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**INDUSTRIAL ORGANIZATION AND  
INTERNATIONAL TRADE:  
METHODOLOGICAL FOUNDATIONS FOR  
INTERNATIONAL FOOD AND  
AGRICULTURAL MARKET RESEARCH**



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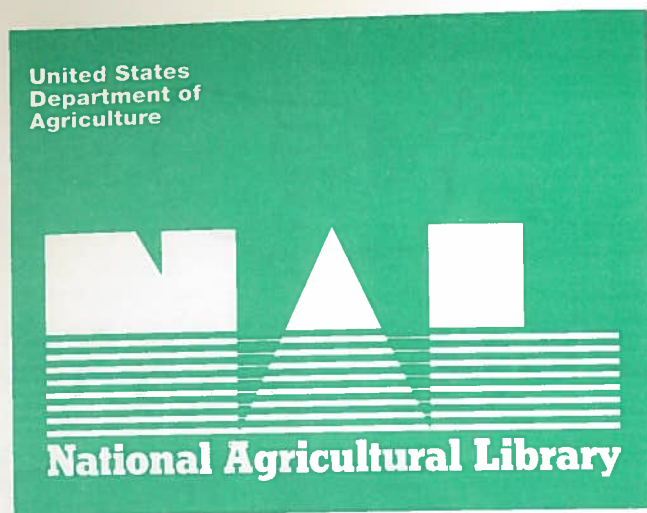
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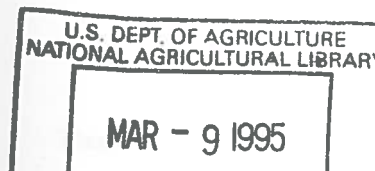
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## Proceedings of a Workshop On Industrial Organization and International Trade

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# Chapter 2: Empirical Studies of Industrial Organization and Trade: A Selective Survey

*Emilio Pagoulatos*

## 2.1 Introduction

During the last twenty years great progress has been made in merging two fields of applied microeconomics: international trade and industrial organization. The resulting synthesis has enriched both fields with new empirical and, more recently, theoretical insights and has provided new tools for policy analysis.

Before a trickle of research began to fill the gap between the two areas in the early 1970's, the field of industrial organization tended to be atheoretical and relied mostly on partial-equilibrium, closed-economy models. The field of international trade, on the other hand, utilized general-equilibrium competitive models, with limited attention paid to empirical testing. These conventional approaches were inadequate in accounting for several empirical regularities that have characterized the world economy during the last two decades, and this inadequacy has been the primary force leading to the integration of industrial organization and trade.

One such empirical observation that challenges the standard theory has been the increasing importance of international trade in the world economy, with trade growing faster than domestic activity for a broad spectrum of industries and countries. This trade expansion has resulted not only in greater import competition in several domestic markets, but also in the simultaneous exporting and importing of very similar products within the same industry category, a phenomenon known as "intra-industry" or "two-way" trade. In addition, it was observed that trade, tending increasingly to concentrate among industrial countries with similar factor endowments and demand structures, and among industries selling differentiated rather than homogeneous products, can be characterized by the exercise of market power at home and abroad.

The increased presence of multinational corporations and the associated phenomena of foreign direct investment, international licensing, and intra-firm trade have become important fixtures of international markets during this period and have required new theoretical and empirical tools for their analysis. Furthermore, the conventional theory has done a poor job in predicting the distributional

consequences of trade liberalization. For example, trade expansion associated with the formation of the European Community or the U.S.-Canada auto pact has resulted in less severe effects than expected. Finally, these new empirical regularities in the world economy have challenged conventional wisdom on the role of governments in addressing protection, exchange rate, antitrust, and industrial policies in the international context.

Proper understanding of many of the above phenomena has required a new framework of theoretical analysis and empirical research grounded upon the integration of the trade and industrial organization literatures. Such research, while still in its infancy, has become one of the fastest growing fields in economics. It is the objective of this paper to survey the trade/industrial organization literature with special emphasis on the empirical work completed thus far.

What follows is a broad overview and a guide -- inevitably, a bit arbitrary, as all such guides are -- to the vast literature that has accumulated on the subject over the last twenty years. It is, of course, impossible to do justice to the breadth and depth of this literature in a single survey paper. Indeed, there already exist over thirty partial surveys of specific parts of this literature, and I will make reference to them throughout the text. My review of the empirical literature will be by necessity selective rather than exhaustive, painting the empirical accomplishments to date, the deficiencies of past work, and the possibilities and prospects for future research with broad brushes rather than in fine detail. The next section gives an introduction to the subject viewed from the perspective of a trade economist who incorporates industrial organization considerations into trade models. Section 3 outlines the approaches which have been adopted by industrial organization researchers in including foreign factors influencing domestic markets. The final section provides a summary and conclusion.

## **2.2 International Trade and Industrial Organization**

Trade economists, in both their theoretical models and their empirical research, attempt to answer questions relating to the pattern and composition of trade as well as to the overall level of trade; that is, who trades what with whom, and, how much? They also address questions relating to the gains from trade and the reasons for and effects of protection. Traditional explanations of trade patterns, based on Ricardian or Heckscher-Ohlin type models, have typically assumed

constant returns to scale, homogeneous products, and perfect competition, internationally immobile factors of production, and countries that differ either in terms of technology or factor endowments. These differences, in turn, result in comparative advantage as the cornerstone of international trade; and gains from trade are expected to be larger, the greater the underlying differences in the countries and goods involved in international exchange.

This conventional view of trade, while providing an adequate explanation for some observed patterns of trade, has failed to account for an increasing portion of trade that takes place between largely similar countries simultaneously exporting and importing rather similar goods under conditions of imperfect competition or between subsidiaries of the same firm located in different countries.

In recent years a new view of trade that integrates industrial organization with international trade has emerged as a complement to the traditional comparative advantage approach. Major contributors to this new approach have been Helpman and Krugman (1985, 1989) and a large number of other economists whose theoretical work has been surveyed by Helpman (1984, 1990), Krugman (1989, 1990), and Dixit and Norman (1980). This theoretical body of literature has incorporated, in mostly general - equilibrium trade models, several advances from the industrial organization literature, such as models of product differentiation and monopolistic competition, the theory of limit pricing and contestable markets, and game-theoretic models of oligopoly.

The emerging view of trade is one where the traditional comparative advantage reason for specialization and trade is complemented by explanations based on external economies of scale (where unit costs depend on the size of the industry) under competitive conditions, internal economies of scale (where unit costs depend on the size of the individual firm) under imperfectly competitive conditions, product differentiation under monopolistic competition or oligopoly, and reciprocal dumping in international markets.<sup>1</sup> In these models international exchange is possible even if countries are similar in their underlying factor endowments; and inter-industry (comparative advantage) trade can co-exist with intra-industry specialization.

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<sup>1</sup> The role of external economies in trade theory has been analyzed, among others, by Ethier (1982). Important contributors to the internal scale economies and product differentiation view of trade are Helpman and Krugman (1985, 1989). The possibility of reciprocal dumping as an explanation of trade was first noted by Brander (1981).

Progress on the theoretical front of merging trade and industrial organization has been considerable to date, but what exists is a series of very stylized special models rather than a general theory of wider applicability. These models often generate a wide range of outcomes that depend on the assumptions made regarding firm behavior and market structure characteristics. This fragmentation of theoretical results, coupled with a reluctance by trade economists to engage in empirical studies, has limited the empirical testing of models. The remaining part of this section will provide a brief overview of some recent attempts to quantify and test some propositions deriving from the theoretical models.

### **2.2.1 Empirical Testing of Inter- and Intra-Industry Trade Models**

Several recent papers have surveyed the empirical analysis of inter-industry specialization based on comparative advantage (Deardorff, 1984; Tharakan, 1985). The extensive empirical testing of the conventional theory following the Leontief Paradox has produced mixed results and has been, in general, unfavorable regarding the theory's ability to predict trade flows. Two recent examples of such conflicting evidence are the paper by Bowen, Leamer, and Sveikanskas (1987) that does not support the factor abundance theory and a book by Leamer (1984) that tends to support the theory.

Empirical analysis of inter-industry trade in an imperfect competition framework has received limited attention in the literature to date. The earliest study by Pagoulatos and Sorensen (1976) has been joined by a few others (Tharakan, 1978; Glejser, Jacquemin and Petit, 1980; Owen, 1983; Koo and Martin, 1984) that have regressed different indices of trade performance to variables measuring various aspects of domestic market structure along with traditional comparative advantage variables for a cross-section of industries. While the results of these studies support the inclusion of elements of market structure in explaining trade flows, the reasons for including them are mostly atheoretical, with only limited connection to the emerging literature on imperfect competition and trade. Most of the theoretical models, on the other hand, have not been formulated to facilitate empirical testing. More work awaits the derivation and testing of empirical hypotheses from the new trade theories. Since the new theories work in tandem with conventional models in explaining trade patterns, empirical tests should consider both inter- and intra-

industry trade as determined simultaneously under conditions of imperfect competition.<sup>2</sup>

Empirical evidence on the extent and reasons for intra-industry trade is more voluminous in the literature and has been surveyed by Tharakan (1981), Greenaway (1984), Greenaway and Milner (1986, 1987), and more recently by Tharakan and Kol (1989). The level of intra-industry trade is usually measured using the Grubel-Lloyd index:

$$B_{ijk} = 1 - \frac{|X_{ijk} - M_{ijk}|}{X_{ijk} + M_{ijk}} \quad 2.1$$

where  $X_{ijk}$  is the value of the  $i$ th country's exports to the  $j$ th country for the  $k$ th product group, and  $M_{ijk}$  represents imports. When exports exactly equal imports this index is one; it is zero when trade goes only one way.<sup>3</sup> By extension, we can define inter-industry trade as

$$T_{ijk} = 1 - B_{ijk}.$$

Following the work of Grubel and Lloyd (1971), several empirical studies have revealed an increasing quantitative importance of intra-industry specialization in world trade. At the same time, following a paper by Pagoulatos and Sorensen (1975), a large number of econometric studies have attempted to explain  $B_{ijk}$  or just  $B_{ik}$  for a broad range of countries and industries based on both industry and country characteristics. Recent examples of the econometric work in this area include papers by Balassa (1986), Balassa and Bauwens (1987), Helpman (1987), Wickham and Thompson (1989), and Bergstrand (1990).

The results of the econometric studies provide support for most hypotheses suggested by the new theoretical models of intra-industry trade. With the exception of the Helpman, Wickham and Thompson, and Bergstrand papers, however, there is little linkage in the empirical literature with the theoretical work to guide a proper econometric investigation. Difficulties have also arisen with measuring two key variables suggested by the theoretical models: product differentiation and internal economies of scale. More empirical work in this area with

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<sup>2</sup> Two recent studies by Lynde (1988) and Hansson and Lundberg (1989) provide a rigorous test of inter- and intra-industry trade and lend support to the Helpman-Krugman analysis.

<sup>3</sup> There are other measures, of course, of inter- and intra-industry trade, and their properties are discussed in the surveys of empirical work mentioned in the text.



a strong theoretical underpinning is needed to help sort out the ability of the various theories to explain observed patterns and flows of intra-industry trade.

Another line of empirical research worth mentioning here, which has recently emerged as a byproduct of the scale economies/imperfect competition model, involves explaining the volume rather than the pattern of trade. A paper by Markusen (1986) provides a theoretical basis, and an attempt to quantify the model can be found in Markusen and Wigle (1990).

### **2.2.2 Foreign Direct Investment and Intra-Firm Trade**

The reasons why it is more profitable to carry out transactions within a firm (internalization) rather than between firms are now the cornerstone of a theory of multinational enterprise that has begun to appear in the theoretical literature (Ethier, 1986; Horstmann and Markusen, 1987). What gives rise to internalization, such as ownership advantages for technological transfer and advantages for vertical integration and localization associated with tariffs or comparative advantage, provides a linkage between the theory of the multinational firm and the recent theories of trade and industrial organization.

While a fully developed theory of multinational enterprise is not yet available, several empirical studies have examined aspects of multinational involvement, such as foreign direct investment, licensing, and intra-firm trade, based on "informal" theorizing. Relatively recent examples of such work include papers by Meredith (1984) and Grubaugh (1987a,b). In general, these studies suggest that multinational firms are important in industries which have a high R&D to sales ratio and a high advertising to sales ratio. The literature on licensing versus direct investment emphasizes issues such as protection of the firm's intangible assets and informational asymmetries between firm and licensee as motives for choosing direct investment. Surveys of the empirical work to date can be found in Caves (1982), Buckley (1985), Casson (1987), and Gilroy (1989). Further empirical analysis awaits the sorting out of the relevant stylized facts that are consistent with the emerging theory of the multinational firm.

### 2.2.3 Trade Policy Under Imperfect Competition

The body of literature integrating industrial organization and international trade has had an unexpected result. It has uncovered additional reasons why trade may be beneficial over and above those arising from differences in factor endowments. In general, trade can be viewed as a way of extending the market and allowing the exploitation of internal economies of scale. Other potential sources of gains from trade can be found through the introduction of additional product varieties or through the introduction of more Cournot-type competitors that would reduce mark-ups of price over marginal cost in oligopolistic industries.

The new theoretical models of trade under imperfect competition have also given new impetus to empirical studies of trade liberalization (Richardson, 1989). Typical of this quantitative literature is the use of numerical general equilibrium models that merge product differentiation, oligopolistic interactions, and scale economies into the analysis (Borges, 1986; Norman, 1990). Examples of this type of work include papers by Cox and Harris (1986) and by Markusen and Wigle on free trade between Canada and the United States. Also interesting have been applications of this approach to the effects of Europe 1992 by Smith and Venables (1988), and to trade liberalization in developing countries by Devarajan and Rodrik (1989). This appears to be a fruitful new avenue of empirical research that no doubt will result in fresh insights in both modelling imperfect competition and trade and in assessing the effects of trade liberalization.

Another unexpected result of recent theoretical developments in the industrial organization/trade literature has been to identify cases under which so-called "strategic trade policy" may be superior to free trade (Grossman and Richardson, 1985; Krishna and Thursby, 1990; and Richardson 1989). Decreasing unit production costs and market structures that contain monopoly elements are common in industries involved in international trade. Market imperfections immediately suggest the potential benefits of government intervention. In the "strategic trade policy" argument, government policy can alter the terms of competition to favor domestic over foreign firms and shift the excess return to monopolistic markets from foreign to domestic firms. This provides a basis for activist trade and industrial policies if it can be shown that they improve a country's position by enhancing the ability of domestic firms to secure a larger share of world markets in which imperfect competition and, thus, high rents are present.

Several recent studies have put "strategic trade policy" to

empirical test. Some of these studies are available in two volumes edited by Feenstra (1988) and Baldwin (1988), while others have been surveyed by Richardson (1989). Even though the "strategic policy" literature has identified important new arguments for protection, the empirical evidence to date lends support for free trade as the appropriate policy for governments to pursue.

### 2.3 Industrial Organization in an International Context

The field of industrial organization or industrial economics can be broadly defined as the branch of microeconomics concerned with the nature and behavior of firms operating in noncompetitive markets.<sup>4</sup> More specifically, it deals with the positive and normative implications of the nature of competition and the exercise of market power. It also examines the role of government regulatory and antitrust policies in improving market performance.

As an applied field, industrial organization has traditionally been empirical in its approach and only recently has been subjected to intense theoretical scrutiny, thus placing it at the center of microeconomic analysis (Tirole, 1989). This transformation has not only shifted the emphasis from empirical work and policy analysis to formal theory, but it is also affecting the tools of empirical analysis as well.

For over thirty years, the predominant approach in this field has been the Structure-Conduct-Performance paradigm (SCP) which relates market structure (seller concentration, product differentiation, conditions of entry, etc.) to conduct (such as pricing, advertising, research and development), which, in turn, yields market performance (profits, efficiency, product variety, rate of innovation and so on). The key hypothesis underlying this paradigm is that when a small number of firms account for most of an industry's sales, those firms will recognize their mutual interdependence, resulting in collusion on price and output decisions. This view, however, has co-existed with the "efficiency" hypothesis; i.e., it is the superior efficiency by large firms that results in both higher profits and, incidentally, in higher concentration.

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<sup>4</sup> While in the past, industrial economics concentrated on the behavior of firms in relation to other firms in the marketplace, more recent work has begun to explore the economic organization of the firm itself.

Dissatisfaction with the SCP on both conceptual and empirical grounds has given rise to a new approach, alternatively named the "price theory" paradigm (PTP) or, more boldly, the "new industrial organization" (NIO) (Jacquemin, 1987). The new paradigm is deeply rooted in recent developments in the theory of noncooperative games, transaction cost analysis, dynamic models, and the role of information for the purpose of explaining the causes, nature, and effects of competitive behavior. A whole range of special models, each dealing with some partial aspect of market structure, has replaced the aim of the SCP to provide a general conceptual framework capable of yielding simple generalizations applicable to different market situations.

It is against this backdrop of change in the major paradigms of industrial organization that I will attempt a brief overview of empirical research, emphasizing the role of foreign factors in affecting market structure and performance. After reviewing the literature that developed along the lines of the SCP, I will address the few attempts to integrate trade and industrial organization within the NIO approach, and within the international finance literature.

### **2.3.1 Empirical Studies of Market Structure, Performance, and Trade**

Empirical research in the structure-performance literature has traditionally involved searching for a cross-sectional correlation between industry profitability measures and concentration. Based on the belief that international linkages (such as imports, exports, foreign direct investment, and tariffs) can affect competition in domestic markets, a large body of empirical work has introduced measures of these international variables in *ad hoc* reduced form equations of profits, concentration, and other structural or performance dimensions. Excellent surveys of the earlier empirical literature are available by Caves (1974, 1979, 1985, 1989), Caves and Khalizadeh-Shirazi (1977), Jacquemin (1982), and Schmalensee (1989). Recent empirical studies utilizing the structure-performance-trade approach include work by Yamawaki (1986), Caves (1988), and De Ghellinck, Geroski, and Jacquemin (1988). A theoretical underpinning based on static oligopoly theory can be found in papers by Lyons (1981), Sugden (1983), and Urata (1984).

In general, the results from this empirical literature indicate that import competition, particularly when concentration is high, places a substantial limit on domestic market power, and that exposure to international trade increases the technical efficiency of

production. Less clear is the effect of exports in influencing domestic market performance (Schmalensee, 1989).

Introducing international variables into the SCP-type empirical analysis has yielded a number of useful stylized facts that have the potential of guiding theory construction and complementing an analysis of particular industries. Recently, however, inter-industry studies along the SCP tradition have come under attack concerning the robustness of their results, the often *ad hoc* nature of model specification, variable measurement problems, and the absence of enough industry specificity inherent in a large cross-section of diverse industries (Sawyer, 1982; Schmalensee; and Bresnahan, 1989).

More specifically, the reasons why cross-section, inter-industry studies of concentration and profitability have fallen out of fashion can be summarized as follows. First, serious doubts have been raised concerning our ability to construct meaningful measures of economic profit from available accounting and asset price data. Second, it is very difficult to account for supply and demand differences (such as differential effects due to the business cycle) in cross-section studies estimated at a point in time. Third, much of this empirical work has been based on loosely specified models, usually based on a literature search, that do not permit precise hypothesis testing. Finally, despite its volume, this empirical literature has failed to resolve the long-standing debate of whether observed correlations between industry profits and concentration are due to high prices (collusion) or lower costs associated with superior large-firm efficiency.

### **2.3.2 The New Empirical Industrial Organization**

Partly as a consequence of theoretical developments in the NIO literature, but mainly as a result of skepticism concerning the ability of the structure-performance approach to detect the presence of market power, a new empirical literature has emerged that purports to avoid the pitfalls inherent in the traditional approach. This recent applied industrial organization literature has been surveyed by Geroski (1988) and Bresnahan (1989) and goes by the name of the "new empirical industrial organization" (NEIO). The NEIO approach typically uses time-series data from a single industry (or firm) to estimate structural econometric models based on firm-level optimization behavior for the purpose of determining market outcomes (performance). This approach evaluates the presence of market power in specific industries by specifying demand and cost functions, and hypotheses about strategic interactions (often using static conjectural variation models) among

participants in the market. Thus, indices of conduct and performance are treated as parameters to be estimated rather than observed from accounting data.

This time-series approach to industry specific studies has problems of its own. For example, it requires a large amount of high quality data for prices (where product differentiation is important) and input costs (particularly the cost of capital) that are not readily available. Furthermore, while the underlying theory refers to firm behavior, researchers have been forced to aggregate equations to the industry level. Finally, results obtained for individual industries may not reveal patterns that hold for the economy as a whole.

While this new empirical literature is still at its early stages, a few studies integrate international trade and industrial organization models. A paper by Haubrich and Lambson (1986) addresses dynamic collusion under import competition on a conceptual level, and recent work by Karp and Perloff (1989) provides an empirical application of measuring market power under dynamic oligopoly conditions in the rice export market. A recent paper by Feenstra and Levinsohn (1989) develops and estimates a model of demand and price-cost margins under differentiated oligopoly conditions.

Another line of recent empirical research involves examining the profit-concentration-trade relationship in a dynamic framework that accounts for the presence of business cycles (Domowitz, Hubbard and Petersen, 1986; Yamawaki, 1989; and Salinger, 1990). These studies utilize pooled cross-section and time-series data sets to analyze the intertemporal behavior of price-cost margins in concentrated industries. In addition to industry specific and macroeconomic effects on the concentration-margin relationship, these studies find that import competition is negatively related to margins, especially in producer goods' industries.

Finally, worth noting is the work of Harris (1984) and Harris and Cox (1984), which develops and quantifies a computable general equilibrium trade model of Canadian manufacturing that explicitly includes scale economies and imperfect competition.

### **2.3.3 Exchange Rate Pass-Through and Imperfect Competition**

Recent theoretical and empirical work has drawn on models of industrial organization to explain the behavior of import prices and their response to movements in the exchange rate. Since the advent of the flexible exchange rate system in the early 1970s, movements in

real exchange rates have been significant and often persistent. The effect of these real exchange rate changes on import prices (pass-through), however, have been less pronounced than expected based on macroeconomic predictions. For example, as the dollar appreciated in the early 1980's, U.S. import prices (prices of foreign produced goods in domestic currency) should have fallen more than they did, and when the dollar began falling, import prices should have been rising much faster than they actually did.

As an explanation of the above phenomenon, Krugman (1987) and Dornbusch (1987) introduced the idea of an oligopolistic international market structure. For them, pricing decisions by domestic and foreign firms are affected by the form of strategic interactions among the firms. They demonstrated that the Cournot and Bertrand models can explain import price rigidity in the U.S. They derived similar results in the context of monopolistic competition and other imperfectly competitive models.

A number of recent studies have begun to empirically test several models of import price decisions under noncompetitive conditions. Examples of this rapidly rising body of literature include papers by Feinberg (1986, 1989), Knetter (1989), and Ohno (1989).

## 2.4 Conclusions

This paper has surveyed the large body of literature that has appeared in the last two decades on the interface between industrial organization and international trade. While references were made to the emerging theoretical work on the subject, emphasis was placed on reviewing the major strands of empirical research. The general conclusions are that real progress has been made in integrating the two fields, and our understanding of how industry structure may impact the pattern of trade and how international forces influence the extent of domestic market power has greatly benefitted from this literature. Continuing advances in both theory and empirical method suggest that the trade/industrial organization field will continue to flourish well into the future.

Finally, it is important to emphasize that greater effort needs to be made by researchers to familiarize themselves with the two fields' contributions if progress is to be made in further integrating the trade and industrial organization areas. It is also necessary to begin closing the gap between theoretical models and empirical testing by constructing cautiously designated and testable hypotheses, if this

integrated literature is to provide guidance to the design of public policy aimed at improving domestic and international market performance.



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