

ESSAYS BY  
PRANAB BARDHAN



International  
Trade, Growth,  
and  
Development

# International trade, growth, and development

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Essays by Pranab Bardhan

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350 Main Street, Malden, MA 02148-5018, USA  
108 Cowley Road, Oxford OX4 1JF, UK  
550 Swanston Street, Carlton, Victoria 3053, Australia  
Kurfürstendamm 57, 10707 Berlin, Germany

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# International Trade, Growth, and Development

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# Preface

The literature on international trade, growth, and development is huge. We do not pretend to even attempt to cover this large literature in any systematic fashion. Instead, this book contains essays, written over three decades, focusing on some of the relatively neglected issues. For example, we deal with the effect of credit market imperfection on the pattern of international specialization, the allocational and distributional implications of localized technical progress, differential learning and different modes of transfer of technology, the equilibrium properties of vintage capital growth models (particularly their implications for international productivity differences brought about by differences in endogenously determined rates of obsolescence of capital), and so on. In the last part of the book we also report several large-scale and yet intensive field surveys in India in which I was involved, which bear on the crucial terms and conditions of contracts in informal factor markets in the rural sector. These contribute to the empirical building blocks that provide microfoundations to a theory of rural development, an area where, as in much of the rest of economics, the theory tends to run far ahead of the slow and tedious but necessary empirical work. So this book straddles a wide range of issues in economic development, both theoretical and empirical, relating to economic agents both at the micro level and the aggregative economy.

A few of the essays were originally published many years back, but I like to think that some of them are on topics that are still relatively neglected. Some readers may be of the opinion that they deserve neglect, but it is part of an aging economist's vanity to think otherwise. In the Introduction to each part I try to briefly put the essays in the context of the more recent literature, when the latter exists.

Exactly half of the 18 chapters in this book are coauthored. My accomplices have been Ashok Rudra (in Chapters 13, 14, 17, and 18), Kenneth Kletzer (Chapters 1, 3, and 8), Harvey Lapan (Chapter 2), and Rodrigo Priale (Chapter 9). My pleasure

in having worked with these fine scholars is heightened by the possibility of partial blame-sharing.

Pranab Bardhan  
Berkeley, California  
November 2001

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The publishers apologize for any errors or omissions in the above list and would be grateful to be notified of any corrections that should be incorporated in the next edition or reprint of this book.



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Part I

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# Trade and Development



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# Introduction

This part of the book deals with some of the constraints faced by poor countries in international trade with, and transfer of technology from, rich countries. While there is a large literature on international credit market imperfections, sovereign risk in debt contracts and their macroeconomic implications, there has been much less research done on the implications of these market imperfections on the pattern of international specialization in micro trade theory. In Chapter 1 we show that even when technology and endowments are identical between countries, and economies of scale are absent (the usual trinity of explanations for international trade), (a) moral hazard considerations in the international credit market under sovereign risk and (b) differences between countries in the domestic institutions of credit contract enforcement under incomplete information may lead to one country facing a higher interest rate or rationed credit compared to another. In such situations the former country may face a comparative disadvantage in producing processed or sophisticated manufactured goods requiring more working capital or credit to cover selling or distribution costs in comparison to bulk primary products. This is a clear example of how the pattern of specialization may depend on institutional features of the economy, which are not emphasized in the theory of international trade.<sup>1</sup>

In a recent paper T. Beck<sup>2</sup> has tried to test a hypothesis derived from a model like that in Chapter 1, that there is a link between financial development of an economy and its structure of international trade. Using a 30-year panel for 65 countries Beck shows that, controlling for country-specific effects and possible reverse causality, financial development exerts a large causal impact on the level of both exports and the trade balance of manufactured goods. One policy implication is that the effect of trade reforms on the level and structure of trade balance may depend on the level of financial development.

Chapters 2, 3, and 4 discuss some aspects of transfer of technology from rich to poor countries, a topic that has in general attracted a lot of attention since these papers were originally written, but not necessarily on the aspects discussed here. In

Chapter 2 we explore a simple model in which a poor country has to choose between indigenous technology with a lot of substitutability between capital and labor, and a foreign technology which is more advanced but available at a rather high capital-intensity (with limited scope for factor substitutability). The latter is due to the localized (in terms of the prevailing factor proportions in the country of origin) nature of technical progress (which happens at a faster rate) in rich countries. We discuss the allocational and distributional implications of a transfer of superior technology that is available only at specific (high, and therefore costly) capital-intensity for a poor country. For example, such a transfer may have an adverse effect on wages in the poor country. In a general-equilibrium extension of the model H. Lapan<sup>3</sup> has demonstrated the possibility that such a transfer may result in a reversal of the trade pattern in a Heckscher–Ohlin model and K. Miyagiwa<sup>4</sup> has discussed its distributional implications in terms of a Ricardo–Viner model.

In Chapter 3 we extend the model of Chapter 2 in a different direction. Suppose the indigenous technology in a poor country produces a product of highly variable quality and the quality of a foreign product is just more dependable. In this case the transfer of technology improves the quality of the product in the sense of a mean-preserving shrink in the distribution of product quality, but at the cost of a highly capital-intensive technique. As in Chapter 2, we discuss the similar allocational and distributional implications of such a transfer. We then introduce an alternative to the adoption of the foreign technique, that of spending resources on domestic quality inspection and output sorting, assuming scale economies in such quality control. As a departure from the usual analysis of choice of techniques, in this model demand conditions and the relationship between price and quality play an important role in determining the optimal selection of production methods.

Chapter 4 focuses on the mode of technology transfer. Suppose a developing country has a choice of importing cars (mode I) from an oligopolistic world market; or producing them at home in a subsidiary (S) of a transnational company, or in a domestic firm under a licensing contract (L) from a transnational which ties the import of components from the latter. If the criterion of host-country national benefit is given by consumer surplus under I or S, and by consumer surplus plus the profits of the domestic firm under L, we compare the benefits from the alternative regimes I, S, or L under different market structure assumptions. While the literature on direct foreign investment is large, there is not too much analysis of the choice problem involving all modes in a unified framework from the welfare perspective of a host country. I. Horstmann and J. Markusen<sup>5</sup> as well as W. Ethier and J. Markusen<sup>6</sup> have studied the choice between S and L from the perspective of the transnational company in the presence of intellectual property rights in the host country. S. Das<sup>7</sup> has extended the analysis to include the option of a joint venture. The models in these three papers are more advanced in terms of the presumed contractual structures underlying transnational companies.

The last two chapters in this part both involve international differences in total factor productivity between rich and poor countries. In Chapter 5 the differences are both exogenous and endogenous, whereas in Chapter 6 they are endogenous. In Chapter 5 we explain the remarkable similarity of rates of return to capital but not

in wage rates between rich and poor countries, in terms of particular types of differences in their production functions, in terms of differential learning effects and differential degrees of specialization in the sector producing intermediate inputs and services. We argue that in understanding this asymmetry in international factor prices the usual explanation in terms of greater international mobility of capital relative to labor is not enough.

Chapter 6 introduces a model of learning-by-doing in international trade theory (many years before the reappearance of the idea in the recent endogenous growth literature). Unlike in the case of the topic for other chapters in this part, a large literature has developed on this topic. Chapter 6 provides a formal rationale for an old argument for infant-industry protection: dynamic learning spillovers accruing from production experience measured, say, by cumulated domestic output may call for policy intervention in favor of some firms and industries, producing import substitutes (or new exports). P. Krugman<sup>8</sup> built on this and emphasized the self-reinforcing nature of initial specialization which results from the learning process, as an economy becomes better at producing the same thing; he also stressed how a deliberate policy intervention may be needed to pry the economy loose from an historical “lock-in” with respect to specialization in a slower-growing sector. Of course, trade policy is not the first-best way of resolving this market failure.<sup>9</sup> (A credit market intervention enabling a nascent firm or industry to tide over temporary losses may be more appropriate.) Besides, in a world of imperfect information, the learning function is not common knowledge, and this may create severe problems for policy intervention (including in the credit market) on the part of an imperfectly informed government. On the other hand, as K. Hoff<sup>10</sup> has suggested, the experience gained by each entrant to a new industry may be viewed as an experiment that reveals information about the production function to later entrants; and, in the context of such learning by experimentation, industrial policy can improve on the competitive equilibrium. There is, of course, a time inconsistency problem that afflicts such policies in most countries: once protected, the infant sometimes refuses to grow and face competition, and instead concentrates on lobbying for prolonged protection.

R. Lucas<sup>11</sup> points our attention to another aspect of the learning process which has been ignored in the earlier literature, including in our Chapter 6: for learning, particularly on-the-job learning, to occur in an economy on a sustained basis, it is necessary that workers and managers continue to take on tasks that are new to them, so as to continue to move up the quality ladder in goods. The major formulations that try to capture this in the context of an open economy are those of A. Young<sup>12</sup> and N. Stokey.<sup>13</sup> Stokey has a model of the so-called North–South trade, based on vertical product differentiation and international differences in labor quality; the South produces a low-quality spectrum of goods and the North, a high-quality spectrum. If human capital is acquired through learning-by-doing and so is stimulated by the production of high-quality goods, free trade (as opposed to autarky) will speed up human capital accumulation in the North and slow it down in the South. A similar result is obtained by Young. The country that begins with a technological lead tends to widen the lead over time. One limitation of the Young–Stokey story is the presumption that all imports substitute for domestic production.

But as H. Wan<sup>14</sup> has emphasized, when imported inputs are complementary with domestic production, there may be a lot of scope for learning in the assembly and processing of imported industrial inputs, as the early stages of East Asian industrialization seem to indicate. Trade may be crucial for development in (a) providing the means to import an essential ingredient for a production process that gives the opportunity to continuously upgrade domestic skills, and (b) providing an external market for the output thus produced, which many consumers at home still cannot afford. Of course, one needs an adequate supply of basic skills and education in the labor force to utilize this trade-related learning.

### Notes

1. For some examples of increasing attention paid by international economists to institutional issues in recent years, see the symposium on Business and Social Networks in International Trade in the *Journal of International Economics*, June 1999, vol. 48, no. 1.
2. T. Beck, "Financial Development and International Trade: Is There a Link?," World Bank, Working Paper, May 2001.
3. H. Lapan, "The Possibility of Reversing the Trade Pattern with Internationally-Diffused Localized Technical Progress," *Journal of International Economics*, vol. 5, 1975.
4. K. Miyagiwa, "International Transfer of Localized Technology and Factor Income in the Ricardo-Viner Trade Model," *Canadian Journal of Economics*, vol. 21, November 1988.
5. I. J. Horstmann and J. R. Markusen, "Licensing Versus Direct Investment: A Model of Internalization by the Multinational Enterprise," *Canadian Journal of Economics*, vol. 20, 1987.
6. W. J. Ethier and J. R. Markusen, "Multinational Firms, Technology Diffusion and Trade," *Journal of International Economics*, vol. 41, 1996.
7. S. P. Das, "Direct Foreign Investment Versus Licensing," *Review of Development Economics*, vol. 3, 1999.
8. P. Krugman, "The Narrow Moving Band, the Dutch Disease, and the Competitive Consequences of Mrs. Thatcher: Notes of Trade in the Presence of Dynamic Scale Economics," *Journal of Development Economics*, vol. 27, 1987.
9. M. Melitz compares in this context the effectiveness of different trade policy instruments when these are not perfectly flexible over time, in his "When and How Should Infant Industries be Protected?," working paper, Harvard University, 1999.
10. K. Hoff, "Bayesian Learning in a Model of Infant Industries," *Journal of International Economics*, vol. 43, 1997.
11. R. E. Lucas, "Making a Miracle," *Econometrica*, vol. 61, 1993.
12. A. Young, "Learning by Doing and the Dynamic Effects of International Trade," *Quarterly Journal of Economics*, vol. 106, 1991.
13. N. Stokey, "The Volume and Composition of Trade between Rich and Poor Countries," *Review of Economic Studies*, vol. 58, 1991.
14. H. Wan, "Why Trade Matters," unpublished paper, Cornell University, 1996.



# Chapter 1

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## Credit Markets and Patterns of International Trade\*

### 1. Introduction

The theoretical literature on the so-called North–South trade models often points attention to a general asymmetry of product specialization in rich and poor countries, with the former concentrating on goods which involve a high degree of processing and the latter on relatively unprocessed primary or intermediate products. The origin and preservation of this asymmetry is usually traced to static differences in factor endowments, in the nature of product and process innovations that take place in rich countries and in the cumulative processes of dynamic economies of scale in manufacturing and generalized learning effects of a larger initial capital stock in rich countries [see, for example, Krugman (1981) and Dutt (1986)]. While not denying the importance of these factors, in this paper we shall abstract from them and focus on the contribution of some aspects of credit market imperfections to inter-country differences in patterns of specialization and trade. In particular we show that even when technology and endowments are identical between countries and economies of scale are absent, (a) moral hazard considerations in the international credit market under sovereign risk and (b) differences between countries in the domestic institutions of credit contract enforcement under incomplete information may lead to one country facing a higher interest rate or rationed credit compared to another. This may lead to differences in comparative advantage<sup>1</sup> in processed goods requiring more working capital, marketing costs, or trade finance. We presume that more sophisticated manufactured finished products require more credit to cover selling and distribution costs than primary or intermediate products.

In general, the impact of financial markets on merchandise trade is a relatively unexplored area of trade theory. In the empirical literature on East Asian success