THE THEORY OF
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An Introduction

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To my parents

Preface

The purpose of this book is to provide an introductory but fairly comprehensive account of the modern theory of economic growth. The exposition assumes no prior knowledge of growth theory, but it does assume that the reader is acquainted with the principles of macro- and micro-economics; it is intended mainly for undergraduates, beyond their first year, and graduate students. Elementary differential calculus is used extensively, and integral calculus occasionally; it will therefore be helpful, to say the least, if the reader is familiar with these branches of mathematics. (The usual introductory mathematics course for university economics students, for example, should have equipped him with most of the tools he will need.) But I have tried generally to supplement the mathematics with verbal explanation, and I hope that the non-mathematician will not feel shut out.

The book is concerned with the descriptive aggregative growth theory which has stemmed from the work of Harrod and Domar; for treatments of both multi-sector (or non-aggregative) and optimal growth theory (which may be traced back to the work of von Neumann and Ramsey, respectively) the reader is referred to more advanced texts – for example the second half of Burmeister and Dobell (1970). This book attempts to provide a fairly comprehensive account of the field thus defined, and it is hoped that it will be found useful as such by the reader who lacks the time to benefit from much study of the original sources. The more serious specialist will not trust or be satisfied with my exposition alone; for him, it is hoped that what follows will assist and guide the reading of the literature. (Some chapters – particularly those in which certain subjects are treated only briefly – are accompanied by supplementary lists of references suggesting possibilities for further reading.)

There are two particular respects in which the content of this book differs from that of most other texts on the subject. First, it provides a fuller account of the 'neo-Keynesian' approach to growth theory. Most textbooks allocate by far the greater part of their space to the 'neo-classical' approach, and provide at most one or two chapters – sometimes even only one or two pages – for a discussion of neo-Keynesian theory. I have attempted to provide a more balanced treatment of the differences between the two schools, and in so doing have included a fuller account than usual of the constructive (as opposed to the critical) efforts of neo-Keynesian theorists. Their critique of neo-classical theory is discussed partly in Chapter 9 but mainly in Chapter 10; together these two chapters may be regarded as forming a bridge between the neo-classical analysis of Chapters 4–8 and the neo-Keynesian theory of Chapters 11–13. Second, whereas most other textbooks have negligible empirical content, I have attempted, in Chapters 14 and 15, to provide an introduction to applied analysis by considering the empirical interpretation of the theory and some of the problems involved in confronting the theory with data. How is growth theory related to growth in real economies? What does growth theory tell us about economic history and vice versa? These questions are worthy of consideration. They are, indeed, worthy of more consideration than I have managed to give them: despite Part IV this book does no more than scratch the surface of empirical growth analysis.

As a student at Cambridge in the late 1960s, I would have found it difficult to ignore the theory of economic growth. More specifically, I owe my original interest in the subject to the lectures and teaching of Professor Kaldor and David Newbery. The book began to develop when I was a graduate student at Oxford, and it owes a considerable debt to the advice of my supervisor, Nicholas Stern; it would have foundered at a very early stage without his encouragement. David Newbery, Roger Pownall, Maurice Scott, Susan Symes and Tony Thirlwall provided valuable comments on parts or the whole of the draft at various stages. My debt to the written work of, in particular, Professors Hicks, Kaldor, Meade, Robinson and Solow will be obvious from the bibliography and also, I hope, from the text. Last, but not least, I am grateful to my employers, the Bank of England, and in particular to Leslie Dicks-Mireaux and Tony Carlisle, for their co-operation, and for their toleration of the distraction which this project has formed at various times while I have been with them. The charts were drawn, under the supervision of Amy Crosby, mainly by Gill Fitzgerald, Amanda Waldie, and Susan

Taylor; the typing of the final manuscript, organised by Jenny Bunkall, was done mainly by Hilary Abbott, Diane Coombs, Christine Hale, Glenys Harris and Lynne Ross. I am very grateful for their help.

It goes without saying that no part of the book - not even those parts which are right - necessarily reflects any Bank of England view, and that I alone am responsible for the final product.

July 1978 GRAHAM HACCHE

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Part I

INTRODUCTION

1

The Emergence of Modern Growth Theory – The Harrod–Domar Models

1.1 Harrod, Domar and Keynes

The birth of modern growth theory, in the work of Harrod (1939, 1948) and Domar (1946, 1947), was one of the earliest by-products of Keynes's (1936) *General Theory*. Both writers aimed to extend Keynes's analysis into the 'long period'. Keynes had been concerned with the *short period*, in which the implications of the level of investment and saving for the stock of capital, and hence for productive potential, may be ignored: in the short run the overriding significance of investment is its influence on effective demand, and the stock of capital may be taken as given and independent of it.[1] But in the *long run* investment expenditure does augment the capital stock; and in the analysis of the long run this cannot be neglected. Domar took account of it directly, by distinguishing between the dependence of actual output on effective demand, and the dependence of potential output on the capital stock. Harrod took the relationship between capital growth and output growth the other way round, by adopting the acceleration principle, whereby producers' demand for capital goods is held to be proportional to output. But both writers were seeking to dynamise the *General Theory* by considering under what conditions, given certain assumptions, an economy could realise growth with continuous full employment; and they arrived at results which in some important respects are similar. In fact their models are commonly referred to in the singular.

We shall concentrate on Harrod's version, since it is the more comprehensive, and since most of the ensuing discussion has employed his terminology. Before proceeding to his model it is interesting to note Keynes's personal involvement in it. Harrod was one of Keynes's closest colleagues: he had been one of the four recipients, in 1935, of the proofs of the *General Theory* (the others were Hawtrey, Kahn and Joan Robinson), and he was later Keynes's official biographer. Moreover, Keynes was editor of the *Economic Journal* when Harrod submitted his 'Essay on Dynamic Theory' for publication, and there was a lengthy correspondence between them about the article (see Moggridge, 1973, pp. 321–50). In fact this was 'the final theoretical subject arising out of the *General Theory* to which Keynes turned his attention' (Moggridge, 1973, p. 320). Keynes's final verdict on Harrod's paper was ambiguous: 'In the final result, I do not find myself in agreement, but I do think that he has got hold of a very interesting point which, subject to the necessary qualifications, is of real importance' (Moggridge, 1973).

1.2   Harrod's model in outline

As is commonly the case in economic theory, Harrod's model begins with an identity. The reader will already be familiar with the *Keynesian identity* between actual (or *ex post*) investment (I) and saving (S) at any time t:

$$I(t) \equiv S(t)$$

Using this, we may decompose the proportional rate of growth, G, of output Y^2 as follows:

$$G(t) \equiv \frac{\dot{Y}(t)}{Y(t)} \equiv \frac{I(t)}{Y(t)} \div \frac{I(t)}{\dot{Y}(t)} \equiv \frac{S(t)}{Y(t)} \div \frac{\dot{K}(t)}{\dot{Y}(t)} \tag{1.1}$$

where K is the volume of capital (both fixed capital and stocks) and a dot above a variable indicates its derivative with respect to time:

$$\dot{Y} \equiv \frac{dY}{dt} \; ; \; \dot{K} \equiv \frac{dK}{dt}$$

The appearance of these derivatives is due to the fact that we are here treating time as a *continuous* variable, and thinking in terms of 'points' rather than 'periods' of time. Then $Y(t)$, for example, is a continuous