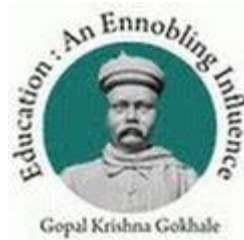


# **INTERNATIONAL TRADE IN CAPITAL GOODS**

SUMMARY OF THE THESIS  
For the Degree of  
**DOCTOR OF PHILOSOPHY**  
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AT



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## Introduction and Review of Literature

International trade theory has been dominated for many decades by models that either explicitly, or implicitly evade altogether the questions of the heterogeneity of capital goods, and the issue of distribution as a consequence of international trade. The capital controversies of the 1960's have had inevitable implications for neoclassical trade theories that were based on the notion of capital as non-produced endowments whose quantity is defined independently of the prices of good. Four kinds of developments have taken place in the literature since then.

- (1) Steedman<sup>1</sup> and his co-authors wrote a series of papers to show that if the distinction between capital as the value of heterogeneous capital goods and the capital goods themselves is made, as it ought to be made, many of the standard propositions and theorems of modern trade theory would either fail to hold or would, at the very least, have to be heavily qualified.
- (2) Dornbusch, Fischer & Samuelson<sup>2</sup>, Shiozawa<sup>3</sup> and others, on the other hand, developed the Ricardian model and extended it to several commodities including trade in intermediate goods. Specifically, they showed that with international trade in intermediate goods it is no longer possible to solve the price system of any country in isolation from the price systems of its trading partners; the price system becomes international in nature.
- (3) Eaton and Kortum<sup>4</sup> developed a model of multi-country multi-commodity trade which allowed trade in intermediates but assumed quite restrictively that the pattern of absolute and comparative advantages across countries and commodities can be represented by index numbers and countries can be monotonically ranked by those indexes.
- (4) New trade theory explained trade which focuses on the role of increasing returns to scale, intra-industry trade and the concentration of industries in locations where all the industries can have the maximal advantage in production and trade. New trade theorists relaxed the assumption of constant returns to scale, and some build up a huge industrial base in certain industries which will then allow those sectors to dominate the world

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<sup>1</sup> Steedman, I. (ed.1977 a), *Fundamental Issues in Trade Theory*, Macmillan, London.

<sup>2</sup> Dornbusch, R. S. Fisher and P. A. Samuelson (1977) "Comparative Advantage and Payments in a Ricardian Model with a Continuum of Goods", *American Economic Review*, Vol. 67, December.

<sup>3</sup> Shiozawa, Yoshinori (2007) "A New Construction of Ricardian Trade Theory—A Many-country, Many-commodity Case with Intermediate Goods and Choice of Production Techniques", *Evolutionary and Institutional Economics Review*, Vol.3 (2).

<sup>4</sup> Eaton and Kortum (2002) "Technology, Geography, and Trade", *Econometrica*, Vol. 70, No. 5, pp. 1741-1779

The trade models developed in this thesis are of a “classical” nature. They are not much concerned either with intra-industry trade or with trade between firms; they share stronger kinship with the theories of Graham (1948) and Shiozawa (2002). At the same time a central concern is to take seriously the implication of the capital controversies for trade theory pointed out by Steedman et. al. (1979). Accordingly, the thesis contain two main chapters. Chapter III applies the static open Leontief model to study the international trade and chapter IV goes further to apply the Sraffa (1960) system to study international trade.

## **Classical and neoclassical value & trade theories**

The theory being advanced in this thesis is based on the classical theory of value as revived by Leontief (1953) and Sraffa (1960) as opposed to the neoclassical theory of value. Very naturally it differs from the neoclassical theory both in its approach as well as the methodology. Trade theory is usually an extension of value theory. The following tables shows the differences in approach and therefore in the results in classical and neoclassical value.

Value Theory	Classical	Neoclassical
Given Data	Land, Labour, Technical coefficients and Consumer preferences.	Land, Labour, Capital, Production function and Consumer preferences.
Variables determined	Outputs of various goods, Relative prices, Level of consumption of consumption goods, National incomes of economies and Capital stock.	Levels of outputs, Levels of consumptions, Relative prices

In the neoclassical value theory, for given endowment of labour and capital, resources and technology, goods are produced considering the standard production functions. The produced goods consumed by consumers according to their taste and preferences. The neo-classical value theory determines the relative prices of goods and their production and consumption at the equilibrium where production is always equal to the consumption at full employment.

In the classical value theory, for given endowment of labour goods are produced using specific technology. These goods then consumed by consumers according to their preferences. The classical value theory determines output of various goods, relative prices of commodities, level of consumption of

consumption goods, national incomes of economies and the capital stocks and where applicable the rates of growth and distribution of income between profits and wage.

Trade theory is usually an extension of value theory. The following tables shows the differences in approach and therefore in the results in classical and neoclassical trade theory.

Trade Theory	Classical	Neoclassical
Determination	Levels of post trade productions, trade pattern, volumes of export and imports, levels of consumption, prices, rates of growth, terms of trade, exchange rate, post-trade capital stocks, national incomes, wage rates.	Levels of outputs, post-trade production= post-trade consumption, volumes of exports and imports, terms of trade, equalised factor prices.
Special Features	Capital goods are traded, Non-tradable commodities are included in the trade.	Capital goods are not traded. Non-tradable goods are not considered in trade.

With usual assumption of immobility of factors of production neoclassical trade theory determines levels of outputs, post-trade production which is always equal to post-trade consumption, volumes of exports and imports, terms of trade and equalised factor prices. The neoclassical trade theory suppose that all goods are consumption goods.

In fact, there are some goods that cannot be consumed but they are traded internationally. The trade in these types of goods is not considered in neoclassical trade theory. Secondly, in international trade of neoclassical type, the production possibility frontiers are not affected, only the consumption possibility frontiers are affected. But what is generally seen in the international trade that, production possibilities are also undergo a change.

In the classical trade theory for given endowments in capital, labours, technology and consumer preferences at international trade equilibrium, levels of post trade productions, trade pattern, volumes of export and imports, levels of consumption where applicable, prices, rates of growth, terms of trade, exchange rate, post-trade capital stocks, national incomes and wage rates are determined in static framework.

In our trade models we have shown that production possibilities changes after countries open to trade chiefly because capital goods are allowed to be traded so that if they are more cheaply available the production possibility frontiers of countries are enlarged. The trade models that are developed considers consumption as well as capital goods. To construct dynamic trade models we have considered savings, investments and growth. In both static and dynamic context the trade models determine all variables of interest such as volume of world trade, terms of trade, direction of trade, national incomes, relative prices, exchange rates and capital stock. In addition to this dynamic model determines rates of growth and profit.

## **Objectives of the Thesis**

The present thesis has four main research objectives.

1. To formulate a model of international trade in capital as well as consumption goods.
2. To formulate a model of international trade which does not compartmentalise the ‘pure’ and ‘monetary’ aspects of trade. In other words, comparative advantage, trade patterns and exchange rates should be determined together simultaneously.
3. To formulate a method to determine international trade between several countries in several commodities.
4. To propose constructive algorithm for numerical solutions and to find the international trade equilibrium in which the size and composition of international trade, the industrial outputs in the countries, the distributive variables, the prices of commodities, the exchange rate and the international terms of trade are fully determined.

## **Research Findings**

This thesis has developed multi-country multi-commodity models of international trade in static and dynamic settings. As stated in the introductory, it has kept strictly intact the distinction between value capital and heterogeneous capital goods and allowing the latter to be internationally traded. Accordingly the value and composition of capital stocks and the national products of the countries have been traded as unknowns whose values must be determined by the model whether in static or dynamic contexts. The trade models themselves may be regarded as *complete* in the sense that they determine all variables of interest. Thus, in the static model of chapter III if trade equilibrium exists then the following variables are determined by the system of equations;

- (a) the pattern of specialization in production; which countries produce which commodities
- (b) the post-trade prices of commodities

- (c) the post-trade outputs of commodities
- (d) the pattern of gains from trade i. e. which country gains how much by importing which commodity from which country
- (e) the commodity wise volumes of inter-country exports and imports
- (f) the equilibrium exchange rates and the international terms of trade
- (g) all value magnitudes such as the gross national products, net national incomes and capital stocks in the countries
- (h) the post trade real wage rates in the countries

In the dynamic trade models of chapter IV the model determines (a) to (h) and further determine

- (i) the post-trade rates of growth of the countries
- (j) the post-trade distribution of real incomes i. e. wages and profits in the countries

All the results are “constructive” in the sense that the theory has not been concerned with providing abstract results such as the existence or otherwise of an international trade equilibrium. On the contrary the thesis has emphasized on developing algorithms to determine the international trade equilibrium, if it exists.

In contrast with traditional trade theory, trade models developed in this thesis consider the internal structure of the production of the countries i. e. the endowments of primary resources, the technique of production and tastes and preferences of consumers while determining the commodity composition of intercountry trade. The relative prices of commodities determine the comparative advantage in the production of the different commodities in the countries. Our trade models determine which commodities will be imported, which produced and exported and accordingly which industries will be close down in different countries and which will be expanded when trade takes place. The taste and preferences and the income levels of consumers determine the volumes of demand for the imported commodities. These along with the prices of commodities in the exporting countries determine the values of intercountry import bills of countries. The intercountry import bills determine the exchange rates. Simultaneously, the endowments and techniques of production determine the volumes and the values of the supplies of exported commodities. The international trade equilibrium is achieved at the exchange rate where the world supplies meets world demands in volumes and values.

The specific results of the theory of international trade presented in this thesis stand in sharp contrast to those of traditional trade theory. Attention is here drawn to only few critical results.

1. In section 3.4 of chapter 3 it has been shown that the theory can generate situations in which the trade pattern is consistent with the Heckscher-Ohlin prediction as well the Leontief paradox prediction.
2. In general, the international trade model of this thesis does not predict equalization of real factor rewards in all countries due to international trade.
3. Traditional trade theory is lacking in models of international trade in which economic growth is considered in an endogenous manner. The theory advanced in this thesis shows how this can be achieved and shows how trade is growth-enhancing chiefly due to access to cheaper capital goods.
4. In contrast with the conclusion of Dornbusch, Fisher and Samuelson (1977) who postulated a model of trade in a continuum of goods in which the exchange rate would be determined by the ratio of nominal wage rates in equilibrium, the present thesis concludes exchange rates would be determined at the point where trade of each country is balanced and foreign exchange markets are cleared.
5. In contrast with the assumption of Eaton and Kortum (2002) that each country imports a given commodity only from one country the model in this thesis allows imports from one or more countries and can therefore make a claim to greater generality.
6. The effects of international trade on the competitive rates of profit that prevail post-trade have been clearly brought out. The traditional trade model requires that the rate of profit in one country declines due to trade. Thus is an unsatisfactory result which is prevented from occurring in the trade model of this thesis.
7. The international trade model in this thesis is based on empirically observable inputs, viz. the input-output coefficients and consumption coefficients that can be obtained from linear expenditure systems or almost ideal demand systems so it is expected that it would be more amenable to empirical implementation.
8. While it is true that the 'pure' and the 'monetary' aspects of international trade have not been fully integrated in the theory, at least they have not been kept entirely separate. So it is, for example, perfectly possible to study the effects of tariffs on exchange rate or the effects of intercountry transfers on the international trade equilibrium.
9. Traditional trade theory has never been satisfactorily extended to apply to multi-country trade problems. The trade model in this thesis has been shown to be capable of handling multi-country multi-commodity trade quite easily.