Frontiers of Research in Intra-industry Trade

Edited by

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**Introduction**

Peter Lloyd and Hyun-Hoon Lee

When intra-industry trade was first observed some forty years ago by Verdoorn (1960), Balassa (1963, 1966) and Grubel (1967), it was a new and exciting way of examining patterns of goods trade. These authors made the revolutionary observation that there was specialisation within industries and two-way international trade in the multiple outputs of industries. Grubel and Lloyd (1975) developed the most widely used index for the measurement of intra-industry trade. Using this measure, they found that the unweighted mean share of intra-industry trade in the total goods trade of ten major OECD countries in 1967 was 50 per cent. Grubel and Lloyd and others attempted to develop a theoretical basis for the existence of intra-industry trade in both homogeneous and differentiated products. However, the underlying concept of an industry was rarely examined and theorising was mostly partial equilibrium analysis.

Starting with the work of Krugman and Lancaster in 1979, a number of formal general equilibrium models which yielded intra-industry trade were developed. These models used different specifications of industries and international trade. Some yielded what became known as horizontal intra-industry trade in differentiated final products or in homogeneous products, some vertical intra-industry trade in different qualities of products and some other forms of intra-industry trade such as fragmentation. New models continue to emerge.

New aspects of intra-industry trade have also been observed. The concept of intra-industry trade has expanded to incorporate marginal intra-industry trade, intra-firm trade, intra-industry trade in New Geography models and intra-industry trade in services.

The world is becoming one global economy. In the second half of the twentieth century, the world economy witnessed many dramatic changes in technology of information and transportation, and successive rounds of multilateral trade negotiations under GATT. As
a consequence, international trade increased dramatically, outpacing income growth. Furthermore, in most developed countries and developing countries alike, a large portion of the volume of international goods trade is intra-industry trade. The proportion of intra-industry trade in services trade and in affiliate production is even higher than in goods trade. (See the chapters in this book by Lloyd and Lee and by Markusen and Maskus respectively.) This high level of intra-industry trade makes the subject of intra-industry trade more important than ever before.

The present book looks at the frontiers of research in intra-industry trade. It consists of four parts. Part One is a single chapter on some historical controversies in the development of the theory and empirical measurement of intra-industry trade. The chapters in Part Two are concerned with further development of models of intra-industry trade while those in Part Three consider empirical patterns and trends and some important policy issues associated with intra-industry trade. Part Four considers intra-industry trade associated with industries in which there is also intra-industry or two-way flows of FDI and assets. This is a new and increasingly important area of intra-industry analysis.

**Development of intra-industry trade theory and measurement**

Chapter 2 in Part One takes a retrospective view of three important controversies in the development of intra-industry analysis. They are the fundamental aggregation problem, the choice of measure in empirical studies and the incorporation of intra-industry trade into analyses of the factor content of international trade.

The first raised the question of whether observed intra-industry trade was real or the result of categorical aggregation of unrelated commodities into one group. This issue was resolved by the accumulation of empirical evidence and the development of models of international trade that yielded both intra- and inter-industry trade. These models also indicate the appropriate measure of intra-industry trade. For the purpose of explaining trade patterns and comparative advantage, it is the Grubel-Lloyd measure. For purposes of empirical studies that compare distributions of trade variables, the appropriate measure
is an index of similarity. The related question of an adjustment to the measure for the trade imbalance is unresolved. The third question is a current issue that may become a new controversy. Recent empirical tests of factor proportions and differences in technologies or products as alternative hypotheses have been enriched by the addition of intra-industry to inter-industry trade flows.

Models of intra-industry trade

Part Two consists of four chapters that focus on modeling intra-industry trade. The models relate to trade in goods with no associated FDI or international production.

In Chapter 3, Nicolas Schmitt and Zhihao Yu investigate further the properties of a model of intra-industry trade with horizontal differentiation. They argue that the standard model of intra-industry trade (i.e., the Dixit-Stiglitz-Krugman model) is able to explain the significant gap between the growth rates of trade and of output, provided that it includes non-traded products. The post-World War II period is characterized by a significantly higher growth rate in world manufactured trade than in world output. Roughly, world manufactured trade has grown on average by about 3 per cent per year faster than GDP since 1950. Over the same period, the share of intra-industry trade has increased significantly and it represents today a significant proportion of overall trade. There is no well-accepted model explaining this gap in the growth rates. This chapter argues that there is a simple channel through which the gap between growth in trade and in output can be explained: non-traded horizontally differentiated products are becoming traded as barriers to trade decrease. Specifically, they find that in a model based on Krugman (1980) which includes both traded and non-traded goods, the effect of trade liberalization on the change in the share of export in total output almost doubles compared to the standard model as some non-traded goods become traded when the cost of trade decreases. Furthermore, we also find that the change in the share of export is sensitive to higher degrees of scale economies.
Chapter 4 by Daniel Bernhofen extends the theory of intra-industry trade in which product differentiation is not the driving force behind such trade. He divides the literature on intra-industry trade in homogeneous products into a “competitive branch” and a “strategic branch”. He provides a critical assessment of the recent theoretical and empirical contributions in these literatures, offers some suggestions for future research, and shows how relaxing the strict product homogeneity assumption in the strategic trade model yields some new results. Although intra-industry trade is due to strategic interaction, relaxing the intensity of strategic interaction in the form of lowering the degree of product substitutability makes firms more eager to trade and leads, therefore, to more two-way trade. This characteristic feature of the model also has some implications for anti-trust policy. Although a higher degree of product differentiation decreases firms’ incentives to refrain from forming a collusive agreement not to sell into each other’s national market, it also reduces the disciplining effect of foreign trade on domestic market power. Furthermore, he shows that – for a given degree of product substitutability - the incentives of international collusion are stronger in industries with a relatively low degree of market concentration.

The costs of outsourcing parts of previously vertically integrated production processes have been steadily going down, and as a consequence, there has been considerable international fragmentation of these processes. Lower real wages abroad have helped to induce labour-intensive fragments to move from advanced to less advanced countries. In some industries, such as autos and parts, the resulting trade is recorded as intra-industry trade. In others, it would be inter-industry trade that expands. In discussing the links between fragmentation and intra-industry trade, Chapter 5, by Ronald Jones, Henryk Kierzkowski and Gregory Leonard, looks more intensively at selected industries in U.S. trade. These are colour television, the automobile industry, and apparel, with particular attention to trade within the NAFTA area. In some industries, for example, the television industry in the United States and Mexico, intra-industry trade remains at a high level for the industry as a whole, but much less when trade is separated into fragments such as cathode ray tubes or final assembled sets. For other industries, such as the automobile
sector, the aggregate measure of intra-industry trade has been falling but the measure in parts separately has experienced a rapid increase.

In Chapter 6 Mary Amiti and Tony Venables explore the implications of new geography for intra-industry trade. This is a new area of research. One of the most robust empirical findings on intra-industry trade is that measures of intra-industry trade relative to inter-industry trade decline with distance. This chapter develops a model that has some geographic structure – a number of countries at different distances from each other. This yields a natural benchmark case in which intra-industry trade occurs but relative intra-industry trade measures are independent of distance. This model explores a variety of deviations from this benchmark and how they create patterns of relative intra-industry trade that are correlated with distance.

The deviations include letting transport costs and demand elasticities vary across industries and letting factor endowments vary systematically with geography. Spatial models create their own forces of industrial location. The overall conclusion is that the negative relationship between relative intra-industry trade and distance is more plausibly explained as a corollary of industrial location than as a consequence of trading technologies.

**Empirical studies and policy issues of intra-industry trade**

In Chapter 7, Marius Brülhart points out that the appropriate definition of intra-industry trade continues to be a matter of debate in the context of adjustment in factor markets to changes in international trade. In this context, economists conventionally assume that intra-industry trade entails relatively smooth factor-market adjustment to trade liberalisation. A range of measures have been developed. These measures capture the degree of symmetry of changes in exports and imports at the sector level. Brülhart gives a critical overview of these measures. He concludes that a consensus is emerging that, in the context of adjustment, one should use measures that are based on marginal intra-industry trade.
Chapter 8, by Lionel Fontagné and Michael Freudenberg, examines European trade patterns over the period 1980-1999, using data on values and unit values of bilateral trade flows at a very disaggregated level. European integration has proceeded in a manner that is both original and quite unexpected. Contrasting with the conclusions of *ex ante* studies, the share of intra-industry trade of varieties has remained remarkably stable over time, whereas the share of intra-industry trade of qualities has increased rapidly, and is now the most important trade type in intra-European trade. Thus the quality of goods and the positioning of the quality ladder are now playing a crucial role. They also address the determinants of shares of trade types in bilateral trade and show that R&D efforts, technological progress or the qualification of the labour force are determinants of the merging qualitative division of labour in Europe.

Hitherto all empirical studies and analyses of intra-industry trade have been confined to trade in goods. Yet, for the analysis of trade flows and their effects on the allocation of resources and the welfare of national residents, there is no reason to separate trade in goods from trade in services. Chapter 9, by Hyun-Hoon Lee and Peter Lloyd, seeks to remedy this gap in the study of intra-industry trade by using data compiled recently under an OECD classification of trade in services. It is found that the shares of intra-industry trade in services for most countries are high, and have remained very stable over the period between 1992 and 1996. They also carry out an empirical analysis of inter-countries differences in intra-industry trade in services and examine the effect the inclusion of trade in services has on the observed levels of intra-industry trade in goods and services combined.

In Chapter 10 David Greenaway and Chris Milner consider the evidence from the tests of horizontally versus vertically differentiated intra-industry trade. New models developed in the 1980s allowed for inter-industry specialization in homogeneous goods and for intra-industry specialization in horizontally differentiated good. This is often referred to as the Chamberlin-Heckscher-Ohlin model of international trade and it came to be accepted as the dominant explanation of observed intra-industry trade. This chapter
argues that this view is largely misplaced. Evidence from North-North, North-South and South-South trade points to vertically differentiated goods as the dominant form of intra-industry trade.

The chapter then considers the implications of this shift in explanation for the analysis of labour market adjustments to changes in international trade. Evidence of substantial intra-industry variation in skills and wages modifies the smooth adjustment view of labour markets.

**Intra-industry trade, affiliate production and FDI**

Economic interactions among the high-income developed countries are characterized by high degrees of both intra-industry trade and intra-industry affiliate production and sales. Similar high-income countries both heavily trade with and invest into each other. Empirical estimation gives good support to the predictions of the theory for intra-industry affiliate sales, with somewhat weaker results for intra-industry trade. Chapter 11, by James Markusen and Keith Maskus, shows how the theory of direct investment can be integrated with the theory of international trade in goods. Building on their own recent work, they construct a general equilibrium model of trade in goods and affiliate production activity where the pattern of firm location, production and trade are simultaneously and endogenously determined. The model is tested empirically using data of US bilateral trade and affiliate production with ten countries or regions. This confirms that the intra-industry affiliate sales index rises relative to the intra-industry trade index as countries become richer and more similar in size and in relative endowments.

In Chapter 12 Karolina Ekholm examines hypotheses relating to intra-industry FDI and affiliate production in models of the type developed by Markusen and Maskus. She measures the extent of intra-industry affiliate production (IIAP), using Swedish data on affiliate activities to calculate Grubel-Lloyd indices. These measures are compared to the corresponding measures for intra-industry trade. She examines whether IIAP and IIT
can be explained by dissimilarity in relative factor endowments and whether IIT can be explained by the interaction between differences in GDP and differences in relative factor endowments, as suggested by theory. It is found that dissimilarity in relative endowments of overall capital affect both IIAP and IIT negatively. Furthermore, she estimates negative effects of dissimilarity in relative endowments of human capital. She also shows that the estimated changes over time unaccounted for by changes in the variables included in the analysis differ between IIAP and IIT in a way that is consistent with the prediction that decreases in trade costs would decrease IIAP, but not IIT.

One important aspect of recent international trade is trade between a parent company and its foreign affiliates in which case products are traded internationally but stay within the ambit of a multinational enterprise (MNE). This type of trade is called *intra-firm* trade as opposed to trade among unrelated parties, called *arm’s-length* trade. Chapter 13, by Kiichiro Fukasaku and Fukunari Kimura, updates research on this phenomenon by analysing the available data on intra-firm trade for two major OECD countries, the United States and Japan.

They argue that globalisation may or may not enhance the weight of intra-firm trade in the overall trade. On the one hand, globalisation provides more room for firms to conduct global operations, which may result in greater intra-firm transactions. On the other hand, globalisation reduces the *service costs* of linking remote locations together, which makes arm’s-length trade easier and cheaper. The US case shows that the share of intra-firm trade to the overall trade has been relatively stable over time, while the Japanese case suggests that firms with higher R&D intensity do not necessarily have higher intra-firm transaction ratios in electronics industry. They also find that intra-firm trade has strong industry-specific and firm-specific characteristics. Intra-firm trade is mostly the result of upstream-downstream fragmentation across different locations. Fragmentation sometimes takes a form of splitting a production block into several sub-blocks and locating them in most suitable places. In other cases, a firm produces in one location and conducts sales activities in another location. This chapter highlights the
importance and advantage of using micro data to analyse in more detail the intra-firm behaviour of MNEs.

Chapter 14, by Herbert Grubel, considers intra-industry trade in asset flows (rather than in affiliate production resulting from FDI as in the papers by Markusen and Maskus and by Ekholm). This is a neglected area of research. He considers the capital account of Germany as a representative industrial country to indicate the relative importance of direct, portfolio and other investment, and the subcategories within these major aggregates. Using data from a number of OECD countries, intra-industry trade in all categories of asset flows is found to be substantial, especially in portfolio investments, though it differs across countries and time.

The second part of the chapter considers theoretical models that are capable of explaining intra-industry trade in assets. Existing models are adequate though there remains much room for rigorous empirical testing. The chapter concludes with a discussion of the implications of intra-industry trade in assets for policies like the liberalization of capital controls.

**Concluding Remarks**

Intra-industry trade has become a part of the mainstream of international economics. Most models that go beyond 2x2 dimensions now incorporate some form of intra-industry trade. Computable general equilibrium models of national economies or of the world economy usually incorporate intra-industry trade. Empirical studies usually relate to data that has both intra- and inter-industry trade. Thus, the concept of intra-industry trade continues to be a useful way of organising the pattern of trade.

Some of the chapters overlap in their content and provide fascinating examples of the way research progresses by the interaction of ideas. Moreover, some of the modelers in Part Two conduct their own empirical tests and some of the papers in Part Three which are primarily empirical extend the existing theory before conducting their tests. The same applies to the chapters in Part Four.
Much research remains to be done on intra-industry trade in goods, services and investment. The ideas and empirical findings in this book have advanced our knowledge of the causes of comparative advantage, the pattern of trade and the effects of international trade has on the welfare of the residents of trading nations.
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