rise if there are too few sellers of a given skill for the buyers' demand. The significant point is that bottlenecks occur below potential output is reached; they have nothing in common with "overheating".

There does not seem to be a case of "overheating" or real excess demand (i.e. signs of overall short supply of labour and capital) during the period considered. This suggests that inflationary pressures that have often arisen were of the cost-push type (wage-push or price-push, or both). The explanation is that the existence of spare capacity gives ground for cost increases, at least in some cases. For instance, unions strengthen their position under the threat of unemployment and ask for costly job and income security clauses; management accepts because it cannot afford a strike[26]. As construction lags, owners use the scarcity of housing to increase the rent; the tenants as workers press their unions for large wage increases to meet the higher cost of living. Unemployment and poverty bring a deterioration of nutrition and health, adding to private and public expenses in medical

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26 A strike during prosperity threatens profits; during a recession, it threatens survival. Of course, real situations are more complex, involving inventories, integration of industries, strike-funds of unions, ability for emergency financing, etc.

and other health care, as well as in general relief programs. As incomes decline, governments (especially municipalities) may feel the need to increase taxes, which are costs to the taxpayers. A contraction of consumer demand shrinks the market, and entrepreneurs may increase their prices to protect their profit margin, at least in sectors where there is little competition and the good has an inelastic demand. A decline in production, by reducing the supply, would push the price level upwards. Unfavourable expectations discourage business from investing in technologically advanced equipment, which has a high fixed cost; they produce with old machinery, increasing the depreciation rate, and their variable costs rise because of the maintenance expenses and the inefficient performance of obsolescent equipment. As entrepreneurs do not innovate, they allow foreign competitors to keep abreast in world markets; subsequently, they pressure government to adopt quotas and protectionnist measures, which, if obtained, introduce often lasting monopolistic features in the domestic market. A further example is the interest rate, which is a cost to businessmen, and which would tend to rise if a low level of income and saving produces a scarcity of available financial resources.[27]

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27 The purpose of this paragraph was to suggest areas in which a low or inefficient utilization of resources produces inflationary pressures. Some cases may be questionable. In other areas, the same conditions could induce a decline in wages, prices and other costs. Microeconomic and less aggregative studies would be required to investigate such cases.

A "perverse" form of excess demand may occur during the gap. In its "pure" form, excess demand occurs when demand is larger than the economy's capacity to meet it. In its "perverse" form, it means that demand is apparently excessive because capacity is underutilized, either because it is restricted by inappropriate counter-inflationary policies, or because large inventories and unused capital put a brake on new production and new investment[28]. This form of excess demand is doubly "perverse", because it tends to be cumulative: restrictions on output limit income creation, which in turn limits sales, demand and further production. A detailed study of inadequate demand and "perverse" excess demand would give indications on the mechanisms of demand and supply. The question would be to analyze the effect of the economic gap (i.e. insufficient and inefficient resource utilization) on the input mix and the output mix. Within the gap framework, such relationships would be seen as a logical, unified sequence.

The question of demand and supply is akin to the egg-and-chicken problem. The supply is demanded, and the demand is supplied; what is supply for one is demand for the other. But they do not always match. This fundamental issue, which has been discussed since Malthus and Say, receives new light from gap analysis. In this perspective, in a "normal" gap

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28 This explains how low consumer demand may coexist with large inventories and rising imports.

situation, what is supplied is less than what could have been supplied; what is demanded is not exactly what is supplied, and is usually less than what could have been supplied. If actual output is maximized, actual demand is likely to be brought in equilibrium with actual supply. But if potential output is maximized, the economy is given the opportunity to work at capacity, and this generates demand and further supply at a higher level.

There are other analytical implications of gap analysis, some of which are not discussed in this rather limited examination. A major one is the relationship between the economic gap and the social indicators[29]. Another is external diseconomies, which could be mentioned briefly. These occur because the government may not enforce the equation of social and private costs and benefits, because producers may not change their methods of production, because consumers may not be able to afford or may not be willing to pay for the disposal of their wastes, and because technology may not be adequate to avoid the pollution of the environment with industrial wastes. Gap analysis suggests that the resources which do not participate to actual production may be used to reduce those externalities, thus producing a potential output that maximizes social welfare.

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29 See above, pp. 48-51, 115-19.

Policy Implications

The theoretical implications of gap analysis affect economic policies. Some of the effects are specific: for instance, it appears than the unemployment rate is not a sufficient datum and that other manpower indicators should supplement it, like the labour force participation rate and the level and type of immigration, possibly combined in an index. Another is the reliability of the figures obtained: if the gap is as wide as this analysis suggests, policies to close it are more urgent than otherwise. There are reasons to believe that the estimates given by the model are realistic, as they are in line with the range suggested by less aggregative studies[30].

Other effects are of a more general nature: for instance, the output-capital ratio declines slightly in periods of adequate growth; this decline can be offset by innovative investment that raises the capital-labour ratio; but capital deepening, which is in principle innovative, requires long-term besic and applied research, increasing educational standards, favourable economic prospects. This implies that it is not

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30 According to the model, the average performance of the economy from 1950 to 1969 was 83.62 % of capacity. The average use of capacity in the Canadian steel industry from 1953 to 1968 was 85.7 % of capacity. See Commission des Prix et Revenus, op.cit., p. 50. In the first quarter of 1970, American manufacturing industries operated at 79.9 % of capacity. See Andrew F. Brimmer, Economic Policy and the Restoration of Price Stability in the United States, (mimeographed), Address to the Annual Convention of the Vermont Bankers Association, June 20, 1970, p.17

enough, say, to use broad fiscal means that attract any kind of investment, to expand consumer demand through a tax cut in order to speed up the rate of economic growth, or to subsidize employment as a means of closing the economic gap. Supply forces are the fundamental basis of growth: it is the inputs that produce output. Policies of demand expansion would be effective in closing the gap inasmuch as they are related to programs destined to improve the quality, quantity and matching of the factors of production.

A policy of employment and investment should be a policy of productivity. But it is clearly not enough to point out that productivity is the long-term major factor in growth, and to wait for labour and management to be more efficient. With some simplification, gap analysis indicates that productivity will increase only with innovative investment, and that innovative investment will be forthcoming only as the gap closes. Restrictions on output, particularly, would have for effect to increase the use of old equipment and to postpone large-scale and up-dated investment.

Inflation has been a recurrent problem in Canada since World War Two, and particularly in the last decade. This analysis suggests that anti-inflationary policies that restrict output and use of resources have been ill-advised[31]. Cost-push trends

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31 Some "official" view on the question maintains that price stability can be restored only via a large unutilization of resources and willful cuts in investment and employment, that is, via an economic gap. See A. F. Brimmer, op.cit., pp. 16-9. The theoretical implications of this analysis are the opposite. See above, pp. 248-50.

have been a major factor and underutilization of resources resulting from anti-inflationary policies have not solved this particular problem. A sound anti-inflationary policy would aim at ironing out the factors that push prices, wages, interest rates, upwards. The conditions, by and large, are caused by inadequate demand. The solution is to increase the supply to bring prices down, to generate income (and demand), and to open the way for innovations that increase productivity.

An increase in supply would follow from a fuller and more effective utilization of resources (men and capital), and from the creation of new inputs. The result would be economic growth. It is possible to direct this growth in a way that maximizes social welfare. Full employment may be equated to employment in the occupation, location and earning range that people want, the rationale being that satisfactory economic performance gives more leeway to workers to choose their job or to be retrained. There would be already a sizeable increase in welfare in the form of a substantial reduction of unemployment, underemployment and poverty. Better economic prospects everywhere would make easier a distribution of industries in networks of growing zones; this would stop and possibly reverse trends towards crowding in metropolies[32].

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32 See National Goals Research Staff, op.cit. See also Robert A. Harper, Theodore H. Schmudde and Frank H. Thomas, "Recreation Based Economic Development and the Growth-Point Concept", in Land Economics, Vol. XLII, No 1, February 1966, pp. 95-101.

With higher incomes, people would be able to afford better cars, homes, etc, that would reduce noise, air pollution, frustrations, social tensions. With higher profits, industries would be willing to invest more in R & D, to engage in new methods of production, to modify their output in ways that increase the quality of the goods and services and that reduce environmental deterioration. Whatever the tax structure, higher incomes, sales and profits would give governments more resources to finance programs of security, education, urban renewal, social amenities, international cooperation, research, pollution control, general well-being. Higher incomes and higher productivity would allow people to better their lives through increases in leisure, probably by shortening the work-year and length of working life, with repercussions on the composition of output and the sectoral distribution of the economy. Quality of life is everybody's responsibility, but is more attainable within affluence than within economic and social deprivation.

At this stage, the implications of gap analysis become hypothetical: it would be up to man's intelligence and good will to use the resources that he has created in such a way that he accomplishes his best desires. The economist can only point out that the waste of resources can be avoided by a closing of the economic gap, and that society, once free from the need to constantly put the economy back on the right track and subsidize the lagging sectors, could finally concentrate on its raison d'être, which is to strengthen and diversify the happiness and self-fulfillment of the individual.

APPENDIX A: TABULAR MATERIAL

The sources of the tabular material used in this work are as follows: for National Accounts statistics, from 1926 to 1966, Dominion Bureau of Statistics, System of National Accounts, National Income and Expenditure Accounts, 1926-1968, Ottawa, August 1969; from 1966 to 1969, Dominion Bureau of Statistics, DBS Daily, Tuesday, May 26, 1970. For labour statistics, Dominion Bureau of Statistics, The Labour Force, June 1969, from 1946 to 1968; T. M. Brown, Canadian Economic Growth, Royal Commission on Health Services, Ottawa, Queen's Printer, 1965, pp. 194-95, from 1926 to 1945; and also Canadian Statistical Review, various issues, and Immigration Statistics, various issues, as well as Canada Year Book, various issues. Other specific sources are given in the tables, where necessary. Growth rates and ratios were calculated by the author, as well as statistics of potential output, according to methods described in Chapters 6 and 7. Unless otherwise noted, all National Accounts statistics are in constant (1961) dollars and in millions, while all labour statistics are in thousands.

TABLE 1: GROSS NATIONAL EXPENDITURE

Year	GNE in constant dollars	Growth rate	GNE in current dollars	Growth rate	Price growth
1926	10203		5146		
1927	11171	9.48	5561	8.06	- 1.42
1928	12191	9.13	6050	8.79	- 0.34
1929	12237	0.37	6139	1.47	1.10
1930	11713	- 4.48	5720	- 6.83	- 2.35
1931	10226	- 12.70	4693	- 17.95	- 5.25
1932	9166	- 10.37	3814	- 18.73	- 8.36
1933	8555	- 6.67	3492	- 8.44	- 1.77
1934	9594	12.14	3969	13.66	1.52
1935	10343	7.80	4301	8.36	0.56
1936	10801	4.42	4634	7.74	3.32
1937	11886	10.04	5241	13.10	3.06
1938	11984	0.82	5272	0.59	- 0.23
1939	12874	7.42	5621	6.62	- 0.80
1940	14687	14.08	6713	19.43	5.35
1941	16800	14.38	8282	23.37	8.99
1942	19917	18.55	10265	23.94	5.39
1943	20719	4.02	11053	7.68	3.66
1944	21539	3.95	11848	7.19	3.24
1945	21057	- 2.24	11863	0.13	2.37
1946	20493	- 2.68	11885	0.19	2.87
1947	20861	1.79	13169	10.80	9.01
1948	21374	2.45	15127	14.87	12.42
1949	22119	3.48	16300	7.75	4.27
1950	23809	7.64	17955	10.15	2.51
1951	25004	5.01	21060	17.29	12.28
1952	27398	9.57	24042	14.16	4.59
1953	28862	5.34	25327	5.34	0.00
1954	28283	- 2.01	25233	- 0.37	- 1.64
1955	31079	9.88	27895	10.55	0.67
1956	33780	8.69	31374	12.47	3.78
1957	34710	2.75	32907	4.89	2.32
1958	35462	2.16	34094	3.61	1.45
1959	36929	4.13	36266	6.37	2.24
1960	37994	2.88	37775	4.16	1.28
1061	39080	2.85	39080	3.45	0.60
1962	41778	6.90	42353	8.38	1.48
1963	43996	5.30	45465	7.35	2.05
1964	47050	6.94	49783	9.50	2.56
1965	50149	6.58	54897	10.27	3.69
1966	53650	6.98	61421	11.88	4.90
1967	55517	3.47	65722	7.00	3.53
1968	58245	4.91	71427	8.68	3.77
1969	61148	4.98	78537	9.45	4.47

TABLE 2: LABOUR STATISTICS

Year	Labour force	Growth rate	Employ-ment	Growth rate	Unemployment rate	Participation rate	Immigration rate
1926	3578		3471		3.0		1.36
1927	3684	2.96	3578	3.08	2.9		
1928	3794	2.98	3705	3.54	2.3		
1929	3909	3.03	3816	2.99	2.4		2.14
1930	4009	2.55	3724	- 2.42	7.1		
1931	4110	2.51	3578	- 3.93	12.9	57.7	
1932	4182	1.71	3405	- 4.84	18.6		
1933	4246	1.53	3395	- 0.30	20.0	58.0	
1934	4312	1.55	3572	5.21	17.2	57.9	0.10
1935	4372	1.39	3636	1.79	16.8	57.8	
1936	4432	1.37	3703	1.84	16.4		
1937	4490	1.30	3863	4.32	14.0	57.5	
1938	4549	1.31	3853	- 0.26	15.3		
1939	4592	0.94	3912	1.53	14.8	57.2	0.10
1940	4537	- 1.20	3998	2.19	11.9	56.6	
1941	4423	- 2.52	4267	6.72	3.5	55.4	
1942	4569	3.30	4432	3.86	3.0	56.5	
1943	4567	- 0.05	4485	1.19	1.7	58.0	
1944	4548	- 0.42	4473	- 0.27	1.4	57.4	0.10
1945	4520	- 0.62	4408	- 1.46	1.6	56.2	
1946	4829	7.83	4666	5.85	3.4	55.0	
1947	4942	2.34	4832	3.55	2.2	54.9	0.61
1948	4988	0.93	4875	0.88	2.3	54.6	1.08
1949	5055	1.34	4913	0.77	2.8	54.5	0.89
1950	5163	2.13	4976	1.28	3.6	53.7	0.70
1951	5223	1.16	5097	2.43	2.4	53.7	1.60
1952	5324	1.93	5169	1.41	2.9	53.5	1.42
1953	5397	1.37	5235	1.27	3.0	53.1	1.69
1954	5493	1.77	5243	0.15	4.6	52.9	1.54
1955	5610	2.12	5364	2.30	4.4	52.9	1.03
1956	5782	3.06	5585	4.12	3.4	53.5	1.57
1957	6008	3.90	5731	2.61	4.6	54.0	2.52
1958	6137	2.14	5706	- 0.44	7.0	53.9	1.02
1959	6242	1.71	5870	2.87	6.0	53.8	0.85
1960	6411	2.70	5965	1.61	7.0	54.2	0.83
1961	6521	1.71	6055	1.50	7.1	54.1	0.53
1962	6615	1.44	6225	2.80	5.9	53.9	0.55
1963	6748	2.01	6375	2.40	5.5	53.8	0.67
1964	6933	2.74	6609	3.67	4.7	54.1	0.81
1965	7141	3.00	6862	3.82	3.9	54.4	1.03
1966	7420	4.21	7152	4.22	3.6	55.1	1.33
1967	7694	3.69	7379	3.17	4.1	55.5	1.55
1968	7919	2.92	7537	2.14	4.8	55.5	1.20
1969	8162	3.06	7780	3.22	4.7	55.8	1.03

TABLE 3: CONSUMPTION

Year	Personal consumption	Growth rate	Government consumption	Growth rate	Total consumption	Growth rate
1926	6370		1138		7508	
1927	7115	11.69	1190	4.56	8305	10.61
1928	7793	9.52	1203	1.09	8996	8.32
1929	8277	6.21	1353	12.46	9630	7.04
1930	7930	4.19	1482	9.53	9412	- 2.26
1931	7543	- 4.88	1566	5.66	9109	- 3.22
1932	6953	- 7.82	1519	- 3.00	8472	- 6.99
1933	6779	- 2.10	1279	- 15.80	8058	- 4.89
1934	7130	5.17	1350	5.55	8480	5.23
1935	7444	4.40	1409	4.37	8853	4.39
1936	7782	4.54	1418	0.63	9200	3.91
1937	8268	6.24	1433	1.05	9701	5.44
1938	8150	- 1.43	1609	12.28	9759	0.51
1939	8382	2.84	1710	6.27	10092	3.41
1940	8998	7.34	3014	76.25	12012	19.02
1941	9609	6.79	4358	44.59	13967	16.27
1942	9854	2.54	9122	109.31	18976	35.86
1943	10145	2.95	9984	9.44	20129	6.07
1944	10874	7.18	11463	14.81	22337	10.96
1945	11974	10.11	7883	- 31.23	19857	- 11.56
1946	13304	11.10	3728	- 52.71	17032	- 14.23
1947	13721	3.13	2814	- 24.52	16535	- 2.92
1948	13438	2.10	2682	- 4.69	16120	- 2.51
1949	14083	4.79	2986	11.33	17069	5.88
1950	15038	6.78	3218	7.76	18256	6.95
1951	15224	1.23	4175	29.73	19399	6.26
1952	16514	8.47	5125	22.75	21639	11.54
1953	17538	6.20	5273	2.88	22811	5.41
1954	18296	4.32	5070	- 3.85	23366	2.43
1955	19757	7.98	5174	2.05	24931	6.69
1956	21172	7.16	5334	3.09	26506	6.31
1957	22044	4.11	5240	- 1.76	27284	2.93
1958	22846	3.63	5398	3.01	28244	3.51
1959	24000	5.05	5354	- 0.82	29354	3.93
1960	24866	3.60	5467	2.11	30333	3.33
1961	25120	1.02	6350	16.15	31470	3.74
1962	26277	4.60	6598	3.90	32875	4.46
1963	27551	4.84	6726	1.94	34277	4.26
1964	29372	6.60	6980	3.77	36352	6.05
1965	31113	5.92	7126	2.09	38239	5.19
1966	32771	5.32	7900	10.86	40671	6.36
1967	34309	4.69	8225	4.11	42534	4.58
1968	35853	4.50	8539	3.81	44392	4.36
1969	37847	5.56	8892	4.13	46739	5.28

TABLE 4: INVESTMENT

Year	Gross investment	Growth rate	Gross investment in current dollars	Capital consumption allowances	Depreciation rate
1926	1870		814	572	0.7027
1927	2310	23.52	994	618	0.6217
1928	2746	18.87	1195	676	0.5656
1929	3038	10.63	1361	726	0.5334
1930	2658	- 12.51	1150	719	0.6252
1931	1972	- 25.51	809	649	0.8022
1932	1094	- 44.52	432	578	1.3379
1933	781	- 28.61	299	532	1.7792
1934	985	26.12	380	536	1.4105
1935	1175	19.28	458	550	1.2008
1936	1335	13.61	531	575	1.0828
1937	1773	32.80	755	624	0.8264
1938	1693	- 4.72	717	639	0.8912
1939	1639	- 3.19	687	671	0.9767
1940	1870	14.09	833	786	0.9435
1941	2289	22.40	1096	934	0.8521
1942	2087	- 8.82	1055	1091	1.0341
1943	1693	- 18.88	902	1099	1.2184
1944	1775	4.84	964	1077	1.1172
1945	2272	28.00	1230	1042	0.8471
1946	3004	32.21	1682	1071	0.6367
1947	3796	26.36	2350	1303	0.5544
1948	4358	14.80	3057	1504	0.4919
1949	4680	7.38	3439	1731	0.5033
1950	5029	7.45	3862	1960	0.5075
1951	5047	0.35	4424	2300	0.5198
1952	5635	11.65	5096	2537	0.4978
1953	6327	12.28	5733	2844	0.4960
1954	6326	- 0.01	5714	3146	0.5505
1955	6911	9.24	6422	3527	0.5492
1956	8174	18.27	8000	4020	0.5025
1957	8756	7.12	8689	4387	0.5048
1958	8659	- 1.11	8535	4381	0.5132
1959	8705	0.53	8647	4723	0.5462
1960	8419	3.39	8473	5036	0.5943
1961	8317	- 1.21	8317	5182	0.6230
1962	8692	4.50	8823	5594	0.6340
1963	9144	5.20	9522	5948	0.6246
1964	10437	14.14	11173	6328	0.5663
1965	11797	13.03	13251	6800	0.5131
1966	13082	10.89	15405	7414	0.4812
1967	13191	0.83	15684	7877	0.5022
1968	13177	- 0.11	15809	8411	0.5320
1969	13583	3.12	17011	9066	0.5329

TABLE 5: "GREAT RATIOS"

Year	Output-capital ratio	Five-year moving average	Capital-labour ratio	Output-labour ratio	Growth rate	Inventory-output ratio
1926	5.45	"5.14"	0.53874	2.93949		2.04
1927	4.83	'4.90'	0.64561	3.12213	6.21	2.74
1928	4.43	4.62	0.74116	3.29004	5.37	2.73
1929	4.02	4.57	0.79612	3.20676	- 2.54	0.73
1930	4.40	6.16	0.71374	3.14527	- 1.92	1.79
1931	5.18	6.58	0.55114	2.85802	- 9.14	- 2.48
1932	8.37	7.72	0.32129	2.69192	- 5.82	- 1.53
1933	10.95	8.60	0.23004	2.51988	- 6.40	- 2.33
1934	9.74	9.19	0.27575	2.68589	6.58	0.38
1935	8.80	8.85	0.32315	2.84460	5.90	0.85
1936	8.09	8.08	0.36051	2.91682	2.53	- 1.78
1937	6.70	7.70	0.45896	3.07688	5.48	0.45
1938	7.07	7.51	0.43939	3.11030	1.08	1.88
1939	7.85	7.36	0.41896	3.29089	5.80	4.48
1940	7.85	7.92	0.47801	3.67358	11.62	3.79
1941	7.33	8.96	0.53644	3.93719	7.17	0.30
1942	9.54	9.81	0.47089	4.49390	14.13	1.45
1943	12.23	10.09	0.37748	4.61962	2.79	- 0.97
1944	12.13	9.99	0.39682	4.81533	4.23	- 0.71
1945	9.26	9.18	0.51542	4.77699	- 0.80	- 2.00
1946	6.82	8.70	0.64380	4.39198	- 8.06	0.68
1947	5.49	6.23	0.78559	4.31725	- 1.71	1.56
1948	4.90	5.33	0.89394	4.38441	1.55	0.23
1949	4.72	4.95	0.96257	4.50213	2.68	0.31
1950	4.73	4.83	1.01065	4.78476	6.27	2.33
1951	4.95	4.76	0.99019	4.90563	2.52	2.97
1952	4.86	4.71	1.09015	5.30044	8.04	1.70
1953	4.56	4.66	1.20859	5.51327	4.01	2.12
1954	4.47	4.50	1.20656	5.39443	- 2.22	- 1.28
1955	4.49	4.32	1.28840	5.79399	7.40	1.09
1956	4.13	4.22	1.46356	6.04834	4.38	2.29
1957	3.96	4.18	1.52783	6.05653	0.13	0.40
1958	4.09	4.18	1.51752	6.21486	2.61	- 0.58
1959	4.24	4.29	1.48296	6.29114	1.22	0.81
1960	4.51	4.46	1.41139	6.36948	1.24	0.90
1961	4.69	4.61	1.37357	6.45417	1.32	0.30
1962	4.80	4.66	1.39630	6.71132	3.98	1.27
1963	4.81	4.61	1.43435	6.90133	2.83	1.30
1964	4.50	4.49	1.57921	7.11908	3.15	0.83
1965	4.25	4.37	1.71917	7.30821	2.65	2.18
1966	4.10	4.29	1.82913	7.50139	2.64	2.13
1967	4.20	4.29	1.78764	7.52364	0.29	0.56
1968	4.42	'4.37'	1.74830	7.72787	2.71	1.04
1969	4.50	"4.46"	1.74588	7.85964	1.70	1.48

Note: there is a three-year moving average for 1927 and 1968, and a two-year average for 1926 and 1969.

TABLE 6: POTENTIAL OUTPUT

Year	Intermediate potential output	Year's growth rate	Potential output	Year's growth rate	Theoretical potential output	Annual growth rate
1926	10484		17680			
1929	12404		15043			
1934	11683		27501			
1939	15414		25948			
1944	22271		40229			
1949	24407		25750			
1950	26125	18.11	27586	24.71	27586	
1951	27433	15.22	27332	14.79	28515	3.36
1952	30390	21.54	29452	17.78	30100	5.55
1953	32207	17.55	32914	20.13	31586	4.93
1954	32236	11.69	35328	22.40	33274	5.34
1955	35479	25.44	37073	31.07	35167	5.68
1956	37597	20.97	38589	24.16	36736	4.46
1957	38594	14.25	41089	21.63	38805	5.63
1958	40883	17.78	42740	23.13	41273	6.36
1959	42266	19.19	46214	30.31	43382	5.10
1960	43635	18.15	50233	36.02	45568	5.03
1961	45120	18.75	53782	41.55	47955	5.23
1962	47787	22.27	57246	46.48	50282	4.85
1963	50219	20.20	58637	40.35	52873	5.15
1964	52787	19.98	58884	33.83	55574	5.10
1965	55478	17.91	58395	24.11	58513	5.28
1966	58248	16.14	60947	21.53	61649	5.35
1967	59930	11.70	61463	14.56	65257	5.85
1968	63690	14.72	66653	20.05	69404	6.35
1969	66489	14.15	69884	19.98	73403	5.76

TABLE 7: ECONOMIC GAPS

Year	Gap in growth	Total gap	Gap in development	Output gap in growth	Total output gap	Output gap in development
1926	281	7477	7196	1.58	42.29	40.70
1929	167	2806	2639	1.11	18.65	17.54
1934	2089	17907	15818	7.59	65.11	57.51
1939	2540	13074	10534	9.78	50.38	40.59
1944	732	18690	17958	1.81	46.45	44.63
1949	2288	3631	1343	8.88	14.10	5.21
1950	2316	3777	1461	8.38	13.69	5.29
1951	2429	2328	- 101	8.88	8.51	- 0.36
1952	2992	2054	- 1938	10.15	6.97	- 6.58
1953	3345	4052	707	10.16	12.31	2.14
1954	3953	7045	3092	11.18	19.94	8.75
1955	4400	5994	1594	11.86	16.16	4.29
1956	3817	4809	992	9.89	12.46	2.57
1957	3884	6379	2495	9.45	15.52	6.07
1958	5421	7278	1857	12.68	17.02	4.34
1959	5337	9285	3948	11.54	20.02	8.54
1960	5641	12239	6598	11.22	24.36	13.13
1961	6040	14702	8662	11.23	27.33	16.10
1962	6009	15468	9459	10.49	27.02	16.52
1963	6223	14641	8418	10.61	24.96	14.35
1964	5737	11834	6097	9.74	20.09	10.35
1965	5329	8246	2917	9.12	14.12	4.99
1966	4598	7297	2699	7.54	11.97	4.42
1967	4413	5946	1533	7.17	9.67	2.49
1968	5445	8402	2957	8.16	12.60	4.43
1969	5341	8736	3395	7.64	12.50	4.85

TABLE 8: POTENTIAL MANPOWER

Year	Potential labour force	Potential employment	Annual growth rate	Year's growth rate
1926	3644	3571		
1929	3956	3876		
1934	4439	4350		
1939	4783	4687		
1944	4721	4627		
1949	5482	5372		
1950	5691	5577	3.81	13.51
1951	5711	5597	0.35	12.47
1952	5853	5736	2.48	12.53
1953	5963	5844	1.88	13.05
1954	6099	5977	2.27	14.17
1955	6258	6133	2.64	16.97
1956	6347	6220	1.41	15.95
1957	6509	6379	2.71	14.21
1958	6721	6587	3.03	14.93
1959	6859	6722	2.04	17.80
1960	6995	6855	1.97	16.78
1961	7147	7004	2.17	17.41
1962	7276	7130	1.79	17.75
1963	7428	7279	2.08	16.93
1964	7580	7428	2.03	16.51
1965	7748	7593	2.22	14.88
1966	7926	7767	2.29	13.18
1967	8145	7982	2.76	11.60
1968	8410	8242	3.25	11.69
1969	8636	8463	2.68	12.28

TABLE 9: MANPOWER GAPS

Year	Actual unemployment	Supplementary participants	Supplementary immigrants	Employment gap - (Unrigged)	Unemployment gap	Participation gap	Immigration gap
1926	107	43	23	95.25	2.93	1.18	0.63
1929	93	47	0	96.46	2.35	1.18	0.00
1934	740	45	82	80.46	16.67	1.01	1.84
1939	680	104	87	81.78	14.21	2.17	1.81
1944	75	87	86	94.74	1.58	1.84	1.82
1949	141	371	56	89.62	2.57	6.76	1.02
1950	186	461	67	87.43	3.26	8.10	1.17
1951	126	467	21	89.24	2.20	8.17	0.36
1952	155	498	31	88.31	2.64	8.50	0.52
1953	162	549	17	87.79	2.71	9.20	0.28
1954	250	581	25	85.96	4.09	9.52	0.49
1955	245	594	54	85.71	3.91	9.49	0.86
1956	197	540	25	87.99	3.10	8.50	0.39
1957	278	501	0	88.04	4.27	7.69	0.00
1958	432	524	60	84.89	6.42	7.79	0.89
1959	372	545	72	85.58	5.42	7.94	1.04
1960	446	509	75	85.27	6.37	7.27	1.07
1961	466	530	96	84.72	6.52	7.41	1.34
1962	390	565	96	85.55	5.36	7.76	1.31
1963	374	590	90	85.82	5.03	7.94	1.21
1964	324	564	83	87.18	4.27	7.44	1.09
1965	280	538	69	88.56	3.61	6.94	0.89
1966	267	458	48	90.23	3.36	5.77	0.60
1967	315	416	35	90.59	3.86	5.10	0.42
1968	382	428	63	89.61	4.54	5.08	0.74
1969	382	395	79	90.08	4.42	4.57	0.91

TABLE 10: POTENTIAL INVESTMENT

Year	Required investment	Supplementary innovative investment	Potential investment	Annual growth rate	Year's growth rate	Theoretical potential investment	Annual growth rate
1926	2681	758	3439				
1929	3148	202	3350				
1934	1199	1793	2992				
1939	1963	1562	3525				
1944	1836	2191	4027				
1949	5171	31	5202				
1950	5636	75	5711	9.78	22.03	5711	9.78
1951	5542	200	5742	10.38	14.17	5990	4.88
1952	6253	0	6253	8.89	23.89	6390	6.67
1953	7063	0	7063	12.95	25.34	6778	6.07
1954	7212	639	7851	11.15	24.08	7394	9.08
1955	7902	680	8582	9.31	35.66	8140	10.08
1956	9103	41	9144	6.54	32.31	8705	6.94
1957	9746	84	9830	7.50	20.25	9283	6.63
1958	9996	229	10225	4.01	16.77	9873	6.35
1959	9968	804	10772	5.34	24.40	10112	2.42
1960	9675	1588	11263	4.55	29.38	10217	1.03
1961	9620	2046	11666	3.57	38.56	10402	1.81
1962	9956	2329	12285	5.30	47.70	10790	3.73
1963	10441	2279	12720	3.54	46.34	11469	6.29
1964	11730	1384	13114	3.09	43.41	12377	7.91
1965	13054	309	13363	1.89	28.03	13389	8.17
1966	14207	0	14207	6.31	20.43	14370	7.32
1967	14269	58	14327	0.84	9.51	15211	5.85
1968	14409	843	15252	6.45	15.62	15881	4.40
1969	14775	894	15669	2.73	19.99	16458	3.63

TABLE 11: POTENTIAL PRODUCTIVITY

Year	Potential capital deepening	Theoretical potential capital deepening	Potential productivity	Annual growth rate	Year's growth rate	Theoretical potential productivity
1926	0.96327		4.95120			
1929	0.84926		3.88111			
1934	0.68793		6.32207			
1939	0.75222		5.53635			
1944	0.87034		8.69266			
1949	0.96834		4.79328			
1950	1.02409	1.02402	4.94635	3.19	9.87	4.94635
1951	1.02592	1.07021	4.88337	- 1.28	2.06	5.09474
1952	1.09015	1.11401	5.13460	5.14	4.67	5.24758
1953	1.20859	1.15982	5.63202	9.68	6.26	5.40501
1954	1.31346	1.23707	5.91057	4.94	7.21	5.56716
1955	1.39927	1.32724	6.04484	2.27	12.06	5.73417
1956	1.47015	1.39951	6.20403	2.63	7.08	5.90620
1957	1.54099	1.45524	6.44137	3.82	6.50	6.08338
1958	1.55228	1.49886	6.48853	0.73	7.13	6.26588
1959	1.60256	1.50431	6.87498	5.95	10.62	6.45385
1960	1.64304	1.49044	7.32795	6.58	16.48	6.64747
1961	1.66568	1.48515	7.67878	4.78	20.56	6.84689
1962	1.72294	1.51332	8.02890	4.55	24.40	7.05230
1963	1.74744	1.57562	8.05569	0.33	20.03	7.26386
1964	1.76553	1.66626	7.92722	- 1.60	14.87	7.48178
1965	1.75986	1.76333	7.69058	- 2.99	8.03	7.70623
1966	1.82913	1.85013	7.84696	2.03	7.37	7.93742
1967	1.79490	1.90566	7.70012	- 1.88	2.65	8.17554
1968	1.85058	1.92683	8.08703	5.02	7.49	8.42080
1969	1.85148	1.94470	8.25760	2.10	6.85	8.67343

TABLE 12: POTENTIAL PERFORMANCE

Year	Actual to intermediate potential output	Actual to potential output	Actual to theoretical potential output	Theoretical potential to potential output
1926	97.31	57.70		
1929	98.65	81.34		
1934	82.11	34.88		
1939	83.52	49.61		
1944	96.71	53.54		
1949	90.62	85.89		
1950	91.13	86.30	86.31	100.00
1951	91.14	91.48	87.68	104.32
1952	90.15	93.02	91.02	102.20
1953	89.61	87.68	91.37	95.96
1954	87.73	80.05	85.00	94.18
1955	87.59	83.83	88.37	94.85
1956	89.84	87.53	91.95	95.19
1957	89.93	84.47	89.44	94.44
1958	86.74	82.97	85.92	96.56
1959	87.37	79.90	85.12	93.87
1960	87.07	75.63	83.37	90.71
1961	86.61	72.66	81.49	89.16
1962	87.42	72.97	83.08	87.83
1963	87.60	75.03	83.21	90.17
1964	89.13	79.90	84.66	94.37
1965	90.39	85.87	85.70	100.20
1966	92.10	88.02	87.02	101.15
1967	92.63	90.32	85.07	106.17
1968	91.45	87.38	83.92	104.12
1969	91.96	87.49	83.30	105.03

TABLE 13: POTENTIAL GROSS NATIONAL EXPENDITURE

Year	Potential consumption	Potential personal consumption	Potential Public investment	Potential Private investment	Potential inventories	Personal Consumption gap	Public investment gap
1950	21599	18381	706	5005	276	81.81	88.10
1951	21317	17142	733	5009	273	88.81	87.99
1952	22904	17779	851	5402	295	92.88	90.12
1953	25522	20249	913	6150	329	86.61	89.59
1954	27124	22054	1131	6720	353	82.96	80.63
1955	28120	22946	1143	7439	371	86.10	80.57
1956	29059	23725	1122	8022	386	89.23	89.39
1957	30848	25608	1384	8446	411	86.08	89.08
1958	32088	26690	1614	8611	427	85.59	84.69
1959	34980	29626	1821	8951	462	81.00	80.83
1960	38468	33001	2017	9246	502	75.34	74.76
1961	41578	35228	2343	9323	538	71.30	71.31
1962	44389	37791	2638	9647	572	69.53	70.77
1963	45331	38605	2605	10115	586	71.36	71.90
1964	45181	38201	2339	10775	589	76.88	79.60
1965	44448	37322	2387	10976	584	83.36	88.31
1966	46131	38231	2526	11681	609	85.71	92.08
1967	46521	38296	2645	11682	615	89.58	92.09
1968	50734	42195	2845	12407	667	84.96	86.39
1969	53516	44624	2742	12927	699	84.81	86.68

TABLE 14: COEFFICIENTS OF CORRELATION

Between	and	Coefficient of correlation	Attributed relationship
Increase in output	Increase in employment	0.5318	28.28 %
Increase in gross output-capital ratio	Increase in output	0.2072	nil
Increase in "net" output-capital ratio	Increase in output in current dollars	0.5336	28.47 %
Ouput-capital ratio	Increase in output	0.1076	nil
Increase in capital deepening	Increase in productivity	0.4745	22.51 %
Increase in output	Increase in prices	0.0911	nil
Increase in investment	Increase in output-capital ratio	0.8357	69.83 %
Increase in output	Increase in investment	0.5775	33.35 %
Increase in productivity	Increase in output	0.9112	83.02 %
Increase in employment	Increase in gross investment	0.3878	nil
Increase in employment	Increase in net investment	0.3940	nil
Increase in investment	Increase in productivity	0.4683	21.93 %

Methodology: John E. Freund, Modern Elementary Statistics, Englewood Cliffs, N.J., Prentice-Hall, Inc., 1960, pp. 328, 333-38. The attributed relationship is only a statistical result, at 0.05 of significance, and has not necessarily an economic meaning.

APPENDIX B: SUGGESTIONS FOR FURTHER RESEARCH

Time and space limitations have kept this work from being an extensive and intensive study of the economic gap. However, despite the shortcomings due to these limitations, the subjects covered do provide a base from which further research can be undertaken. Some of this research would deal with the assumptions on potential labour force, capital and productivity; some would relate to the general assumptions underlying the model; other would bear on the uses of gap analysis for economic theory and the social sciences.

(1) The model assumes that all the unemployed would be part of the potential labour force. In reality, at least the structurally unemployed would leave the labour force to be retrained, while the remainder would start working or be trained or retrained in the job place. The number of those who would leave the labour force could usefully be assessed. The impact of such movements on the participation rate could also be estimated.

(2) The capacity of the economy and of society of absorbing immigrants without undue social and economic pressures and distortions could be estimated. This would involve assumptions as to the occupation of immigrants, the place they are going to live and work, and the costs (language training, immigration facilities, social tensions, claims on housing and schools, etc) of immigration.

(3) The willingness to participate in the labour force depends on a variety of factors. Some of these have been mentioned, but all of them need to be identified and quantified. The distribution of the supplementary participants should be compared to the composition of all participants, and the effect on manpower in general should be assessed. It is also necessary to discuss the soundness of a constant potential participation rate, to see whether the actual increase in the rate means that the potential rate is being reached or is being pushed forward.

(4) Three other aspects concerning potential labour force require further examination. The first concerns the advisability of including the institutional population in the estimates. The second refers to what was called "destroyed" labour, and which amounts to the effects of a better economic performance on the morbidity and mortality rates. The third is the possibility of assessing the number of emigrants that leave the country for economic reasons, and would remain in the labour force if the economic outlook was more favourable.

(5) The aggregative model used in this study assumes that manpower is to some extent homogeneous. The effect of full employment on the composition and productivity of the labour force could usefully be examined.

(6) The closing of the gap requires policies on supply, even within a framework of demand management. Supposing that a large part of the non-participants and unemployed should be retrained or relocated, the cost of such programs could be assessed. Assuming that government bears these costs, it should be estimated whether the closing of the gap provides the resources to finance such programs. For example, the closing of the gap would increase the level of incomes and taxes, while lessening the need for relief programs. What is needed is a cost-benefit analysis. It would also be useful, for policy purposes, to inquire into the possibility of setting a "timetable" to close the gap.

(7) The model used is a macroeconomic one. The question of underemployment should be studied at a less aggregative level. It would involve questions of schooling, poverty, misallocation of labour, areas of low productivity. The results of such studies should be compared with the aggregate results.

(8) A macroeconomic model gives results that may be found too general for practical purposes as well as for analytical inferences. The study of the economic gap could be conducted at other levels. For example, the manpower gaps in agriculture, or the investment gaps in the service industries as compared to manufacturing. The results could then be compared with the main study, or could serve to make

projections concerning the closing of the gap. Such a disaggregation of the analysis might also test the plausibility of the macroeconomic model.

(9) For analytical purposes, the notion of potential depreciation and the relation of capital deepening with productivity should be clarified. The analysis of innovative investment should tie in with considerations on the qualitative requirements for manpower. There is also something unsatisfactory with the treatment of potential output-capital ratio as a five-year moving average of the actual ratio, which could usefully be remedied.

(10) There are other limitations to capital formation than the depreciation rate and the output-capital and capital-labour ratios. The availability of savings (which increase with incomes and profits), of government deficit financing, of public borrowing, of credit facilities, of foreign investment, together with their impact on the economy, should be analyzed. With the findings of such studies the notion of potential investment could be improved.

(11) The model presupposes that there would be no change in average yearly hours worked. Higher productivity levels, however, would probably be taken partly in leisure. An alternative model working with man-hour figures would allow to experiment with historical and potential trends in leisure, which would be relevant in the estimate of welfare gaps. Such changes in hours worked would likely affect the relative demand for goods and services.

(12) Rapid growth may have disastrous effects on the quality of the air, water and land. Such appears to be the Japanese case. A larger level of output may have similar effects. This is probably the American experience. The tolerance of the environment to growth should be evaluated. This would require assumptions on the kind of output (rural, urban, suburban or metropolitan setting, increases in which goods and services, and so forth) and the technology.

(13) The tolerance of the environment to growth depends largely on the means adopted to curb pollution levels. The cost of these means should be assessed, to see whether the closing of the gap provides the resources to utilize them. The extent of the possible use of wastes could also be estimated.

(14) The tolerance of society to change and to affluence should be analyzed. Student discontent, ethnic upheavals, crime levels, autoritarianism and anarchy might be linked to the rate of growth and change, which have definite psychological impacts. These trends could be viewed within the economic gap, especially if social indicators could be used.

(15) Alternative models can be devised which cancel or modify the assumptions of the model used in this work. For instance, changes in the structure of the economy, effects of cost variations, expansion of the scope of economic activity, modifications in the methods of production, improvements in the market organization.

(16) The closing of the gap is likely to improve social welfare through full employment, higher productivity levels, better incomes. A study of the gap from a systematic welfare viewpoint would be desirable, if possible with a set of social indicators. It would consist in assuming how the unused or poorly used resources could be better utilized to enhance the quality of life, the cultural well-being, social amenities, international cooperation, individual pleasure, the environment, the social and private happiness of people.

(17) Questions like overheating and inflation, benefits from technology, full employment, conditions for productivity increases, should be discussed within the framework of the economic gap.

(18) This study developed a model of the gap. The next step would be to arrive at a relationship between actual and potential output, the gap, and its components. With that, it would be possible to formulate a model of consistent growth which matches demand and supply efficiently, in such way that social welfare is maximized. Such model would require a clear-cut definition of social welfare, possibly broken down in its components, as opposed to purely economic welfare. Formally, this model would consist in a set of causal relationships, with dependent and independent, endogeneous and exogeneous, variables. As it would link together supply and demand forces, via the gap, and would include measures of potential output maximized according to either social, economic or technological criteria, it would be a versatile tool with considerable theoretical utility and policy overtones.

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