

8090868

# THE ACCUMULATION OF CAPITAL



BY  
JOAN ROBINSON

# THE ACCUMULATION OF CAPITAL

BY  
JOAN ROBINSON

LONDON  
MACMILLAN & CO LTD  
1956

*This book is copyright in all countries which  
are signatories to the Berne Convention*

---

*First Edition June 1956  
Reprinted October 1956*

MACMILLAN AND COMPANY LIMITED  
*London Bombay Calcutta Madras Melbourne*

THE MACMILLAN COMPANY OF CANADA LIMITED  
*Toronto*

ST MARTIN'S PRESS INC  
*New York*

PRINTED IN GREAT BRITAIN

THE ACCUMULATION OF CAPITAL

## PREFACE

ECONOMIC analysis, serving for two centuries to win an understanding of the Nature and Causes of the Wealth of Nations, has been fobbed off with another bride — a Theory of Value. There were no doubt deep-seated political reasons for the substitution but there was also a purely technical, intellectual reason. It is excessively difficult to conduct analysis of over-all movements of an economy through time, involving changes in population, capital accumulation and technical change, at the same time as an analysis of the detailed relations between output and price of particular commodities. Both sets of problems require to be solved, but each has to be tackled separately, ruling the other out by simplifying assumptions. Faced with the choice of which to sacrifice first, economists for the last hundred years have sacrificed dynamic theory in order to discuss relative prices. This has been unfortunate, first because an assumption of static over-all conditions is such a drastic departure from reality as to make it impossible to submit anything evolved within it to the test of verification and, secondly, because it ruled out the discussion of most of the problems that are actually interesting and condemned economics to the arid formalism satirised by J. H. Clapham in 'Of Empty Economic Boxes'.<sup>1</sup>

Keynes's *General Theory* smashed up the glass house of static theory in order to be able to discuss a real problem — the causes of unemployment. But his analysis was framed in terms of a short period in which the stock of capital and the technique of production are given. It left a huge area of long-run problems covered with fragments of broken glass from the static theory and gave only vague hints as to how the shattered structure could be rebuilt.

<sup>1</sup> *Economic Journal* (September 1922).

In recent times the centre of interest has returned to the classical problems of the over-all growth of the economy. A leading example of this change is R. F. Harrod's *Towards a Dynamic Economics*. In order to discuss dynamic problems in a simple manner Harrod dismisses the whole problem of relative prices and sets out an analysis of the over-all development of an economy without paying attention to the theory of value. The present work follows his example.

The revival of interest in the classical questions brings a revival of the classical theory. Much in the following pages will be startlingly familiar to learned readers. I did not myself arrive at these ideas by studying the Classics. The problem presented itself to me as the generalisation of the *General Theory*, that is, an extension of Keynes's short-period analysis to long-run development. But I was very much illuminated by Piero Sraffa's Introduction to Ricardo's *Principles*.

#### ACKNOWLEDGMENTS

My debt to Keynes, Wicksell and Marshall is the debt we all owe to our progenitors, and will be sufficiently obvious in the following pages. I have referred to them at particular points for the reader's convenience, not by way of acknowledgment of their legacies. Michal Kalecki, though a contemporary, comes into the same category. In this connection I should like also to mention Gunnar Myrdal's *Political Element in Economic Theory*.

My first attempt at setting out an analysis of accumulation was inspired by Harrod, and I must repeat once more my gratitude for his most fruitful provocation. My debt to Harrod goes back much earlier, for it was under his influence that I first formulated the concept of neutral technical progress that we have both made the centre of our analysis.<sup>1</sup> As so often, it was R. F. Kahn who saw the point that we were groping for and enabled us to get it into a comprehensible form.

<sup>1</sup> See 'The Classification of Inventions', *Review of Economic Studies* (February 1938).

A problem which Harrod left completely open was the reconciliation of secular growth at a constant ratio of capital to output with the notion embodied in Wicksell's production function, or what F. von Hayek called the 'Ricardo effect' — the relation of real wages to the most profitable 'length of the period of production'. On this subject, as well as on the whole question of accumulation, my ideas were formed in a long series of debates with Nicholas Kaldor, going back to the time when we disputed with Erwin Rothbarth the theory put forward in his posthumous article: 'Causes of the Superior Efficiency of U.S.A. Industry compared with British Industry'.<sup>1</sup>

In discussions of this sort it is impossible to evaluate the contribution of one party. I only know that my borrowings from Kaldor have been very great though he did not always approve the use to which I put them.<sup>2</sup>

The production function was a very tough nut to crack. In this undertaking I had invaluable help from R. F. Kahn, who, once more, found the essential clue to rescue the argument from the tangle into which I had ravelled it. D. G. Champernowne came to our aid with the heavy artillery of his mathematical expertise. I am especially indebted to him for his part in the formulation of the problem of the value of invested capital, and he and Kahn (with the consent of the editors of the *Review of Economic Studies*) have kindly allowed their joint note on this subject to be republished herewith.

An alternative method of solution was independently evolved by C. A. Blyth.

I am also indebted to Champernowne for his extension of the argument to the problem of accumulation with two factors of production (land and labour in fixed supply with capital

<sup>1</sup> *Economic Journal* (September 1946).

<sup>2</sup> His published works bearing on the subject of our debate are: 'The Recent Controversy on the Theory of Capital', *Econometrica* (July 1937); 'On the Theory of Capital', A Rejoinder to Professor Knight, *Econometrica* (January 1938); 'Capital Intensity and the Trade Cycle', *Economica* (February 1939); 'Professor Hayek and the Concertina Effect', *Economica* (November 1942); 'Mr. Hicks on the Trade Cycle', *Economic Journal* (December 1951); 'The Relation of Economic Growth and Cyclical Fluctuation', *Economic Journal* (March 1954); and the article on the Theory of Distribution in *Chambers's Encyclopaedia*.

investment going on)<sup>1</sup> and for much help (even when he did not agree with me) in the formulation of the theory of accumulation in a given state of technical knowledge.

I have also had much assistance from discussions with R. Goodwin, D. Bensusan-Butt, R. Matthews, H. G. Johnson, Ruth Cohen, J. Knapp and L. Tarshis. E. F. Jackson read a large part of the proofs and made many helpful suggestions.

## PLAN OF WORK

Book I contains some discussion of the concepts and categories required for the analysis of accumulation. Its general theme is that it is of no use framing definitions more precise than the subject-matter to which they apply. In this connection I would like to cite the following passage from K. R. Popper, *The Open Society and Its Enemies*.<sup>2</sup>

‘The view that the precision of science and of scientific language depends upon the precision of its terms is certainly very plausible, but it is none the less a mere prejudice. Rather, the precision of a language depends just upon the fact that it takes care not to burden its terms with the task of being precise. A term like “sand-dune” or “wind” is certainly very vague. (How many inches high must a little sand-hill be in order to be called a sand-dune? How quickly must the air move in order to be called a wind?) However, for many of the geologist’s purposes, these terms are quite sufficiently precise; and for other purposes, when a higher degree of differentiation is needed, he can always say “dunes between 4 and 30 feet high” or “wind of a velocity of between 20 and 40 miles an hour”. And the position in the more exact sciences is analogous. In physical measurements, for instance, we always take care to consider the range within which there may be an error; and precision does not consist in trying to reduce this range to nothing, or in pretending that there is no such range, but rather in its explicit recognition.’

<sup>1</sup> ‘The Production Function and the Theory of Capital: A Comment’, *Review of Economic Studies*, vol. xxi (2), No. 55 (1953-4).

<sup>2</sup> Vol. ii, p. 18.

Economic concepts such as wealth, output, income and cost are no easier to define precisely than wind. Nevertheless these concepts are useful, and economic problems can be discussed.

Book II, 'Accumulation in the Long Run', contains the central part of the work. Its strategy is to proceed step by step from the most severely simple assumptions towards greater complexity, squeezing out all that can be learned at each step before proceeding to the next. Section I of Book II, 'Accumulation with One Technique', contains the most important propositions set out in this way, and the rest of the book may be regarded as complications and qualifications surrounding this central core. One simplification used in this section is the assumption of rigid technical coefficients at any given stage of development, so that, when the pattern of consumption is given, the ratio of labour to equipment (at capacity) is given irrespective of the level of wages and profits. In Chapter 9 technical progress, both neutral and biased, is treated under this assumption.

In Section II this assumption is removed and the influence of the level of wages on the choice of technique is brought into the argument. This problem is extremely intricate, and the difficulty of the analysis is out of proportion to its importance. It seemed necessary, however, to treat it at some length, both because it has some importance in reality and because it occupies (under the guise of the conception of a production function) a large place in traditional economic doctrine.

In Section III the analysis of technical progress is recombined with the analysis of the influence of wages on technique.

Chapter 18 summarises the propositions which have been deduced so far.

Book III deals with the evolution of an economy in which uncertainty prevails and expectations about the future are overweighted by current experience. This state of expectations gives rise to short-period fluctuations in activity. The relation between fluctuations in the rate of investment from year to year and its trend over the long run is discussed in Chapter 22.

Book IV treats of finance and the monetary system. In this department of economic life the particular form of institu-

tions (such as Central Banks) and legal rules (such as laws regulating the issue of currency) play a large role ; no attempt is here made to account for or to assess the particular forms that institutions and rules have taken in actual economies. The description of their operation is set out in a generalised and therefore highly stylised form.

So far, the argument has been conducted under the assumption that there is no consumption out of profits. Book IV introduces the rentier. We then have to retrace our steps and consider how the argument already set out has to be modified to allow for consumption out of profits. This arrangement is perhaps troublesome to the reader, but (I believe) less so than would be the introduction of rentiers into the first model.

Up to this point scarcity of land has been assumed away. In Book V rent is introduced, and once more we have to retrace the earlier argument to show what complications are required in it to allow for scarcity of land. Much of this analysis could be modified to apply to problems presented by a multiplicity of factors of production, for instance skilled and unskilled labour.

The last chapter of this Book ('Increasing and Diminishing Returns') and the remaining Books ('Relative Prices' and 'International Trade') map out in a very sketchy manner well-trodden ground which occupies a large space in current economic teaching ; they are appended in order to show the connection between this territory and the terrain of the problem of accumulation rather than to contribute anything fresh to the topics discussed.

The whole argument is set out, as far as possible, as an analytical construction, with a minimum of controversy.

Some Notes are added on a variety of topics in order to defend the concepts used and to show their connection or divergence from some other methods of analysis. These Notes are not intended to provide a survey of current economic doctrines. They are offered only to assist the reader to see in what respects the argument of this work conflicts with certain lines of thought with which he is likely to be familiar.

The discussion of one point, the concept of marginal productivity of investment, is both so important and so perplexing

that it seemed best to promote it to a place in the main text. It appears as a 'Digression' after Chapter 30.

The diagrams illustrate those propositions in the text which are susceptible to treatment in two dimensions.

The final Note by D. G. Champernowne and R. F. Kahn provides a formula, on certain simplifying assumptions, for the element of interest in the cost of capital goods.

JOAN ROBINSON

CAMBRIDGE, 1955

# CONTENTS

## PREFACE

PAGE  
V

## BOOK I

### INTRODUCTION

Chapter 1.	THE CLASSES OF INCOME	3
2.	THE MEANING OF WEALTH	15
3.	THE MEANING OF MONEY	25
4.	CAPITAL AND INCOME	33
5.	CONSUMPTION AND INVESTMENT	41
6.	THE MEANING OF EQUILIBRIUM	57

## BOOK II

### ACCUMULATION IN THE LONG RUN

Chapter 7.	A SIMPLE MODEL	63
------------	----------------	----

#### *Section I — Accumulation with One Technique*

8.	ACCUMULATION WITH CONSTANT TECHNIQUE	73
9.	TECHNICAL PROGRESS	85

#### *Section II — The Technical Frontier*

10.	THE SPECTRUM OF TECHNIQUES	101
11.	THE EVALUATION OF CAPITAL	114
12.	THE TECHNICAL FRONTIER IN A GOLDEN AGE	124
13.	PRODUCTIVITY AND THE REAL CAPITAL RATIO	132

Chapter 14.	ACCUMULATION WITHOUT INVENTIONS	PAGE 139
15.	A SURPLUS OF LABOUR	153

*Section III — Accumulation and Technical Progress*

16.	ACCUMULATION WITH NEUTRAL TECHNICAL PROGRESS	159
17.	ACCUMULATION WITH BIASED PROGRESS	164
18.	SYNOPSIS OF THE THEORY OF ACCUMULA- TION IN THE LONG RUN	173

BOOK III

THE SHORT PERIOD

Chapter 19.	PRICES AND PROFITS	179
20.	WAGES AND PRICES	193
21.	FLUCTUATIONS IN THE RATE OF INVESTMENT	198
22.	CYCLES AND TRENDS	213

BOOK IV

FINANCE

Chapter 23.	MONEY AND FINANCE	225
24.	THE RATES OF INTEREST	237

BOOK V

THE RENTIER

Chapter 25.	CONSUMPTION OF PROFITS	247
26.	CONSUMPTION AND ACCUMULATION IN THE LONG RUN	255
27.	RENTIERS AND THE TRADE CYCLE	264
28.	RENTIERS AND FINANCE	274

# *Contents*

xv

## BOOK VI

### LAND

	PAGE
Chapter 29. LAND AND LABOUR	283
30. FACTOR RATIOS AND TECHNIQUES.	298
A DIGRESSION	307
Chapter 31. LAND AND ACCUMULATION	313
32. LAND, LABOUR AND ACCUMULATION	329
33. INCREASING AND DIMINISHING RETURNS	336

## BOOK VII

### RELATIVE PRICES

Chapter 34. SUPPLY AND DEMAND	351
-------------------------------	-----

## BOOK VIII

### INTERNATIONAL TRADE

Chapter 35. EXTERNAL INVESTMENT	367
36. INTERNATIONAL INVESTMENT	372
CONCLUSION	386

## NOTES ON VARIOUS TOPICS

Welfare Economics	389
The Neo-Classical Theory of Wages and Profits	390
Income from Property as the Reward of Waiting	393
Wicksell on Capital	396
The Natural Rate of Interest	397
Savings and Investment	400
The Supply of Loanable Funds	402
The Quantity Theory of Money	403
Mr. Harrod's Dynamics	404
Innovations under Monopoly and Competition	407

	PAGE
DIAGRAMS	411
THE VALUE OF INVESTED CAPITAL By D. G. Champernowne and R. F. Kahn	429
INDEX	437

BOOK I  
INTRODUCTION

