FOREIGN DIRECT INVESTMENT AND PROCESSED FOOD TRADE

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Papers Presented at the
Conference of NCR-182 "Organization and
Performance of World Food Systems"
Arlington, Virginia
March 9-10, 1995

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TIME DEPENDENT RELATIONSHIPS IN US PROCESSED FOOD TRADE AND FOREIGN DIRECT INVESTMENT

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Introduction

Considerable uncertainty exists regarding the relationship, if any, between international trade and foreign direct investment (commonly referred to as FDI; also, called sales by foreign affiliates or foreign production). The question is, does an increase in one lead to an increase, or decrease, in the other? As early as 1973, Rock described trade and FDI as sequential events; firms use exports to obtain a toehold and then, if market conditions warrant, shift to local production. Later, in studies of the food processing industries, Reed and Ning found FDI and exports to be substitutes, while Handy and Henderson concluded that the available evidence on the net effect of FDI on trade is mixed. Anecdotal evidence from interviews with multinational food manufacturers revealed that firms used exports as a precursor to FDI in some cases, but in other situations FDI preceded exports (Vaughn *et al.* 1994).

In a theoretical review, Geldner concluded "(t)he task of defining the TNCs' (FDI) impact on international trade seems to be particularly difficult" (1986, 104). Uncertainty regarding the dynamic between trade and FDI is well summed in a recent United Nations report that stated, "(a)vailable evidence on the impact of international production on the trade of home countries is mixed. Some studies have found a net substitution of international production for trade, while other studies found no effect or an increase in exports..." (1986, 68). Yet, particularly for the food and agriculture sector the issue is of substantial importance; the US has as a policy objective increasing exports while the preferred international marketing strategy of the leading US food firms--indeed of leading firms regardless of nationality--is, sales through foreign affiliates (Handy and Henderson 1994).

The purpose of this paper is to examine the historical record on trends in US trade in processed food and in sales by foreign affiliates of food manufacturing firms, both in and outside the US, in order to detect and characterize time-dependent relationships between trade and FDI. The analysis turns on the use of unique data sets compiled by ERS: annual aggregates of quarterly observations of US imports and exports of SIC20 (food and kindred) products, and annual observations of exports and sales by foreign affiliates of leading US-based food manufacturers.

The paper is organized thusly: part I briefly reviews studies of the motivations for trade and FDI, part II provides a time-relevant perspective on trade and FDI in processed foods and describes data compiled by ERS that are used for analysis herein, part III examines these data for evidence of time-dependent lead-lag relationships between trade and FDI, and part IV draws conclusions and suggests some implications for further research.

I. Motivations for Trade and FDI

A number of efforts have been put forth to help clarify the relationship between FDI and trade. Drawing on neoclassical (Heckscher-Ohlin-Samuelson) trade theory with unequal factor endowments and treating FDI as the international transfer of factors, Mundell demonstrated that trade and FDI are perfect substitutes when factor price equalization is obtained. This is consistent with the Rybczynski theorem which holds that, as two countries become more alike (*e.g.*, from international factor mobility, or FDI), trade contracts. On this basis one would expect, *inter alia*, an increase in FDI to be followed by a decrease in trade.

By contrast, Markusen has shown that, if differences in relative prices in two countries under autarky are due to differences in technology rather than in factor endowments, trade in goods will generate rents to the technology-advanced industry in each country. These rents, in turn, attract international factor movement, the result being a complementary relationship between trade and FDI; an increase in trade leads to an increase in FDI.

Thus, depending upon the cause of factor price differences (*i.e.*, unequal factor endowments, unequal technology), neoclassical

trade theory can be used to rationalize either a time-related substitution or complementary relationship between trade and FDI.

More recent developments in the theories of international economics accommodate real-world conditions of imperfect competition, generally in the forms of economies to scale and product differentiation (Krugman, 1979; Helpman and Krugman 1985; Ethier 1994; Eaton and Grossman 1986; Dunning 1981). This literature identifies a number of motivations common to both trade and FDI; some with independent but common directional impacts, some with independent and opposite directional effects, and others that suggest a jointness between trade and FDI. The theoretical literature is joined by an expanding body of empirical studies. Most of these are cross-sectional, revealing firm, industry and/or country idiosyncrasies that explain the presence of trade, FDI or both. Covering a wide array of industries--only a few are specific to processed foods--and several developed countries, these studies reveal a number of empirical regularities regarding the determinants of trade and FDI. But, they offer relatively little insight into time-dependent interrelationships between the two. The major findings are briefly summarized here below.

Exports

Pagoulatos and Sorensen, using cross sectional data for 88 US manufacturing industries, found exports positively related to scale economies, product differentiation, and research and development (R&D). Using similar data for another time period, Marvel confirmed the positive R&D-export relationship, found exports positively related to managerial intensity, and a negative association between home market power and exports. Baldwin (1979), across 27 manufacturing industries, also reported finding trade positively associated with managerial intensity and negatively related to seller concentration, but contrary to Pagoulatos and Sorensen, reported a negative product differentiation-trade tie. Koo and Martin, using a sample of 288 US industries, confirmed the negative market power-export relationship, found a positive impact of product innovation on exports, and a negative home market advertising-export tie.

Lyons, based on pooled time series and cross sectional data for 111 UK industries, also reported a negative advertising-export

relationship and positive effects on exports of scale economies and R&D. Lipsey, with pooled cross sectional-time series data for 28 US industries, confirmed positive effects of managerial intensity and R&D on exports and a negative impact of advertising; Handy and MacDonald also documented positive R&D and negative advertising impacts on exports across 32 US manufacturing industries. Henderson and Frank, using cross sectional data on 42 US food manufacturing industries, reported negative export impacts of advertising, home market power, and trade barriers and confirmed positive impacts of scale economies and R&D. Glejser, Jacquemin and Petit, with data representing 1,446 Belgian firms in 35 industries, also documented negative impact of market power on exports but, contrary to several other studies, reported a negative R&D-trade relationship.

Rapp, exploring relationships between firm size and export market development using 100 years of Japanese data, found that large firms are more likely to export than smaller firms, and the export position of large firms increased both relatively and absolutely over time. Veugelers found trade among OECD countries to be negatively influenced by distance.

FDI

Yu reported finding positive impacts of firm size, R&D, and home-market advertising on sales by foreign affiliates; the latter two variables were interpreted as indicators of firm-specific intellectual capital. Handy and MacDonald, using cross-sectional data on 32 US manufacturing industries, also found positive impacts of R&D and home advertising on FDI. Ray, in a study of 32 manufacturing industries in five countries, cites strong evidence that FDI is positively influenced by specialized human capital, managerial intensity, and host market growth, and weak evidence of positive influences by seller concentration is the host market and trade barriers. In a study of 27 industries in 30 countries, Baldwin found product differentiation, managerial intensity, and seller concentration to positively affect FDI.

Grubaugh reported findings from a study of 300 US-based multinational firms that tie FDI directly to relative levels of firm expenditures on both R&D and advertising. Dunning cites evidence

of a positive relationship between value of intangible assets, also considered an indicator of intellectual capital, and FDI. Veugelers, in a cross-sectional study of FDI patterns in OECD countries, found positive effects on FDI of cultural similarity between host and home countries and confirmed the importance of host market growth. Connor, using US food manufacturing industry data, documented positive impacts of firm size, advertising, R&D, and home market share on FDI. Using pooled cross section-time series data for 628 food manufacturers across 16 countries, Henderson, Vörös and Hirschberg found intangible assets, product differentiation, firm size, and home market power positively associated with FDI.

Trade and FDI

Lipsey and Weiss, using cross sectional data for 44 destination countries, reported a positive relationship between US exports and shipments from foreign affiliates of US manufacturing firms. Examining patterns of exports and FDI in 24 US industries, Gruber, Mehta and Vernon found both to be driven by R&D with evidence in some industries, notably not including food, that FDI followed exports. For food, FDI was often the sole foreign market strategy. Overend and Connor examined factors jointly influencing export and FDI patterns for a cross-sectional sample of 33 US food manufacturing firms that also do business in the UK. Their findings show a positive relationship between a firm's foreign orientation (*e.g.*, its investment in foreign marketing expertise) and both exports and FDI, thus suggesting a complementary relationship between the two.

Principal variables that have been related to trade and FDI are summarized in table 1. In essence, the presence of specific conditions argue for international commerce primarily in the form of FDI; the absence of some of these appears to favor trade.

However, a number of conditions plausible in the processed food sector appear to be commonly tied to both trade and FDI. Thus, observation of simultaneous trade and sales by foreign affiliates should not be surprising.

Even so, this begs the question, do FDI and exports occur simultaneously, or typically does one lead the other? If the latter,

which leads; which lags? More specifically, does an increase in exports pave the way for FDI which, in turn, displaces trade? If so, there should be a positive correlation between past exports and present FDI, and a negative correlation between past FDI and present exports. Alternatively, growth in trade and FDI may be unrelated; each reflecting unique strategic decisions of firms at a point in time. Or, FDI could generate future trade (*e.g.*, importing ingredients for manufacture of finished consumer foods). Both theory and empirical evidence are surprisingly mute on these relationships. These are the points addressed in the subsequent analysis.

Table 1. Factors Influencing Firms' Exports and Sales by Foreign Affiliates

		Direction of Impact	
Indicator	As measured by	Exports	FDI Sales
Economies of Size	Size of Firm	+	+
Product and Process Innovation	Research and Development	+	+
Managerial Intensity	Value Added/Value of Shipments, Employee Educational Level	+	+
Foreign Marketing Expertise	Foreign Sales/Total Sales	+	+
Economies of Scale	Minimum Efficient Plant Size	+	0
Market Power	Price-Cost Margin, Seller Concentration, Market Share	-	+
Product Differentiation	Advertising Expenditures	-	+
Locational Advantage	Transportation Costs/ Value of Sales	-	+
Trade Barriers	Tariffs	-	+
Intellectual/Human Capital	Intangible Assets	0	+
Demand Expansion	Growth in Real GNP	0	+

  0 = no consistent theoretical or empirical relationship

II. Trends and Characteristics of Trade and FDI in Processed Foods

Data Sources

To explore the time dependent nature of the FDI-trade relationship, we use two distinct sets of data. The first combines annual data on SIC 20 trade between the US and other countries from the Bureau of Census with annual data on SIC 20 US affiliate sales abroad by country from the Bureau of Economic Analysis. This yields observations on foreign affiliate sales and exports for 32 countries from 1983 to 1992. In addition to industry level data, we use firm level data compiled by ERS from 1988 to the present to obtain

observations on 41 US food manufacturing firms involved in both export and FDI. In addition to information on exports and foreign affiliate sales, the data set includes information on total food sales, location of foreign affiliates, employment, and advertising.

General Trends in Trade and FDI

An examination of both firm and industry level data show that despite a widening gap between foreign affiliate sales and exports, both continue to grow. Figure 1 shows the relative value of foreign affiliate sales for US food manufacturing firms compared with the value of total US processed food exports. Affiliate sales have long exceeded the value of US exports, but since 1985, the gap has widened. From 1985 to 1994, sales from US affiliates abroad grew 172 percent to $101 billion, while exports increased 149 percent to $25.6 billion. As a result, by 1994 FDI sales were an estimated 4.0 times larger than total US processed food exports. Thus, aggregate industry-wide data, while crude, does suggest that rapid growth of FDI sales has not come at the expense of US exports.

Figure 1. US Exports and Foreign Affiliate Sales of Processed Foods
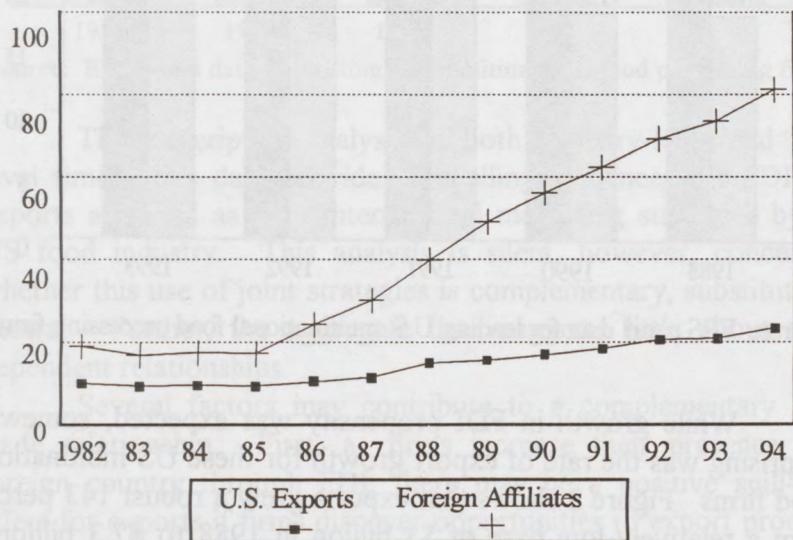
1/ERS estimate
2/Preliminary Source:
U.S. Department of Commerce and USDA, ERS

Additional insight into US food manufacturers' FDI and export behavior is provided by ERS panel data for the years 1988-93. In 1993, these firms accounted for 52 percent of total processed food industry output, with a 66 percent share of FDI sales and a share of total exports equal to 32 percent. Figure 2 shows that foreign affiliate sales for these firms increased 56.5 percent from $40.9 billion in 1988 to $64 billion in 1993. In addition, FDI propensity rose significantly. Affiliates' share of total company world-wide food sales increased from around 25 percent of sales to more than 30 percent.

Figure 2.   US Foreign Affiliate Sales of Processed Food for Leading MNCs
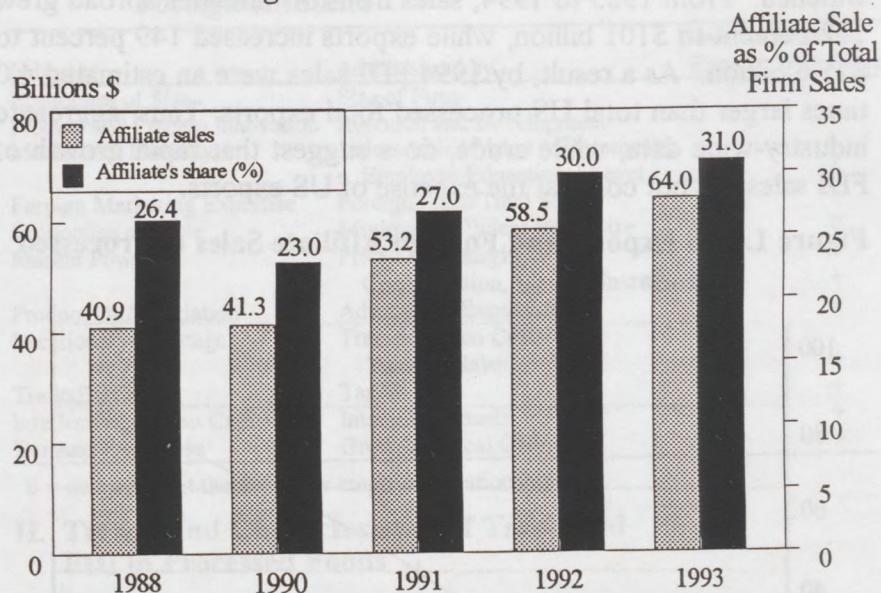
Source: ERS panel data for leading U.S. multinational food processing firms.

While growth in FDI propensity was expected, somewhat surprising was the rate of export growth for these US multinational food firms. Figure 3 shows that exports grew a robust 143 percent from a relatively low base of $3 billion in 1988 to $7.3 billion in 1993. Exports increased from 2.6 percent of these firms' US food sales to 5.1 percent in 1993. With exports increasing 143 percent

during 1988-93 compared to FDI growth of 56 percent, the FDI-to-exports ratio fell from 13.6 to 8.8. Thus, these leading US food processors are clearly expanding their export markets even as they increase their FDI sales.

Figure 3. US Exports of Processed Food by Leading MNCs
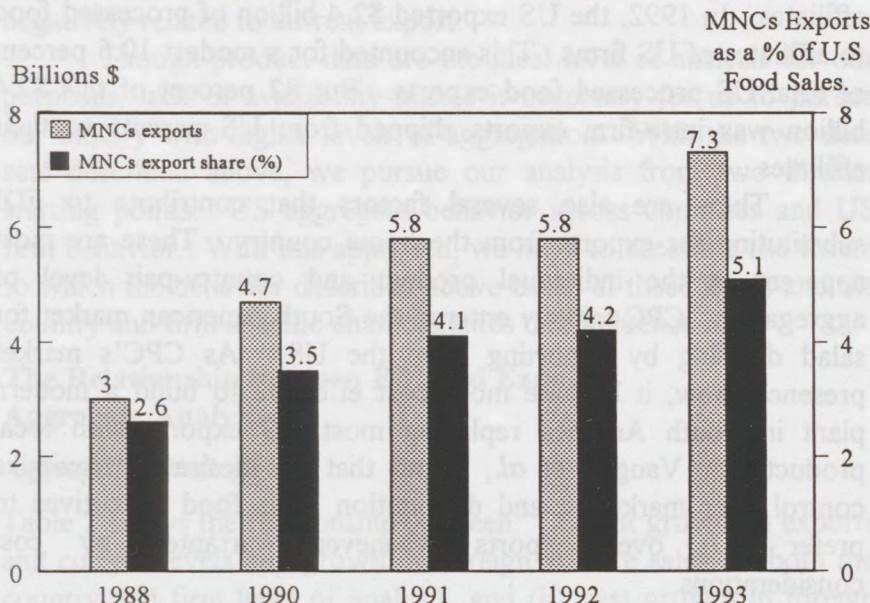
Source: ERS panel data for leading U.S. multinational food processing firms.

This descriptive analysis of both industry-level and firm-level time series data provide compelling evidence that FDI and exports are used as joint international marketing strategies by the US food industry. This analysis is silent, however, concerning whether this use of joint strategies is complementary, substitute, or neutral. Further, the aggregate data suggests little about time-dependent relationships.

Several factors may contribute to a complementary FDI-trade relationship. First, as firms increase their presence in a foreign country through FDI, there may be a positive spill-over affect for exports if firms discover opportunities to export products from the home country that may not be produced by their affiliates. For example, Gerber produces baby food in Venezuela, but local production is limited to vegetable-based products. Fruit-based

products are imported from the US due to raw material and economies of scale considerations. Second, as a firm's international expertise grows from FDI, host country production and marketing staffs and distribution facilities can be used to both find and service export customers in the host country and neighboring countries. Third, the US parent can exploit trade opportunities with its affiliates. In 1992, the US exported $2.4 billion of processed food to affiliates of US firms. This accounted for a modest 10.5 percent of total US processed food exports. But 82 percent of this $2.4 billion was intra-firm exports shipped from US parents to their affiliates.

There are also several factors that contribute to FDI substituting for exports from the home country. These are most apparent at the individual product and country-pair level of aggregation. CPC initially entered the South American market for salad dressing by exporting from the US. As CPC's market presence grew, it became more cost effective to build a modern plant in South America replacing most US exports with local production. Vaughn *et al.*, found that the desire to maximize control over marketing and distribution leads food executives to prefer FDI over exports whenever warranted by cost considerations.

In the next section we analyze both industry- and firm-level data to determine lead-lag relationships between US outbound FDI and exports in processed foods.

III. Temporal Relationships Between Trade and FDI

To explore the time dependent nature of the relationship between FDI and trade, we examine the effect of past growth in exports on the current growth and level of foreign affiliate sales and the effect of past growth in foreign affiliate sales on the current growth and level of exports. This approach provides a more explicit test of the prevalence of the behavior described by Vaughan et al. and others, *i.e.*, the extent to which firms lead FDI with exports or vice versa.

While the present analysis lends itself easily to inferences regarding one activity leading to another, care must be taken when extending the inference to substitution or complementarity between the two activities. For example, it is often argued the sequential use

of exports and foreign direct investment to enter a market indicates the two are substitutes. While one might infer confirmation of sequencing exports and foreign direct investment from a positive correlation between past export growth and current foreign affiliate sales, it would be more difficult to infer substitution without ascertaining whether past growth in foreign direct investment was negatively related to current export.

Though product data are the ideal level of analysis for our purposes, lack of availability makes it necessary for us to pursue our inquiry with higher levels of aggregation. With the two data sets described above, we pursue our analysis from two distinct starting points: US aggregate behavior across countries and US firm behavior. With this approach, we hope to ascertain the extent to which the behavior described above exists at these levels and the country and firm specific characteristics that influence it.

The Relationship between FDI and Exports: Aggregate Analysis

Aggregate Findings

Table 2 shows the relationship between: (a) past growth in exports and current levels and growth in foreign affiliate sales for both the country and firm level of analysis, and (b) past growth in foreign affiliate sales and current levels and growth in exports for both the country and firm level of analysis. For exports, one, two, and three year average annual growth rates for the year preceding the current year are used for the country analysis; one, two, and four year average annual growth rates for the year preceding the current year are used for the analysis of firms.[1] Because of the exploratory nature of this study, no attempt was made to determine the appropriate ·lag or lead time. Rather, every possibility was explored. Standard errors are reported under each correlation coefficient.

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[1] An annual growth rate was also calculated for the second and third year preceding the current year. The results did not differ from the results obtained with average annual growth rates and excluded from the current analysis.

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The table shows a positive relationship between past growth in US exports of SIC 20 goods and current growth in foreign affiliate sales among both countries and firms. Among countries, the past average annual export growth rate calculated over a single year is positively related to the current annual growth rate for foreign affiliate sales (statistically significant correlation coefficient of .2163). Among firms, the same relationship exists between the past average annual export growth rate calculated over two years and the current annual growth rate for foreign affiliate sales. These findings suggest that exports may serve as precursors to foreign investment.

Table 2. Aggregate Analysis

Correlations Among Past Export Growth and Current Foreign Affiliate Sales

Country			
	Exports: Average Annual Growth Rate Between t-1 and		
Foreign Affiliate Sales	t-2	t-3	t-4
In time period t	.0396	.0157	-.0162
	.5806	.8402	.8531
Average Annual Growth between t and t-1	.2163*	.1245	-.0357
	.0035	.1277	.7025

Firms			
	Exports: Average Annual Growth Rate Between t-1 and		
Foreign Affiliate Sales	t-2	t-3	t-5
In time period t	-.1054	.0662	.0275
	.5407	.7188	.8873
Average Annual Growth between t and t-1	.1516	.5329*	.1876
	.3488	.0024	.3848

Correlations Among Past Growth in Foreign Affiliate Sales and Current Exports

Country			
	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
Exports	t-2	t-3	t-5
In time period t	-.0156	-.0118	-.0165
	.8211	.8632	.8200
Average Annual Growth between t and t-1	-.0577	.0371	-.0247
	.4019	.5869	.7331

Firms			
	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
Exports	t-2	t-3	t-5
In time period t	-.1043	-.0499	.0327
	.5510	.7970	.8714
Average Annual Growth between t and t-1	-.0550	-.0829	-.1649
	.7537	.6751	.4207

* = Statistically significant at 0.05

Across both countries and firms, a significant relationship between past growth in foreign affiliate sales and the current level or growth of exports does not exist. These findings suggest that at aggregate levels foreign direct investment may not affect future exports.

Taken together the aggregate results do not provide strong support for either complementarity or substitution between foreign direct investment and exports. While the positive relationship between past export growth and current growth in foreign affiliate sales might be interpreted as evidence of substitution, the lack of a negative relationship between past foreign affiliate sales and current exports weakens the substitution argument. In other words, growth in exports may stimulate foreign direct investment, but there is no evidence that growth in foreign direct investment is related to a contraction in exports.

The Relationship between FDI and Exports: Geographic and Firm Differences

Anecdotal information from interviews with multinational food manufacturers (Vaughan *et al.* 1994) suggests that strategies for delivering products to foreign markets varies by destination, product, and firm. In the present context, this suggests that the temporal relationship between FDI and exports may vary along the same lines. The current data allow for the examination of the effect of characteristics of destinations and firms on the FDI-trade relationship.

Geographic Difference: Country Level Analysis

Differences in Income

A division of the country sample on the basis of membership in the OECD provides a crude measure of the impact of the level of economic development, or income, in the destination country on the temporal FDI-trade relationship. Table 3 contains the results for members; and for nonmembers of the OECD.

A comparison of results for members and nonmembers of the OECD reveals that the significant relationships for OECD members are both negative and opposite those for non-OECD members. The results for OECD members indicate that past

growth in exports has a negative impact on current foreign affiliate sales and that past growth in foreign affiliate sales has a negative impact on exports. Contrary to our aggregate findings, this provides no support for exports as a precursor to FDI and suggests that the relationship between exports and FDI may be competitive in OECD countries.

Table 3. OECD/Non-OECD Comparison

OECD Members

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

Foreign Affiliate Sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	-.1451	-.1694	-.3161*
	.1416	.1125	.0077
Average Annual Growth between t and t-1	.1177	.0726	-.0454
	.2534	.5196	.7259

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	-.1913*	-.1562**	-.2046*
	.0424	.0941	.0382
Average Annual Growth between t and t-1	.0336	.1384	.0883
	.7243	.1386	.3751

Non-OECD Members

Correlations Among Past Export Growth Rates and Current Foreign Affiliate Sales

Foreign Affiliate sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	.0145	.3685*	.3097*
	.8901	.0009	.0135
Average Annual Growth between t and t-1	.2325*	.1375	-.0368
	.0323	.2563	.7899

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	.1510	.2540*	.3187*
	.1337	.0104	.0022
Average Annual Growth between t and t-1	-.0752	.0132	-.0483
	.4569	.8959	.6514

** = Statistically significant at 0.10

As in the aggregate findings, the results for non-OECD countries show a significant positive relationship between both past export growth and current foreign affiliate sales. Unlike the aggregate results, however, a positive relationship between past growth in foreign affiliate sales and current exports exists for non-

OECD countries. This suggests that foreign affiliate sales have a positive impact on exports -- a complementary relationship.

Regional Differences

Along with differences in strategy due to disparities in income, FDI-trade strategies may vary by region. Regional differences may exist due to differences in culture, income, and infrastructure among regions.[2] The sample is divided into three regions: Central and South America; Asia/Pacific; and Western Europe and Canada.

Table 4 shows the results for each region. The split observed between OECD and non-OECD countries is also present in the regional analysis. Not surprisingly, the results for Central and South American duplicate those for non-OECD members. In a similar vein, the Canada and Western Europe results between past growth in exports and current foreign affiliate sales duplicate OECD results. Unlike the OECD results, no significant relationship between past foreign affiliate sales and current exports exists.

The results for the Asia/Pacific split show a positive relationship between past growth in exports and current foreign affiliate sales, similar to the non-OECD results; however, no significant relationship between past foreign affiliate sales and current exports exists. The positive relationship between past export growth and current affiliate sales is somewhat surprising given the inclusion of several OECD members (Australia, New Zealand, Japan and South Korea) in the Asia/Pacific category. These results suggest that the level of industrialization within a region may influence the temporal relationship between exports and foreign direct investment.

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[2] The aggregate nature of the data may make the detection of a sequential relationship more difficult in mature markets (regions). As a result, the FDI-trade relationship may vary across regions. For example, much of Asia represents an emerging market for both exports and foreign direct investment. Few firms have established a strong presence in this region. Given the common starting point for firms, it is more likely that aggregate behavior will reflect common strategy. In contrast, Western Europe represents a mature market for many firms heavily involved in FDI but an initial investment for firms with little experience in FDI. A multitude of strategies may exist within Western Europe and, thereby, lead to an aggregate relationship between FDI and trade which differs from Asia.

Table 4. Regional Comparisons

Central and South America (Including Mexico)

Correlations Among Past Export Growth Rates and Current Foreign Affiliate Sales

Foreign Affiliate sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	.1126	.3856*	.2393
	.4001	.0062	.1371
Average Annual Growth between t and t-1	.3369*	.1868	-.0446
	.0127	.2191	.7963

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	.1749	.2231**	.3310*
	.1703	.0741	.0112
Average Annual Growth between t and t-1	-.0943	-.0088	-.0545
	.4621	.9447	.6845

Western Europe and Canada

Correlations Among Past Export Growth Rates and Current Foreign Affiliate Sales

Foreign Affiliate sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In the time period t	-.1588	-.2124**	-.3780*
	.1568	.0776	.0044
Average Annual Growth between t and t-1	.1549	.1235	-.0065
	.1845	.3310	.9647

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	-.1454	-.1368	-.1681
	.1765	.1987	.1336
Average Annual Growth between t and t-1	.1843	.1581	.0975
	.7849	.1367	.3864

Asia/Pacific

Correlations Among Past Export Growth Rates and Current Foreign Affiliate Sales

Foreign Affiliate Sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	.1698	.2804**	.3497*
	.2243	.0652	.0395
Average Annual Growth between t and t-1	-.0519	-.0310	-.0483
	.7234	.8494	.7964

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-4
In time period t	-.1507	-.1253	-.1338
	.2588	.3532	.3542
Average Annual Growth between t and t-1	.0067	.1022	-.0523
	.9600	.4495	.7181

Firm Differences

Four aspects of the firm--product diversity, advertising intensity, firm size, and international experience--are used to determine if the temporal trade-FDI relationship found in the aggregate firm results (table 2) varies with the characteristics of the firm. International experience is characterized by two dimensions: the geographical dispersion of foreign direct investment and the international ratio. For each characteristic, the sample is subdivided into two groups. The groups for advertising intensity and the international ratio use the mean value of a characteristic as the point of division between groups. For size, the sample is subdivided on the basis of the median total sales. The grouping for product diversity and the geographical dispersion of foreign direct investment uses subjective evaluation of information from annual reports and the ERS data to place firms within a group.

Product Diversity

Table 5 shows the results for the low and high product diversity groups. For the low product diversity group, table 5 indicates a positive significant correlation between past export growth and current growth in foreign affiliate sales and no significant correlation between past growth in foreign affiliate sales and current exports. For the high product diversity group, table 5 also indicates a positive significant correlation between past export growth and current growth in foreign affiliate sales. In addition, however, it shows a positive correlation between past growth in foreign affiliate sales and current exports.

These results provide some support for anecdotal information gathered by Vaughan *et al.*, about the strategic use of exports to "fill in" product lines of foreign affiliates. The positive correlation between past foreign affiliate sales and current export growth found only for highly diverse firms may occur because it may be infeasible for foreign affiliates to replicate a highly diverse product line.

Table 5. Product Diversity Comparison

Low Product Diversity

Correlations Among Past Growth Rates of Exports and Current Foreign Affiliate Sales

	Exports: Average Annual Growth Rate Between t-1 and		
Foreign Affiliate sales	t-2	t-3	t-5
In time period t	-.1293	-.1239	-.0408
	.6090	.6358	.8946
Average Annual Growth between t and t-1	.1188	.8860*	.1247
	.6499	.0001	.7149

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
Exports	t-2	t-3	t-5
In time period t	-.0304	-.1712	-.0817
	.9077	.5759	.8224
Average Annual Growth between t and t-1	-.0459	-.0867	-.2381
	.8611	.7783	.5077

High Product Diversity

Correlations Among Past Growth Rates of Exports and Current Foreign Affiliate Sales

	Exports: Average Annual Growth Rate Between t-1 and		
Foreign Affiliate sales	t-2	t-3	t-5
In time period t	.0260	.1181	.4283**
	.9186	.6752	.0979
Average Annual Growth between t and t-1	.2743	.4256	.5081
	.2706	.1138	.0445

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
Exports	t-2	t-3	t-5
In time period t	-.0839	.4542**	.4774**
	.7407	.0772	.0527
Average Annual Growth between t and t-1	-.3788	-.0297	-.0744
	.1211	.9164	.7841

Advertising Intensity[3]

Table 6 shows the results for the low and high advertising intensity. For the group with low advertising intensity, the table shows that no statistically significant relationship can be found between either past export growth and current foreign affiliate sales and between past foreign affiliate sales and current exports. In contrast, the table shows that a positive, significant correlation exists between past

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[3] A similar analysis was performed for a subdivision of firms based on a subjective evaluation of whether their goods were primarily bulk or branded products. - Because the results were similar to those for advertising intensity, they are not reported here.

export growth and current foreign affiliate sales for the group with high advertising intensity.

Table 6. Advertising Intensity Comparison

Advertising to Sales Ratio Less than Mean
(Low Advertising Intensity)

Correlations Among Past Growth Rates of Exports and Current Foreign Affiliate Sales

	Exports: Average Annual Growth Rate Between t-1 and		
Foreign Affiliate sales	t-2	t-3	t-5
In time period t	-.1311	-.0074	-.0547
	.5511	.9752	.8239
Average Annual Growth between t and t-1	-.0811	-.0292	-.0368
	.8974	.7491	.8885

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
Exports	t-2	t-3	t-5
In time period t	-.0813	.2370	.1586
	.7192	.3598	.5433
Average Annual Growth between t and t-1	-.0576	-.0995	-.3264
	.7989	.7138	.2172

Advertising to Sales Ratio Greater than Mean
(High Advertising Intensity)

Correlations Among Past Growth Rates of Exports and Current Foreign Affiliate Sales

	Exports: Average Annual Growth Rate Between t-1 and		
Foreign Affiliate sales	t-2	t-3	t-5
In time period t	-.0145	.0223	.2394
	.7634	.9451	.5054
Average Annual Growth between t and t-1	.6723*	.5898*	.6143**
	.0118	.0435	.0588

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
Exports	t-2	t-3	t-5
In time period t	-.2341	-.2151	-.1389
	.4414	.5019	.7019
Average Annual Growth between t and t-1	-.0446	-.1105	.1990
	.8850	.7325	.5816

The differences between the results for groups with low and high advertising intensity should not be surprising in light of other empirical results which find a positive relationship between advertising intensity and foreign direct investment. These results suggest that advertising intensity may affect strategy - the use of exports as precursors to foreign direct investment - as well as the choice of foreign direct investment.

International Experience

Tables 7 and 8 show the results for groupings based on the geographical dispersion of FDI and the international ratio. A comparison between the geographical dispersion groups (table 7) reveals no substantive difference between the narrow and wide dispersion groups with respect to the temporal trade-FDI relationship. For both groups, a positive and significant correlation exists between past growth in exports and current foreign affiliate growth and no significant correlation exists between past foreign affiliate growth and current exports.

Table 7. International Experience-Geographical Dispersion of FDI

Narrow Geographical Dispersion

Correlations Among Past Export Growth Rates and Current Foreign Affiliate Sales

	Exports: Average Annual Growth Rate Between t-1 and		
Foreign affiliate sales	t-2	t-3	t-5
In time period t	-.1187	.0647	.2235
	.6182	.7986	.3727
Average Annual Growth between t and t-1	.1131	.7186*	.1590
	.6447	.0017	.5560

Correlations Among Past Growth Rates in Foreign Affiliate Sales and Current Exports

	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
Exports	t-2	t-3	t-5
In time period t	-.1055	-.1304	-.1558
	.6672	.6302	.5545
Average Annual Growth between t and t-1	-.0460	-.0346	-.1615
	.8516	.9026	.5652

Wide Geographical Dispersion

Correlations Among Past Export Growth Rates and Current Foreign Affiliate Sales

	Exports: Average Annual Growth Rate Between t-1 and		
Foreign Affiliate sales	t-2	t-3	t-5
In time period t	.0190	.1548	.3895
	.9442	.5971	.2364
Average Annual Growth between t and t-1	.2419	.3466	.6099*
	.3667	.2248	.0463

Correlations Among Past Growth Rates in Foreign Affiliate Sales and Current Exports

	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
Exports	t-2	t-3	t-5
In time period t	-.2312	-.0683	.4849
	.3889	.8244	.1306
Average Annual Growth between t and t-1	-.1306	-.1797	-.2168
	.6297	.5569	.5221

Table 8 shows the results for international ratio subgroups. For the group consisting of firms with an international ratio less than the mean, a positive, significant correlation exists between past growth in exports and current growth in foreign affiliate sales. There is no significant relationship between past foreign affiliate sales and current export growth. The results for the group of firms with an international ratio greater than the mean reveal that no statistically significant relationship exists between either past export growth and current foreign affiliate sales or past foreign affiliate sales and current exports.

Table 8. International Experience - International Ratio

International Ratio Less Than Mean

Correlations Among Past Export Growth Rates and Current Foreign Affiliate Sales

Foreign Affiliate sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-5
In time period t	-.0729	.3389	-.0087
	.7811	.2364	.9774
Average Annual Growth between t and t-1	.1320	.8119*	.7993*
	.6261	.0013	.0032

Correlations Among Past Growth Rates in Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-5
In time period t	-.1046	.0783	-.3408
	.6999	.8298	.3352
Average Annual Growth between t and t-1	.1300	.2945	.1103
	.6314	.4088	.7616

International Ratio Greater Than Mean

Correlations Among Past Export Growth Rates and Current Foreign Affiliate Sales

Foreign affiliate sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-5
In time period t	-.0584	.1211	.0052
	.8124	.6321	.9847
Average Annual Growth between t and t-1	.0380	-.0187	.0100
	.8772	.9412	.9707

Correlations Among Past Growth Rates in Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-5
In time period t	-.1563	-.1068	-.0172
	.5228	.6634	.9478
Average Annual Growth between t and t-1	-.0339	-.1113	-.3502
	.8904	.6601	.1835

A comparison between the results for the international subgroups suggests that the past export growth is indicative of current foreign affiliate sales only for firms with a lower international ratio. A possible explanation for this finding may lie in the relationship between risk and international experience. In interviews conducted by Vaughan *et al.*, several firms discussed the role of international experience in reducing their risk in entering foreign markets. Because the choice of entry strategy depends on a firm's perception of risk, the use of exports (low risk) and FDI (higher risk) or the progression from one to another will vary with international experience. For example, firms with little international exposure - lower than average international ratio - may perceive a higher risk to entering every new market and, therefore, first enter with a low risk method - exports. As their experience in the market increases, they then move to foreign direct investment. This would cause a positive correlation between past growth in exports and current foreign affiliate sales found in table 8. On the other hand, firms with greater international exposure - a higher than average international ratio - may vary their strategies, using exports then FDI in some markets (the risky ones) but choosing to move directly to FDI in others. The use of many strategies by these firms could be responsible for the lack of correlation found in this table.

Size

Table 9 shows the results for firms with total sales below and above the median. For firm size below the median, a positive and significant correlation exists between past growth in exports and current foreign affiliate sales. No significant correlation exists between past growth in exports and current foreign affiliate sales. No significant correlation between past foreign affiliate sales and current growth in exports exists. These results are reverse for firm size greater than the median.

In the context of previous empirical work, these results are difficult to interpret. They do not easily conform to previous empirical results. A possible explanation might exist for the firm size below the median group if size is positively correlated with international experience, *e.g.*, the international ratio. In this case,

the relationship found for relatively small firms might be attributed to lack of experience in international markets. If so, the explanation used for the international ratio would apply.

Table 9. Size Comparison

Size Less than Median

Correlations Among Past Growth Rates of Exports and Current Foreign Affiliate Sales

Foreign affiliate sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-5
In time period t	-.1723	-.0607	.2570
	.4806	.8171	.3750
Average Annual Growth between t and t-1	.1501	.9235*	.1597
	.5396	.0001	.6024

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-5
In time period t	-.0522	-.2442	-.3003
	.8372	.3997	.3429
Average Annual Growth between t and t-1	-.0381	-.1084	-.1514
	.8808	.7122	.6385

Size Greater than Median

Correlations Among Past Growth Rates of Exports and Current Foreign Affiliate Sales

Foreign affiliate sales	Exports: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-5
In time period t	-.0232	.0468	.2744
	.9321	.8737	.3424
Average Annual Growth between t and t-1	.1159	.0592	.2108
	.6691	.8408	.4694

Correlations Among Past Growth Rates of Foreign Affiliate Sales and Current Exports

Exports	Foreign Affiliate Sales: Average Annual Growth Rate Between t-1 and		
	t-2	t-3	t-5
In time period t	-.0610	.4539**	-.0513
	.8223	.0892	.8559
Average Annual Growth between t and t-1	-.3518	-.0172	-.2321
	.1815	.9535	.4246

IV. Conclusions and Implications

In the end, which comes first, trade or FDI? Furthermore, does whatever comes second displace, or augment, what comes first? Neoclassical international economic thought turns out to be not particularly insightful. Empirical studies suggest that the

motivation which leads firms to export often also leads them to foreign production; joint trade/FDI strategies appear to be rational under many conditions common to the processed food sector.

Overall, at least as a method for generating out-bound foreign commerce by US food manufacturers, FDI is clearly the predominant strategy. Even so, aggregate data provide no support for the suggestion that exports and foreign production are substitute strategies; in general, as one rises, both rise--with statistical correlations suggesting that, for the sector as a whole, growth in exports provides roughly a one-year leading indicator of growth in sales from foreign affiliates.

That said, there appear to be some fairly distinct temporal differences in the outbound trade-FDI patterns for different groups of countries. Based on the country groupings examined herein, the distinction appears to reflect stage of economic advancement for the destination countries. Specifically, countries that may be characterized as "less industrialized lower income" (LILI) appear to exhibit a complementary temporal relationship, *i.e.*, in-bound trade in processed foods from the US subsequently leads to in-bound FDI; this in-bound FDI, in turn, often leads to further growth in trade.

By contrast, "industrialized-high income" (I-HI) countries appear to demonstrate a greater competitiveness between US-originated FDI and imports; in particular, production by affiliates of US firms seems to displace earlier imports from the US. Further, some observations suggest that subsequent increase in imports is followed by slower growth in FDI. These destination-country distinctions may overlay a certain "product life cycle" type of logic. To the extent that in-bound commerce in processed foods is triggered by some threshold level of economic growth (a seemingly logical presumption not tested in this analysis), once that threshold is passed, rapid growth in the processed food market obtains. This, in turn, sets off a scramble by outside suppliers to get a piece of the action; some do it best by exporting, others do it best through in-bound FDI, and aggregate data point to a complementary relationship. Once the market starts to mature and the rate of growth diminishes, the strategies become more competitive; gains for one come more at the expense of the other.

Unlike the country destination differences, the analysis of firm characteristics does not find evidence of competitiveness between exports and FDI. A positive relationship between past growth in exports and current foreign affiliates sales is observed for firms in the highly advertising intensive subgroup, the low international ratio subgroup, and the small firm subgroup, but not for their subgroup counterparts. A positive relationship between past foreign affiliate growth and current exports is also observed but only for the high product diversity subgroup. This suggests that the relationship between exports and FDI may differ with these characteristics.

Putting the works in perspective raises a number of questions that are fodder for the research agenda:

- What are the distinguishing characteristics of countries that, at given points in time are aligned with seemingly complementary, or competitive trade-FDI relationships? Were we simply lucky in lumping together countries for analytical convenience? Or, are there distinctions based upon income level, rate of income growth, stage of industrialization or other economy-wide characteristic that affects these strategic interactions theoretically as well as empirically?

- Do what appear to be country-specific temporal patterns of trade-FDI interaction hold across all lines of processed foods? Or, are there product-specific idiosyncrasies? For example, could it be that imports of consumer-branded and packaged goods beget in-bound FDI which in turn begets import of processed ingredients; this, then, leading to investment in host-country ingredient production, itself leading to import of basic commodities; followed again by investment in local commodity production?

- Do similar firms pursue similar strategies in similar markets? Or, are our observations heavily influenced by the strategies of those relatively few firms that have been successful at establishing dominant foreign market positions and thus, missing the strategic games being played among the multitude; the most successful of which conform to the identified patterns of trade and FDI but revealing little of the strategic interaction that brought them to dominance?

Largely sans the foundation of a solid theoretical footing, we observe the beginning shape of empirical regularities regarding temporal relationships between different forms of US outbound international commerce in processed foods. The challenge is to refine these observations, and combine them with a rational theoretical framework so that, ultimately, predictions can be made with confidence. Only then will we be able to contribute in a tractable manner to the policy debate regarding inducements for, and constraints on, trade and foreign direct investment in the food sector.

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Appendix

Table 1. Trends in Foreign Direct Investment and Exports by Firm Characteristics

	Ave. FDI per Firm (Mil.$)	%Change	Ave. Exports per Firm (Mil $)	%Change	FDI/Export Ratio
Sub-group	1993	93/91	1993	93/91	1993
All 38 Firms	1,467	24.3	152	19.7	9.7
Size of Firm					
Below $1 Bil.	57	30.7	20	-50.2	2.8
$1-$10 Bil.	954	16.4	107	24.5	8.9
Above $10 Bil.	4,251	32.1	398	19.8	10.7
Product Diversity					
Narrow	725	43.0	56	11.1	13.0
Broad	2,487	18.1	283	22.3	8.8
Advertising to Sales					
Below average	1,251	16.7	133	41.2	9.4
Above average	1,780	20.7	228	20.0	7.8
International Ratio					
Below average	317	18.6	113	44.0	2.8
Above average	2,674	27.4	224	13.1	11.9

Source: ERS panel data.

Appendix A

To gain further insights into these firms' FDI and export behavior, we broke a sample of 38 firms that were in the data base in both 1993 and 1991 into sub-groups. We calculated mean FDI sales and mean exports for 1993, the percent change from 1991, and the 1993 FDI/Export ratio (Appendix table 1). For the full sample, FDI sales averaged $1,467 million per firm and increased 24.3 percent. Exports average $152 million per firm and grew 19.7 percent. For these firms, FDI was 9.7 times larger than their US exports in 1993.

Large firms dominate FDI more so than for exports. FDI sales for the seven firms with sales above $10 billion averaged $4,251 million

per firm, while exports averaged $398 million. For large firms FDI was 10.7 times larger than exports while for medium size firms the FDI/export ratio rose to 8.9. Even for the four firms with sales below one billion dollars, FDI was 2.8 times larger than exports. The largest firms also had the highest percent increase in FDI during 1991-93. Export growth varied sharply by size of firms. For the four relatively small firms, exports declined by 50 percent (due primarily to one firm). The 27 medium size firms' exports had the highest growth rate at 24 percent from an average of $86 million per firm to $107 million, while exports for the largest firms grew 20 percent.

Firms that produce a broad product line over several four-digit SIC industries are much more global than more specialized firms. While product diversity is related to firm size, some very large firms such as Coca-Cola have narrow product lines. Even though mean FDI is significantly lower for narrow rather than broad product line firms, narrow line firm FDI sales grew 43 percent to $725 million per firm -- the highest growth rate for any sub-group.

Firms with advertising to sales ratios above the group average had larger FDI and export sales than firms with below average advertising to sales ratios. While above average FDI sales for high advertising firms is consistent with previous literature, the ERS data shows that the high advertising sub-group also maintains above average export sales of $228 million per firm in 1993.

The international ratio is the sum of the firm's FDI and export sales divided by the firm's world-wide processed food sales. Firms with an international ratio below the group mean, not only had significantly lower FDI as expected, but also had significantly lower average exports per firm. However, these low international ratio firms had the highest export growth rate (44 percent) of all sub-groups. For below average international ratio firms, FDI was 2.8 times larger than their US exports, while for above average firms, FDI was 11.9 times larger.