Food

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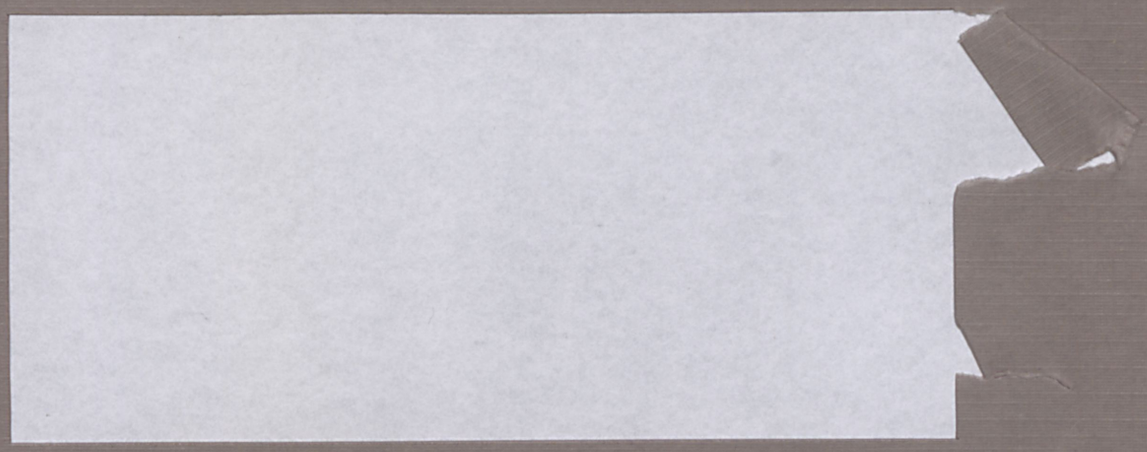

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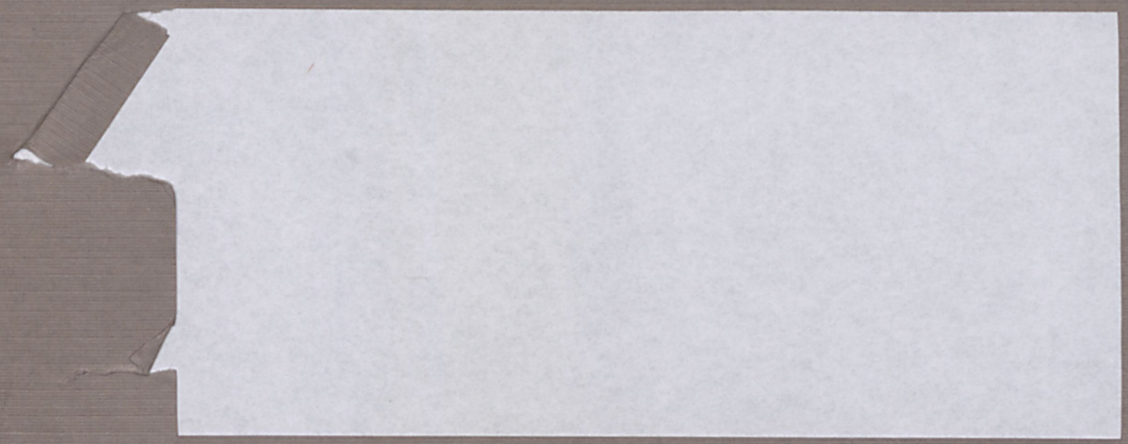

INDUSTRY ORGANIZATION AND GLOBAL COMPETITIVENESS IN FOOD MANUFACTURING

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Introduction

With the evolution of multinational firms, the formation of multinational economic communities, and the persistent if somewhat erratic trend toward free trade in products, capital and resources, the food manufacturing sector is becoming increasingly global in both scope and behavior. The purposes of this paper are to describe the global character of the sector and identify the leading firms therein, suggest an analytical framework within which the organization of the food manufacturing industries can be related to world-wide commercial behavior and economic results, and in the end, raise some questions regarding international market performance and the methods available to economists for answering these questions.

Economic Framework

In this section we examine economic theory from the perspective of how it contributes to our understanding of the organization of industries, the behavior of firms therein, and market performance. While we recognize that there are numerous ways to describe and evaluate firms and industries in the food and agriculture sector, economic theory provides a systematic or disciplined framework, i.e. one that generates postulates or themes that are not situation-specific; rather, that are generalizable. At the same time, we recognize that empirical observations of economic behavior and performance

are not always consistent with theory; further, that the generally accepted economic theory of firms and markets is not sufficiently robust to provide certain predictions and indisputable conclusions. As we demonstrate, however, it does lead to some useful "stylized facts" and offers promise of more as both theory and related empirical analytical techniques are further refined.

Economic theory holds that market performance and the economic welfare of society are functions of the structure of industries and the behavior of firms therein. There are well-developed and generally accepted economic models of behavior and performance under two sets of "perfect" structural conditions: perfect competition and perfect monopoly. In the former there exists such a large number of firms, dealing in virtually identical products, that no single firm can individually influence the total quantity of products supplied to the market or the price at which they sell. In the latter, there is just one firm, dealing in a product that is distinct and unique from those offered by other firms in other markets. Thus, this single firm has complete control over both quantity and price in its relevant market.

In terms of performance, the perfectly competitive model unambiguously generates Pareto optimal economic results. That is, at equilibrium, there is no alternative way to use labor, land, capital and management resources or to reallocate products among consumers that will increase one person's economic well-being without decreasing that of another. With equal certainty, perfect monopoly results in deadweight economic loss from reduced production, lower payments to resources, higher prices to consumers, and redistribution of income to the monopolist.

While there is general acceptance of *how* perfect markets perform, economists can, and do, disagree on the *desirability* of such performance. Disagreements tend to rest on two basic themes: rejection of the implicit assumption that the initial distribution of income and wealth is socially desirable, and observation that the real world is not "perfect" and thus the models of perfect competition and perfect monopoly are irrelevant.

Implicit to Pareto optimality is the assumption that all persons (individuals, firms) have equal marginal utilities of money (wealth and/or income). That is, for example, an income increase of $1 to person A generates the same amount of gain in utility or economic well-being as an income increase of $1 to person B. It may be argued, however, that this is an unrealistic assumption; further, to the extent that persons have different marginal utilities for money, total economic welfare can be enhanced by reallocating money away from those with low, to those with high marginal utility. Accepting these views, achieving Pareto optimality is not necessarily desirable; income or wealth redistribution may be an objective. If so, the social desirability of perfect competition, and perhaps the undesirability of perfect monopoly, can be questioned.

Relaxing Pareto optimality as the objective allows other economic objectives to be introduced into the evaluation of market performance. Common performance criteria in the industrial economics literature include price levels, price-cost margins, profits, efficiency, progressiveness, and in an international market context, competitiveness. Even so, there are no widely-accepted standards for what constitutes "good" performance, other than a general sense that more of such things as efficiency and competitiveness is preferable to less. As we demonstrate subsequently, the theory that relates these

performance dimensions to industry organization and firm behavior is not highly refined; nonetheless, quite a bit of descriptive analysis has been done regarding how various industries measure up.

It is widely recognized that most industries deviate significantly from the "perfect" economic models. Competitive imperfections such as modest to high levels of seller (or buyer) concentration, differentiated products, and scale economies are readily observable. For example, more than half of the food manufacturing industries in the United States are characterized by high seller concentration[1] (Connor *et al.*). The aggregate market share held by the 20 largest firms across all food manufacturing industries exceeds 25 percent in the European Community and 35 percent in the U.S. (Handy and Henderson). Among the most heavily advertised of all consumer goods, many consumer-ready foods are highly differentiated by brand name (Connor). Scale economies in food manufacturing are of such magnitude that per unit costs would be as much as 21 percent higher if plants were operated at 50 percent of current levels (Pratten). Similar observations can be cited in other industries.

Lipsey and Lancaster, in developing the theory of second best, have shown that in industries where more than one competitive imperfection exists, there is no assurance that market performance will be made Pareto-better solely by removing one such imperfection. Thus, the objective of Pareto optimality becomes an evasive goal, even presuming its desirability.

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[1]Defined as a four-firm concentration ratio of at least 50 percent or an eight-firm ratio of at least 65 percent.

Industrial Organization Theory

In economic thought, controversy regarding market behavior and performance arises when the structure of an industry is somewhere between the "perfect" extremes of competition and monopoly, i.e., where most industry resides. As Joseph Schumpeter stated in 1954, "The unbroken line from monopoly to competition is a treacherous guide" (p. 981). That is, no support exists in either economic theory or empirical observation for a presumption that market performance becomes incrementally "less competitive" (or less Pareto optimal) as the number of firms decreases incrementally from "many" to one.

Industrial organization theory has been built up, as a specialized branch of economic thought, specifically to explain behavior and performance in imperfectly competitive markets. Numerous theoretical concepts have been advanced, e.g. duopoly, monopolistic competition, non-cooperative and cooperative oligopolies. All of these theoretical variations include implicit or explicit assumptions about how firms react to the behavior of their rivals. Such reactions are categorically referred to as "strategic interactions", and they represent the extent to which firms act collusively rather than as competitors or rivals. As such, strategic interactions are an expression of market power exercised by firms in imperfectly competitive markets; conceptually this can range from none to perfect collusion.

Strategic interactions are of unique concern in imperfect competition, as under perfect conditions there are either no rivals (monopoly) or the actions of rivals are of no consequence to other firms (perfect competition). The most common of these strategic behavioral assumptions are the Cournot conjecture, wherein each firm is assumed to

believe that if it changes its output, its rivals will continue to produce at their current levels, and the Bertrand conjecture, where rivals are assumed to hold prices constant.

None of these theoretical concepts has yet proven to be sufficiently robust to explain observed behavior under all conditions of imperfect competition; no general or widely received theory of imperfect competition has yet emerged. In part, this may be because of the inherent difficulty of accurately specifying strategic interactions, or one firm's beliefs or conjectures about its rivals strategic reactions. Perhaps Marcus Aurelius Antoninus stated the problem best: "(There is) no state sorrier than that of the man who...is curious in conjecture of what is in his neighbor's heart" (as quoted in Carlton and Perloff). Contrariwise, it may be that there are so many variations of imperfect competition that it is not conceptually possible to describe all with one model, i.e. while there is only one way to be perfect, there can be many ways to be other than perfect.

Empirical Studies and Stylized Facts

Despite the lack of a single, generally accepted theoretical model of how the "real world" of imperfectly competitive firms behave and perform, there has been a great deal of empirical study of industry organization and market performance. Historically, most of these studies focused on domestic rather than international markets, in part because domestic data are more readily available, in part because international trade barriers tend to isolate domestic industries from foreign influence, and in part because industrial organization has had its greatest following among Anglospeak economists, particularly Americans. Recent years, however, have seen increased interest in the application of empirical industrial organization techniques to international commerce, in part because

international trade economists discovered imperfect competition and in part because industrial organization economists discovered that domestic and international markets are increasingly indistinguishable.

Most of the empirical studies have followed the dictates of the structure-conduct-performance (SCP) paradigm. In essence, this paradigm holds that market structure determines market conduct, which in turn determines economic or market performance. In practice, however, this typically has been reduced to structure and performance parameters; the difficulty of observing and quantifying strategic interactions causing most empirical researchers to presume that seller (buyer) concentration reflects collusion or cooperation among sellers (buyers).

The most common structural parameters have been seller concentration, typically measured as the four-firm or eight-firm concentration ratio (CR4 or CR8, respectively) or the Herfindahl-Hirschman Index (HHI), and product differentiation, measured by the ratio of advertising expenditures to sales. Performance has generally been specified in terms of profits, price levels, or price-cost margins (PCM).

Empirical structure-performance studies typically have been multi-industry cross-sectional regression analyses, using some performance measure as the dependent variable regressed against a number of structural variables. Collectively, these studies fail to show a consistent functional relationship between industry structure and market performance across both time and space, i.e. they have not established a uniform incremental or marginal change in a performance measure such as PCM that is consistently associated with a given marginal change in a structural measure such as

CR4. Further, some equally well designed studies of similar industries have found the same structural and performance measures to be, or not to be, statistically associated. For example, in large cross sectional studies of U.S. grocery supermarkets, Marion *et al.* found a statistically significant positive relationship between CR4 and retail price levels; Kaufman and Handy found no statistical association between these variables.

Nonetheless, the sum and substance of a wide range of studies reveal some empirical regularities. Weiss and his colleagues re-examined 121 industry data sets that had been used in econometric studies of the concentration-price relationship. Positive correlations between seller concentration and price levels were found in 106 of these cases; 15 had negative correlations. Weiss concluded that there may exist a "critical concentration ratio" (CCR), below which there is no association between concentration and price and above which they are positively correlated. Implicitly, this suggests that firms in industries with concentration levels below the CCR act as rivals, but act collusively above CCR. No consistent estimate of CCR across all industries was revealed, however.

Schmalensee has recently published a review of findings from more than 250 empirical structure-performance studies, providing a reasonably comprehensive survey of the studies that have been conducted over than past 20 or so years. He concluded that these studies "...rarely if ever yield consistent estimates of structural parameters, but they can produce useful stylized facts..." (p. 952). He states such stylized facts as revealed regularities, e.g., "In cross section comparisons involving markets in the same industry, seller concentration is positively related to the level of price" (p. 988), and "The

estimated effect of market share on profitability in U.S. manufacturing industries is positively related to the industry advertising/sales ratio" (p. 985).

When viewed in total, empirical structure-performance studies confirm that, *how* industries are organized *does* make a difference in their performance, even if the results have not been sufficiently specific to allow prediction of performance levels given an industry's structural configuration. As a stylized fact, the further that an industry's structure deviates from perfect competition, the greater the likelihood (but not assurance) that leading firms therein will act less competitively and more in concert and thus, market performance will be Pareto sub-optimal, e.g. higher prices, price-cost margins, and profits than if firms acted more as competitors.

That being said, however, not a lot has been said. There are significant problems of both measurement and interpretation. For example, seller concentration is an imperfect measure of market power. A high level of concentration implies that the possibility of seller collusion is high, but does not mean that it has occurred. Ignoring strategic interactions among firms, that is, excluding conduct from the analysis, excludes the opportunity to determine whether firms act cooperatively or competitively. Cowling and Waterson have demonstrated that, based on microeconomic theory, PCMs are jointly determined by seller (or buyer) concentration, as represented by HHI, *and* by the extent to which sellers (or buyers) act collusively, as represented by their strategic interactions. That is, in order to determine the extent to which sellers will raise prices above marginal cost, or gain monopoly profits, both seller concentration (HHI) and strategic interactions (conjectures) must be known.

By excluding conduct (strategic interaction or competitive conjectures among sellers), researchers are, in essence, assuming that concentration alone represents market power. By implication, this is the equivalent of assuming a zero value or Cournot conjecture, i.e. no competitive reaction to a change in one firm's market behavior; firms act non-cooperatively. As such, an incongruity is created; non-cooperative behavior is implicitly assumed, thus denying the possibility of seller collusion, one potential source of market power. As a result, interpretation is ambiguous.

Other difficulties arise because available industry data are frequently not entirely consistent with the conceptual definitions of relevant variables. For example, advertising expenditures are a poor proxy for product differentiation; accounting profits are much different from the economic concept of excess profits and thus bear no specific relationship to non-Pareto allocative inefficiencies. Also, cross-sectional data from multiple industries may embody industry idiosyncracies which can distort statistical correlations. Finally, discovery of statistically significant regression coefficients indicates that changes in the values of the relevant dependent and independent variables are statistically associated; not that changes in one necessarily *cause* changes in the other.

During the 1980s a new empirical industrial organization (NEIO) methodology began to emerge, in response to the limitations inherent in structure-performance studies. There are four techniques that distinguish NEIO from SCP: (1) individual industries are taken to have important idiosyncracies, thus analysis typically is single industry time series, (2) conduct of firms is taken to be an unknown parameter and thus is estimated from behavioral equations by which firms set prices and quantities, (3)

PCMs are not measured directly from accounting data, rather inferred from observable market prices and quantities and marginal cost estimates based on firm behavior, and (4) market power is revealed by hypothesis testing; typically none is one of the alternatives from which the data can choose.

Reports on some NEIO studies are now available. Specific to food manufacturing, Azzam and Pagoulatos have estimated parameters of strategic conduct in the highly-concentrated U.S. meat packing industry that show modest levels of market power in both the input (livestock) and output (meat) markets. Bresnahan, in reviewing published results, found 12 single industry studies from which conclusions could be drawn regarding empirical relationships between market power and PCMs. In all cases the industries studied were highly concentrated. PCMs ranged from 2.5 percent of costs for the 2nd largest coffee roasting firm to 88 percent for large Uruguayan banks prior to deregulation of entry. Based on this review Bresnahan drew three conclusions: (A) "There is a great deal of market power, in the sense of price-cost margins, in some concentrated industries" (p. 1052), (B) "One significant cause of high price-cost margins is anticompetitive conduct" (p. 1053), and (C) "Only a very little has been learned from the new methods about the relationship between market power and industrial structure" (p. 1053).

While considerably fewer results are available from NEIO studies than from SCP studies, these new studies do demonstrate that firms in some industries exercise substantial market power, i.e., non-competitive market behavior; high price-cost margins. That is, industrial organization does affect market performance. Moreover, these studies

are sufficiently well specified and detailed that alterative explanations of their findings can be rebutted. Yet, this is not the end of the inquiry. Inter-industry NEIO studies are needed to improve our understanding of what are the causes of market power, e.g. to what extent can it be predicted on the basis of industry structure or market size, and what are the implications of non-competitive market behavior, e.g. what are the magnitudes of economic losses, what do the winners do with their gains.

Industrial Organization and International Commerce

Economic theory and empirical evidence from both SCP and NEIO studies demonstrate that behavior and performance in imperfectly competitive markets is different from that in perfect competition or perfect monopoly. Traditionally, however, economists have viewed international trade in the context of perfect competition. Early concern for competitive imperfections in international commerce rose from empirical observations that patterns of trade did not accord very well with expectations based on the traditional Heckscher-Ohlin model of comparative advantage. Initially, trade economists dealt with this concern by developing methods for getting the issue of industrial organization out of the way as easily as possible. The Armington model for treating products as differentiated by source is a well-known example.

By contrast, contemporary thinking about international commerce explicitly recognizes imperfect competition as the core of the story rather than as an unavoidable nuisance. This is bringing about an application of industrial organization concepts to international markets. Some such applications, approached mainly as extensions of international trade theory, examine the implications of competitive imperfections on the

structure of trade. One outcome of this approach has been strategic trade policy, or the use of such things as export subsidies and import taxes as means of enhancing the economic welfare of one country at the expense of others.

A second set of applications is concerned with the competitive impacts of "borderless" national markets, or the interactions between competitive market forces at home and abroad. At least three themes are emerging: (1) imports as a source of competitive discipline in home markets, (2) home market competitiveness as a determinant of foreign competitiveness, and (3) reducing non-competitive behavior through market enlargement, e.g. formation of common markets.

The logic of the first theme is straight-forward. Imports are more likely to occur in markets where the home firms exercise market power, making it more difficult for them to cooperate in setting prices and/or output levels. Empirical studies have shown that high seller concentration in the home market stimulates imports (Caves; Pagoulatos and Sorensen), that import penetration reduces both PCMs and industry X-inefficiency in the home market (Marvel; Roberts), and that the effect of imports on home market competitive behavior is positively related to seller concentration (Neumann *et al.*; Esposito and Esposito).

The logic of the second theme is nearly as straight-forward, if perhaps somewhat less obvious. The essence of the idea is, firms that behave competitively in their home market have honed their skills of market rivalry, thus are more able competitors in foreign markets. We have argued elsewhere, for example, that many leading U.S. food manufacturers have developed the ability to formulate and market ethnically diverse

foods that, while often not truly traditional, appeal to a large segment of consumers; this ability may be a competitive advantage for these firms in a single European Community market (Handy and Henderson). Porter, in a study of the determinants of international competitive advantage in more than 100 industries in the 10 largest trading countries, found that in every case the industries that perform best in international markets are those where there are a number of able home market competitors. Specific to the U.S. food manufacturing industries, Henderson and Frank found a statistically significant negative relationship between export propensity and implicit domestic market power as proxied by seller concentration, integration, and product differentiation.

The third theme is more hypothetical, but again the logic is transparent. All else equal, the larger a market, the greater the number of efficient-size firms that can operate therein. The larger the number of firms, the lower the probability that they will collude, i.e., the more likely they are to behave competitively. Forming common markets or free trade alliances among a number of countries is a means of creating larger markets; at least conceptually, one could view a successful GATT as the creation of a world-wide free trade bloc or a single global market.

This review of contemporary thinking about industrial organization and international markets reveals many imperfections in our knowledge of both. Yet, theory, logic and empirical evidence all support the postulate that the two are inexorably interlinked; one cannot fully understand the antecedents and implications of international commerce absent knowledge of the structure and behavior of the firms and

industries involved. To that end, we now turn to what we know about industrial organization and international competition in food manufacturing.

Global Structure and Conduct in Food Manufacturing

This section examines some of the forces affecting international competition in food manufacturing. We focus on three forces for change: (1) globalization; (2) economies of size; and (3) the drive for larger and more open markets.

Globalization

Since food manufacturers can use several strategies for entering foreign markets, analyses of international competitiveness must include far more than an analysis of trade. In addition to exporting, firms may also market their branded products in foreign countries under licensing agreements with foreign firms. While this generally requires no direct investments in foreign production facilities, considerable investments are required to identify appropriate licensees, develop production and marketing procedures, and establish quality control safeguards. Joint ventures allow firms to tap into the production, marketing, and regulatory know-how of host-country firms without the expense of acquiring wholly owned subsidiaries. Finally, processors can acquire or build foreign manufacturing facilities and operate them as wholly owned subsidiaries. In actual practice, firms can use any one or all of these strategies at the same time.

Trade

In absolute terms, trade in processed food in large and growing. U.S. exports of food and kindred products increased 18 percent in 1988, 9 percent in 1989, and another 9 percent in 1990 reaching $18.5 billion (Table 1). Japan is our largest single-country

export market followed by Canada and Mexico. While large in absolute terms, U.S. food manufacturers export an average of only 3 to 4 percent of their total shipments. In contrast, food manufacturers in the EC on average export over 25 percent of their shipments, although much of this is intra-EC trade.

Table 1. U.S. Trade in Food and Kindred Products, by Country

Country or Region	U.S. Exports		U.S. Imports	
	1989	1990	1989	1990
		---Million Dollars---		
EC-12	2,826	3,049	4,586	4,862
Japan	5,417	5,236	347	353
Canada	1,537	2,662	3,262	3,461
Mexico	1,238	1,097	1,068	1,063
World	17,078	18,547	19,680	20,877

The largest U.S. food manufacturers in general do not rely on exports as their primary strategy for accessing foreign markets. A sample of 64 large firms exported only 2.7 percent of their sales in 1989. Several of these firms including Campbell Soup, Sara Lee, Borden, Quaker Oats, and Pepsico exported less than one percent of their sales. Instead, these firms tend to rely on direct foreign investment to gain sales in international markets. Indeed, these 64 firms received an average of 22 percent of total sales from their foreign subsidiaries. Two companies, Coca-Cola and CPC International, receive over 50 percent of their sales from foreign affiliates, while an additional 9 firms received between 30 and 50 percent of their sales from foreign operations.

Foreign Direct Investment

U.S. companies' sales from their foreign food processing operations reached $60.3 billion in 1988, up 54 percent from 1982 (table 2). European affiliates account for 57 percent of all U.S. affiliate sales. After falling in the early 1980's, sales from affiliates in both South America and Central America increased sharply in 1988 and continue to increase through 1990. PepsiCo is the largest snack food company in Mexico and in 1990 became Mexico's largest cookie manufacturer when it acquired Gruppo Gamesa.

At the same time, foreign firms are gaining ground in U.S. markets by purchasing U.S. firms and building new processing plants. Food processing plants in the United States owned by foreign firms had sales of $30.1 billion in 1988, an increase of 102

Table 2. United States Investment Aboard: Value of Food and Beverage Shipments by U.S.-Owned Affiliates.

County or Region	1982	1987	1988	% change 1982-88
		---Million Dollars---		
Total, all Countries	39,023	50,049	60,264	54.4
Europe	18,974	29,070	34,534	82.0
Canada	5,258	5,407	7,518	43.0
Japan	2,363	4,442	4,933	108.0
Australia	1,447	1,880	2,092	44.6
South America	5,133	3,911	5,045	-1.7
Central America	2,951	2,176	2,638	-10.6

percent from 1982 (table 3). Europe's U.S. affiliates rang up $22.3 billion in sales, or 74 percent of the total. Canadian-owned affiliates in the U.S. had $4.0 billion in sales followed by Australian affiliates with $1.5 billion.

Mergers are a major vehicle for facilitating foreign direct investment. Table 4 shows international mergers involving U.S. food manufacturers. During the five-year period 1985-89, foreign firms acquired 75 U.S. food manufacturing businesses. At the same time, U.S. firms acquired 66 foreign food processing operations. But acquisitions are not a one-way street. Firms continually reappraise their operations and strategic plans and spin off under-performing assets. According to Mergerstat Review, 45 percent of all acquisitions are also divestitures.

Table 3. Foreign Investment in the United States: Value of Food and Beverage Shipments by U.S. Affiliates of Foreign Firms

County or Region	1982	1987	1988	% change 1982-88
		---Million Dollars---		
Total, all Countries	14,847	22,862	30,053	102.4
Europe	10,527	17,967	22,318	112.0
Canada	2,218	3,174	4,017	81.1
Japan	564	612	1,003	77.8
Australia	n.a.	220	1,478	n.a.

n.a. = not available

Leading Food Processing Firms

With firms increasingly becoming multinational, it is important to understand who are the leading firms and how they interact.

Table 4. International Mergers Involving U.S. Food Manufacturing Firms

Year	Foreign Acquisitions of U.S. Firms	U.S. Acquisitions of Foreign Firms
	Number of Transactions	
1985	10	10
1986	13	9
1987	13	14
1988	22	19
1989	17	14
Five-year Cumulative	75	66

Source: Mergerstat Review

Table 5 lists the 50 largest food manufacturers world-wide and gives each firm's total sales as well as it's processed food sales. Nestle S.A. is the world's largest food manufacturer, followed by Philip Morris and Unilever. Philip Morris solidified it's number two position by acquiring Jacob Suchard (Switzerland) in 1990. Among the top fifty, U.S. firms dominate, followed by the UK and Japan. Of the top 20 firms, 12 are U.S., 3 are UK, and 3 are Japanese. Twenty-one of the top 50 firms are U.S. while 11 are UK firms. Japan has 9 of the top 50 firms, Canada has 2, and Australia has one.

Table 6 shows the top 50 firms in the United States. Even though foreign investment in U.S. food processing has been growing rapidly, only 8 of the top 50 firms are foreign-owned. Of the top 20 firms, Nestle is the sixth-largest with $7.2 billion of its $31 billion processed food sales in the U.S. and Unilever is the nineteenth-largest with $3.5 billion in U.S. sales. Among the top 50 firms in the U.S., 6 are European and 2 are Canadian.

Table 5. World's Largest Food Manufacturing Firms, 1989-90.

Company	Headquarters locations	Processed food sales	Total sales	Major product
	Country	--Billion dollars--		Item
1. Nestle' S.A.	Switzerland	31.0	32.0	Diversified foods, restaurants
2. Philip Morris/Kraft General Food 1/	United States	29.8	47.0	Foodstuffs, tobacco, beer
3. Unilever	UK/Netherlands	17.2	34.4	Diversified foods, soap
4. ConAgra (includes Beatrice) 2/	United States	15.3	19.8	Foodstuffs, meat, poultry
5. Kirin Brewery	Japan	11.2	11.4	Beer, soft drinks
6. RJR Nabisco	United States	9.9	16.9	Foodstuffs, tobacco
7. IBP	United States	9.5	9.5	Meat
8. Anheuser-Busch	United States	9.3	9.7	Beer, snacks
9. Pepsico	United States	9.0	15.2	Soft drinks, snacks, restaurants
10. Grand Metropolitan	UK	8.8	14.5	Diversified foods, restaurants
11. Coca-Cola	United States	8.5	8.9	Soft drinks, fruit juices
12. Taiyo Fishery	Japan	8.1	9.0	Seafood products
13. Cargill	United States	7.9	43.0	Meat, grains
14. Allied-Lyons	UK	7.6	7.6	Beverages, restaurants
15. BSN	France	7.5	8.0	Snacks, bakery, beverages
16. Archer Daniels Midlands	United States	7.3	7.9	Food products, grains
17. Sara Lee	United States	7.1	11.7	Frozen food, meals
18. Mars	United States	7.0	8.0	Confectionery, pet food
19. Snow Brand Milk Products	Japan	6.6	6.6	Dairy products
20. Borden	United States	6.5	7.6	Dairy, pasta, adhesive
21. Hillsdown Holdings	UK	6.5	7.0	Poultry, flour, seafood
22. Gruppo Ferruzzi	Itlay	6.4	29.3	Sugar, vegetable oils
23. Ralston Purina	United States	6.1	6.7	Pet food, cereal, food products
24. Bass	UK	6.1	6.1	Beverages
25. H.J. Heinz	United States	5.9	6.0	Diversified food products
26. Campbell Soup	United States	5.8	6.0	Soups, prepared food
27. Elders	Australia	5.8	8.4	Beer, food products, meat
28. Asahi Breweries	Japan	5.7	5.7	Beer
29. Quaker Oats	United States	5.6	5.7	Cereal, food products
30. CPC International	United States	5.1	5.1	Fats and oils, corn milling

--Continued

Table 5. World's Largest Food Manufacturing Firms, 1989-90,--continued1/

Company	Headquarters location	Processed food sales	Total sales	Major products
	Country	--Billion dollars--		Item
31. Guiness	UK	5.1	5.2	Beer
32. Cadbury Schweppes	UK	4.8	4.8	Confectionery, beverages
33. Kellogg	United States	4.7	4.7	Cereal, prepared foods
34. Dalgety	UK	4.6	8.0	Meat products
35. Seagram	Canada	4.6	4.6	Beverages
36. General Mills	United States	4.5	6.1	Foodstuffs, flour, restaurants
37. United Biscuits	UK	4.4	4.6	Cookies, snacks
38. Nippon Meat Packers	Japan	4.3	4.3	Meat
39. John Labatt	Canada	4.2	4.2	Beer, dairy products, fruit juices
40. Tate & Lyle	UK	4.1	5.7	Sugar
41. Associated British Foods	UK	4.0	4.2	Bread, flour, foodstuffs
42. Coca-Cola Enterprises	United States	3.9	3.9	Soft drinks, fruit juices
43. Sapporo Breweries	Japan	3.8	4.0	Beer
44. Chiquita Brands	United States	3.8	3.8	Chiquita Brands
45. Unigate	UK	3.7	3.9	Dairy products, fresh food
46. St. Louis	France	3.7	3.7	Sugar
47. Heineken	Netherlands	3.6	3.7	Beer
48. Nippon Suisan	Japan	3.5	3.8	Seafood
49. Ajinomoto	Japan	3.2	3.5	Soups, sauces, coffee
50. Itoham Foods	Japan	3.2	3.2	Meat products

1/ Includes Jacob Suchard, acquired in 1990.
2/ ConAgra announced its acquisition of Beatrice in 1990.

Table 6. Largest Food Manufacturing Firms in the United States, 1989-90.1/

Company	Headquarters location	Processed food sales in the United States	Total processed food sales
	Country	--Billion dollars--	
1. Philip Morris/Kraft General Foods	United States	17.3	29.8
2. ConAgra 2/	United States	14.7	15.3
3. IBP	United States	9.5	9.5
4. Anheuser-Busch	United States	8.7	9.3
5. Cargill	United States	7.9	7.9
6. Nestle' S.A.	Switzerland	7.2	31.0
7. RJR Nabisco	United States	6.9	9.9
8. Pepsico	United States	6.8	9.0
9. Archer Daniels Midland	United States	5.9	7.3
10. Sara Lee	United States	5.5	7.1
11. Mars	United States	4.5	7.0
12. Campbell Soup	United States	4.1	5.7
13. General Mills	United States	4.1	4.5
14. Borden	United States	3.9	6.5
15. Coca-Cola	United States	3.9	8.5
16. Coca-Cola Enterprises	United States	3.9	3.9
17. H.J. Heinz	United States	3.7	6.0
18. Ralston Purina	United States	3.5	6.1
19. Unilever	UK/Netherlands	3.5	15.1
20. Quaker Oats	United States	3.4	5.6
21. Grand Metropolitan	UK	3.0	14.5
22. Procter and Gamble	United States	2.9	3.0
23. Kellogg	United States	2.7	4.7
24. Seagram Company Ltd.	Canada	2.7	4.6
25. Tyson Foods	United States	2.5	2.5
26. Associated Milk Producers	United States	2.4	2.5
27. CPC International	United States	2.3	5.1
28. Chiquita Banana	United States	2.3	3.8
29. Hershey Foods	United States	2.2	2.4
30. Land O' Lakes	United States	2.2	2.2

Continued--

Table 6. Largest Food Manufacturing Firms in the United States, 1989-90,--continued

Company	Headquarters location	Processed food sales in the United States	Total processed food sales
	Country	--Billion dollars--	
31. Whitman	United States	1.8	1.8
32. Mid-America Dairyman	United States	1.8	1.8
33. Dean Foods	United States	1.7	1.7
34. United Biscuits	UK	1.6	4.4
35. John Labatt	Canada	1.6	4.2
36. Allied-Lyons	UK	1.5	7.6
37. Beef America	United States	1.5	1.5
38. Gruppo Ferruzzi	Italy	1.4	6.4
39. International Multifoods	United States	1.4	2.0
40. Agway Inc.	United States	1.4	1.4
41. Stroh Brewery Co.	United States	1.4	1.4
42. Kroger	United States	1.3	1.3
43. Adolph Coors	United States	1.3	1.3
44. Castle & Cooke	United States	1.3	2.7
45. Purdue	United States	1.3	1.3
46. Gold Kist	United States	1.2	1.2
47. Savannah Foods & Industries	United States	1.1	1.1
48. Brown-Forman	United States	1.0	1.1
49. Dairyman Inc.	United States	1.0	1.0
50. Abbott Labs	United States	1.0	1.0

1/ Sales from U.S. food processing plants only.
2/ Includes sales from Beatrice, acquired in 1990.

Table 7 shows that 19 of the top 20 food processors in the EC are European firms. Contrary to what is often reported, only one U.S. firm is among the top 20 in the EC. Philip Morris is the third leading firm in the EC with processed food sales of $7.7 billion. While 38 of the top 50 EC firms are European, and 18 of the top 50 are UK, 11 of the top 50 are U.S.-owned firms. Thus, 10 of the 21 to 50 largest firms, or one-third, are U.S. firms. Only one of the top 50 EC firms is Canadian.

U.S. multinational food manufacturers are well situated in Europe to take advantage of EC-1992. Eighteen U.S. firms have at least two plants in the EC, while ten firms have over ten plants each (table 8). In 1989, Campbell Soup had 31 plants in the EC (although they have since divested at least five of those). Heinz, CPC International, Mars, Ralston Purina, ConAgra, and Borden all have 20 or more EC food processing plants. Many firms are trying to reduce unit costs by consolidating production into their most efficient and strategically located plants.

Most of the leading firms we have been discussing so far are packaged food manufacturers. But ingredient firms are also consolidating and becoming major multinational corporations. Although not well known, a growing number of ingredient firms are organizing to supply "one-stop-shopping" services to their customers. In addition to supplying ingredients these firms offer a wide array of R & D, quality control, product development, and pilot plant services. Some develop formal alliances or partnerships to customize ingredients and help perfect new products for their customers. Examples of these multinational ingredient firms include: Genencor International; Rhone-Poulenc, Inc; Quest International; Snofi Bio Ingredients Inc.; Pfizer; and a McCormick and Wild joint venture.

In summary, globalization is increasing in both trade and foreign direct investment. Seventeen of the world's largest food manufacturers appear on both the U.S. and EC lists of top 50 firms. Thus substantial integration already exists.

Table 7. Largest Food Manufacturers in the European Community, 1989-90

Company	Headquarters location	Processed Food sales in the EC	Total processed food sales
	Country	--Million dollars--	
1. Unilever	UK/Netherlands	10,866	17,128
2. Nestle' S.A.	Switzerland	10,791	31,000
3. Philip Morris/Kraft General Foods1/	United States	7,700	29,800
4. BSN Groupe	France	6,175	7,500
5. Allied-Lyons	UK	5,834	7,600
6. Gruppo Ferruzzi	Italy	4,868	6,438
7. Grand Metropolitan	UK	4,748	14,500
8. Bass PLC	UK	4,489	6,100
9. Hillsdown Holdings PLC	UK	3,468	6,500
10. Booker PLC	UK	3,188	3,500
11. Cadbury Schweppes PLC	UK	3,089	4,789
12. Guiness PLC	UK	3,042	5,064
13. United Biscuit	UK	3,000	4,400
14. Associated British Foods PLC	UK	2,914	3,706
15. Pernod Richard Groupe	France	2,595	2,595
16. Heineken N.V.	Netherlands	2,550	3,558
17. Unigate PLC	UK	2,518	3,700
18. Ranks Hovis McDougall PLC	UK	2,442	2,942
19. Coop Melkproductenbedr Noord	Netherlands	2,300	2,300
20. Sudflesiah	Germany	2,000	2,000
21. Seagram Company Ltd.	Canada	1,844	4,436
22. Coca-Cola Co.	United States	1,843	8,500
23. Mars	United States	1,836	7,000
24. Northern Foods PLC	UK	1,834	2,000
25. CPC International	United States	1,622	5,100
26. Sara Lee Corp.	United States	1,600	7,100
27. Source Perrier	France	1,600	2,000
28. Union Laitiere Normande	France	1,600	1,600
29. Tate & Lyle PLC	UK	1,561	4,083
30. H.J. Heinz Company	United States	1,539	5,900

Continued--

Table 7. Largest Food Manufacturers in the European Community, 1989-90 --continued

Company	Headquarters location	Processed food sales in the EC	Total processed food sales
	Country	--Million dollars--	
31. Scottish & Newcastle Brewers	UK	1,521	1,542
32. Whitbread & Co. PLC	UK	1,466	1,697
33. Dalgety PLC	UK	1,412	4,609
34. Besnier	France	1,400	1,500
35. United Breweries	Denmark	1,300	1,300
36. MD Foods amba	Denmark	1,157	1,614
37. British Sugar PLC	UK	1,115	1,126
38. Sudzucker AB	Germany	1.012	1,112
39. Borden, Inc.	United States	1,110	5,386
40. Melitta Gruppe	Germany	1,000	1,100
41. Tchibo	Germany	1,000	1,100
42. Kellogg	United States	999	4,439
43. Campbell Soup Co.	United States	984	5,672
44. Quaker Oats & Co.	United States	968	4,508
45. Saint Louis Groupe	France	901	1,407
46. Moet-Hennessey	France	900	900
47. Mums	France	900	900
48. Landwirtshaftliche Fleischzentrale GmbH	Germany	888	888
49. Pepsico Inc.	United States	812	8,152
50. Wessanen N.V. Koninklijke	Netherlands	782	1,900

1/ Includes Jacob Suchard (Switzerland), acquired in 1990.

Table 8. Number and Location of European Food Processing Plants Owned by U.S. Firms, 1989

Company	European Community							Other Europe2/
	Total EC	France	Germany	Italy	Spain and Portugal	U.K. and Ireland	Other EC1/	
	Number of Plants							
Campbell Soup	31	4	3	4	1	9	9	0
H.J. Heinz	30	4	6	7	8	3	2	0
CPC International	24	6	5	2	2	4	4	5
Mars	22	4	0	2	0	4	12	1
Ralston Purina	22	7	0	5	9	0	1	0
ConAgra	21	0	0	0	3	18	0	0
Borden	20	0	3	2	4	4	7	3
Philip Morris	19	3	3	3	2	6	2	2
Quaker Oats	13	4	3	1	1	1	3	0
Pepsico	11	2	1	2	3	2	1	0
RJR Nabisco	9	3	0	2	1	3	0	0
Anheuser-Busch	9	3	0	0	6	0	0	0
Coca-Cola	8	1	1	2	1	2	1	1
Kellogg	6	0	1	0	1	3	1	0
Sara Lee	5	1	0	0	0	2	2	0
General Mills	3	0	0	0	1	2	0	0
Archer Daniels Midland	3	0	1	0	0	2	0	0
Wm. Wrigley	2	1	0	0	0	1	0	1

Source: Company Annual Reports and 10-K Reports.
1/ Belgium, Denmark, Greece, Luxemburg, Netherlands
2/ Austria, Finland, Norway, Swedan, Switzerland, Turkey

Competition will be enhanced as large firms increasingly come into head-to-head competition in diverse geographic markets. Even though nine of the top 50 food manufacturers are Japanese firms, so far no Japaneses firm is among the top 50 firms in the U.S. or the EC.

Economies of Size

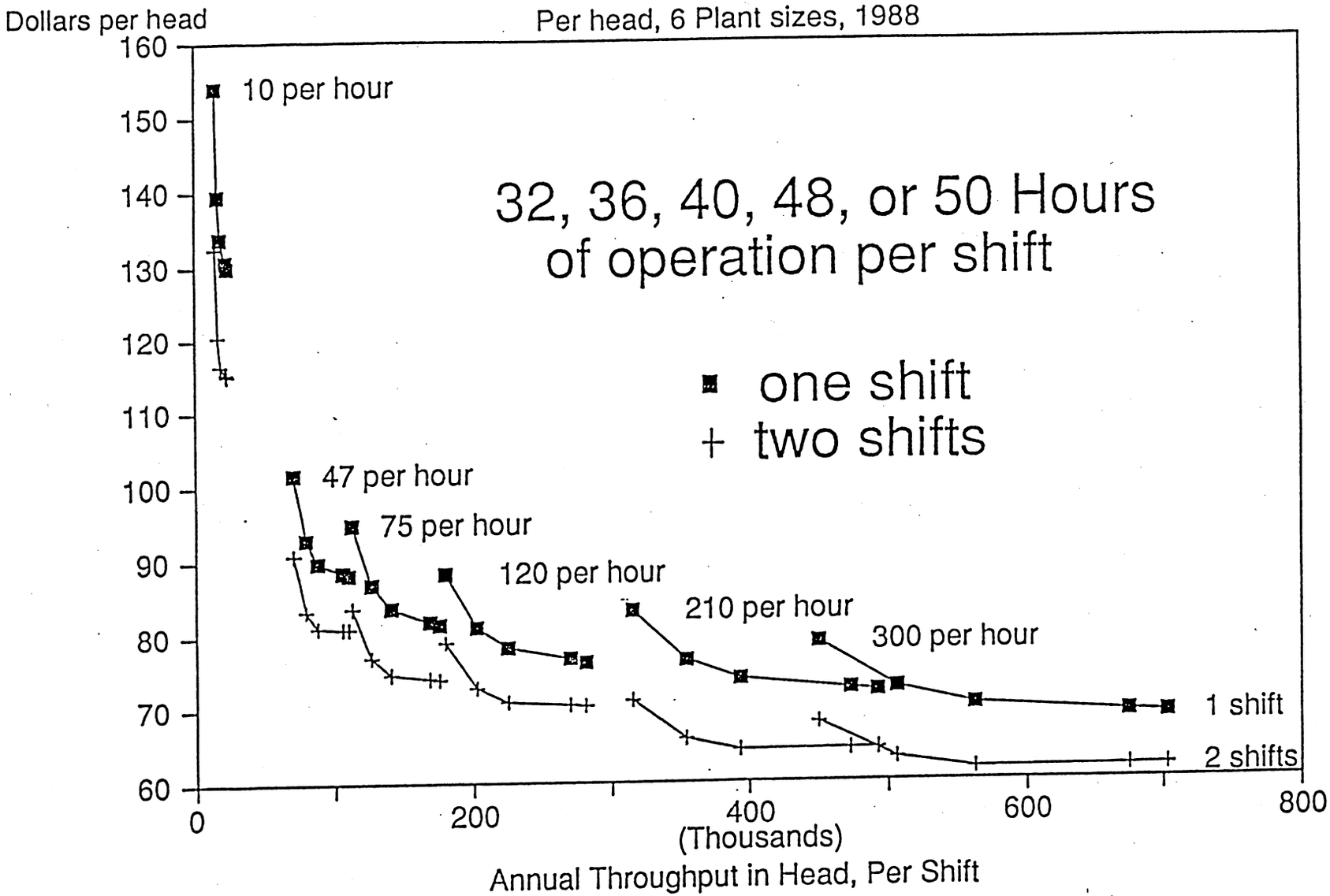
Economies of plant and firm size are another force leading to consolidation and structural change. The aggregate market for food is growing slowly in developed countries--less than 1.3 percent per year in the United States. This puts great pressure on firms to expand volume by consolidating firms and plants, and to capture potential cost savings from larger and more capital intensive plants.

There is considerable debate over the extent of economies of plant size-- often because relevant plant-level data are not available to researchers. The Economic Research Service recently developed economic engineering data for six different sizes of beef slaughtering and fabrication plants (figure 1). For each size plant, average slaughter and fabrication costs per head are shown for five different levels of plant utilization per shift. For plants operating one shift for 40 hours per shift, average cost per head decreases from $89 for plants having a capacity of 47 head per hour to $71 for plants with a capacity of 300 head per hour. The data also demonstrate the strong economic incentive to operate plants at close to full capacity. When operating at only 32 hours per shift, cost per head increased from $89 to $101 for the 47 head per hour plant and costs at the 300 head per hour plant increased from $71 to $80 per head. Some of newest beef packing plants recently opened have capacities considerably above 300 head per hour.

The point is that new low-cost plants put considerable competitive pressure on other firms in an industry to duplicate the cost savings of the innovator. It also places

FIGURE 1

Cost of Steer/Heifer Slaughter and Fabrication



Source: ERS estimates from economic engineering data

competitive pressure on all firms to obtain the volume necessary to operate near full capacity. Even brand-oriented package food firms such as Heinz, Borden, and PepsiCo are aggressively investing in cost reduction strategies in an effort to become the low cost producer in their respective product lines.

Drive for More Open Markets

A rapidly growing phenomenon in recent years has been the multi-faceted effort many by countries to achieve markets more open to both trade and foreign investment. The activities surrounding the formation of a single European Community market by the end of 1992 (EC1992), the United States-Canadian Free Trade Agreement, and the proposal for a free trade arrangement between the U.S. and Mexico have received the most attention. But many developing countries are also moving at various speeds to reduce trade and investment barriers. These countries are realizing that such barriers limit competition, protect inefficient domestic firms, and result in a stagnant domestic economy, higher consumer prices, less choice in the marketplace, and lower product quality. Also, Eastern European countries are privatizing many firms and reducing trade and investment barriers in efforts to modernize their economies and achieve the benefits from enhanced competition.

Some limited evidence on potential welfare gains from achieving common markets is available. The European Commission estimated the economic impacts of the formation of a single, barrier-free market among the EC member countries. These estimates suggest that economic gains from increased trade among member countries could reach 7 billion ECUs for the food and beverage manufacturing industries, or

roughly 2.5 percent of the average annual value of industry turnover, while benefits from market integration--increased competition and capturing of scale economies--could exceed 9 billiion ECUs, or more than 3 percent of annual industry trunover (Table 9).

Table 9 Estimated Welfare Gains of Market Integration on EC Food Industries

	Billion ECUs
Removing Trade Barriers	7.0
Gains from Market Integration	
Economies of Scale	5.6
Increase Competition	3.3

Source: Compiled from estimates by the European Commission, as reported in Sheldon and von Witzke.

With expanding free trade associations and common markets, national boundaries are increasingly becoming artificial definitions of markets for both analytical and industrial policy purposes. For example, live feeder cattle are coming into the western United States in record numbers from western Canada, while U.S. beef exports to Canada are also at record volumes. Ontario meat packers are undergoing major structural adjustments as a result.

Conclusions and Implications

Clearly, to understand the determinants and consequences of international commerce in the food sector requires an understanding of industrial organization; market structure and firm behavior. However, much is yet to be learned. Some of the priority items for the international agribusiness research agenda suggested by our analysis are:

- How is strategic conduct or interaction among firms in an industry affected by market size? As barriers to international commerce fall, do firms respond by behaving more, or less, competitively?
- How do product characteristics affect strategic competitive behavior? As foods become "endogenized" to reflect ethnic and cultural distinctions in international markets, do firms become increasingly specialized or do they meet as rivals in an increasingly number of product markets?
- What are the market performance and social welfare implications of international commercial activities other than trade? Who are the gainers, losers from investment in foreign facilities, international licensing of production technology, brand names, and other intangible assets, foreign joint ventures, international franchising and other business arrangements?
- Is there a generalizable theory of competition and strategic behavior in international markets? Can we systematically determine where rivalry ends and collusion begins?
- What are the public policy implications of the interface between industrial organization and international commerce? How does this interface affect national

choices regarding industrial structure and antitrust policy, international trade policy, and policies regarding the protection of intellectual capital?

Further, there a number of methodological issues that need to be resolved within the research community, if economists are to make unambiguous contributions to the collective understanding of international competition and market performance.

- Means must be established to collect and compile consistent and meaningfully defined data for both intra-industry and inter-industry studies that cross national boundaries.
- Techniques need to be improved for empirically estimating strategic interactions and other aspects of competitive firm behavior in both home and international markets.
- More work needs to be given to conceptualization, descriptive analysis, and the development of corresponding techniques for quantification of such internationally-observable industrial organization phenomena as economies of scope, vertical coordination, strategic alliances, and product differentiation.

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