

STUDIES IN
INTERNATIONAL ECONOMICS

4



INTERNATIONAL
TRADE:
ESSAYS IN
THEORY

RONALD W. JONES

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**INTERNATIONAL TRADE:
ESSAYS IN THEORY**

STUDIES IN INTERNATIONAL ECONOMICS

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Volume 4

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INTRODUCTION TO THE SERIES

This series is intended to embrace all aspects of international economic analysis: theoretical, empirical and econometric. It will equally encompass contributions to pure and monetary theory.

The series will include the publication of collected essays, conference proceedings of exceptional professional quality and interest, and edited volumes addressed to specific phenomena of importance in the analysis of international economics. It will particularly encourage, however, the publication of hitherto unpublished studies which represent fresh and valuable contributions to the analysis of international economic problems.

The Journal of International Economics now provides an excellent outlet for original scientific work in international economics in article length form. For pamphlet length contributions, the different series published by the *International Finance Section* at Princeton have long been of exceptional value, even though they have not generally extended beyond international monetary issues. It is the hope of the editors that the launching of this series, *Studies in International Economics*, will now fill the lacuna in the systematic publication of monograph and volume length research output of international economists, and succeed in doing so consistently with the high quality that the promotion of scientific study of international economic issues requires.

THE EDITORS

To the Five-by-fives:

Deane
Laura
Dylan
Brenn
and
Polly

PREFACE

This collection of essays brings together works of widely ranging vintage, from my first published work in 1956 (Chapter 1) to several previously unpublished papers. The focus is upon the pure theory of international trade instead of the monetary or balance of payments aspects of the field.

For some years I had thought of preparing a volume of essays centered upon my 1965 *Journal of Political Economy* article, 'The Structure of Simple General Equilibrium Models' (appearing here as Chapter 4), since I have over the years published a series of papers which make direct applications of this model. Further thought convinced me that since the field of trade theory encompasses many topics not directly related to the simple general equilibrium model of production, this volume might more usefully gather together work on the transfer problem, international factor mobility, technology and trade and Ricardian models as well as the standard Heckscher–Ohlin approach.

Although each essay stands on its own, I have tried to arrange this collection so that the volume comes close to being a graduate level 'text'. Thus, the subject matter of these papers covers at least three-quarters of the material I traditionally present in my graduate seminar in trade theory at the University of Rochester. I have arranged the chapters under six groupings and added introductory remarks to each section. These serve to place the essays in somewhat wider perspective and, on occasion, to correct statements made in the original publication (see, for example, my remarks in the Introduction to Part I on the possibility of ranking commodities by factor intensity in a Heckscher–Ohlin setting). The final section of the book reproduces my 1976 Graham lecture at Princeton which, while discussing the issue of 'dimensionality' in trade theory, serves to bring together many of the substantive issues discussed in other essays.

Many of the essays which have been previously published are left intact save for minor typographical corrections. Others have been revised or abridged, such as Chapters 8, 12, 13, and 16, and the Appendix to Chapter 14. Chapters 7 and 17, as well as the new Appendix to Chapter 10, have not previously been published.

For this new work (as well as many of the previously published pieces) I am indebted to the National Science Foundation for research support.

Since this volume contains work spanning my academic career, there are many people whose influence and suggestions warrant mention. My interest in trade theory was kindled as an undergraduate at Swarthmore in the excellent seminars conducted by the late Joe Conard, and received further nourishment at M.I.T. from Charles Kindleberger, Paul Samuelson, and Bob Solow. Many of the others who should be acknowledged hopefully are in each chapter. I should especially single out for thanks several co-authors: José Scheinkman (whose piece with me in the *Journal of Political Economy*, 1977, has been shortened and revised as Chapter 8), Roy Ruffin (Chapter 13), and Eitan Berglas (Chapter 16). All have kindly given permission for our joint products to appear here. Typing preparation for the manuscript was excellently provided by Marge Adams.

R.W. Jones

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PART I
THE PURE THEORY OF TRADE

INTRODUCTION TO PART I

Two basic models of trade and production, those associated with David Ricardo on the one hand and Eli Heckscher and Bertil Ohlin on the other, provide the pillars upon which most of the pure theory of international trade rests. The first two chapters in Part I explore and extend the Heckscher–Ohlin theory, while Chapter 3 is devoted to the Ricardian model in its many-country, many-commodity version analyzed by Frank Graham and Lionel McKenzie.

Fundamental developments of the two-country, two-commodity, two-factor version of Heckscher–Ohlin theory had been made prior to 1953, especially by Stolper and Samuelson (on the effect of tariffs on income distribution) and Lerner and Samuelson (on the tendency of free trade to equalize factor prices). However, it was Leontief's application of input – output analysis to the structure of trade in the American economy in his now classic 1953 paper that shocked trade theorists, practitioners, and half a generation of graduate students into re-examining the connection between factor endowments and the pattern of trade. Chapter 1, my first published work in economics, focuses upon the role of demand differences between countries and of factor-intensity reversals in technology in challenging the Heckscher–Ohlin theorem that relatively capital-abundant countries export capital-intensive commodities. This early work goes further in attempting to describe relationships in a multi-commodity Heckscher–Ohlin setting. As Jagdish Bhagwati [1] and others have observed, I overextended myself (in section 6 of Chapter 1) in suggesting that if two countries share a common technology for producing a variety of commodities, these commodities can be ordered from the most capital-intensive to the least and demand conditions would provide a dividing line between those more-capital-intensive commodities that would be exported by the capital-abundant country and the commodities at the labor-intensive end of the chain exported by the labor-abundant country.

The problem with an assertion of this type is that a model with more commodities than productive factors has a ruled transformation surface. That is, the pattern of production becomes indeterminate as the price plane is tangent to a 'rule' or 'flat' of the transformation surface. If factor prices have been equalized

with free trade, costs of production for all commodities are equated between countries and the location of production of any single item becomes indeterminate. My remarks in section 6 must presuppose that factor prices are not driven to equality by trade (as they need not be, even if transport costs are absent), in which case relative costs of production are strictly ordered by the factor-intensity ranking.

Chapter 2 pursues the analysis of a two-factor, many-commodity Heckscher–Ohlin model by taking advantage of the ‘small country’ assumption. This allows commodity prices to be given from the outside, thus making easier the task of analyzing how a country’s production pattern and factor prices depend upon its underlying factor endowment base. Trade patterns typically involve a country importing a variety of commodities, some of which are more capital-intensive than its exports, while some are more labor-intensive. Furthermore, if a non-traded commodity is produced, local demand patterns always can influence factor prices even with given world commodity prices (for traded goods) and a given factor endowment.

Chapter 3 illustrates how the simplification provided by the Ricardian assumption that only one productive factor (labor) requires remuneration allows an analysis of production patterns in a world of many commodities *and* many countries. Building upon earlier work of Graham and McKenzie, this chapter discusses the generalization of the concept of comparative advantage and how it is related to the familiar bilateral cost ratios of Ricardian theory.

Reference

- [1] Bhagwati, J., ‘The Heckscher–Ohlin Theorem in the Multi-Commodity Case’, *Journal of Political Economy*, 80 (September/October 1972) 1052–1055.

FACTOR PROPORTIONS AND THE HECKSCHER–OHLIN THEOREM*

1.

Recent contributions to the pure theory of international trade have relied heavily on the variable-proportions account of trade developed by Heckscher [2] and Ohlin [9], who linked export–import patterns to factor endowments and methods of production. Their hypothesis is expressed in summary form in the *Heckscher–Ohlin theorem*: a country exports those commodities produced with relatively large quantities of the country's relatively abundant factor. Perhaps the most controversial application of this theorem to appear recently is that based on Leontief's input–output studies of the American economy. According to Leontief [5], America is not capital-rich compared with the rest of the world, as popularly supposed. His data suggest that American exports require a higher proportion of labor to capital than do American imports (or rather, American import-competing commodities). Leontief's conclusions then follow from his unqualified support of the Heckscher–Ohlin dictum.

However, there are significant exceptions to the Heckscher–Ohlin theorem.¹ The theorem rests both upon a concept of factor abundance related to pre-trade factor-price ratios and special shapes for the production functions. Should these strict conditions be modified, the Heckscher–Ohlin theorem in some cases no longer holds, in others becomes meaningless. The purpose of this chapter is to clarify the meaning of the Heckscher–Ohlin theorem and to demonstrate that there is no *a priori* basis for accepting the Leontief conclusions; his

* *Review of Economic Studies* (October 1956) 1–10. In preparing this article I have benefited greatly by conversations with Professor Robert Solow and my colleagues, Louis Lefebvre and Michael Moss.

¹ The tendency towards factor-price equalization, a corollary of the Heckscher–Ohlin theorem, has been challenged by James and Pearce [3]. For a statement and discussion of the factor-price equalization theorem see Samuelson [11, 12], and McKenzie [7].