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This paper, drawing on the analytical framework of international trade and industrial organization, reviews and tests some new hypotheses concerning the effect of foreign trade, protection, and foreign direct investment on domestic profitability of U.S. food processing industries. While a number of studies exist which have examined the relationship between market structure and performance in food processing [6, 9], they have implicitly assumed that the economy is closed. The extensive multinational expansion of American food-processors, documented by Horst [7], and the growing volume of U.S. food trade suggest that this assumption has become untenable and that the proper identification of industrial structure must account for these foreign factors.

The purpose of this study is two-fold. The first is to present an analytical framework that incorporates not only the role of import competition and protection, but also the impact of export opportunities and foreign direct investment in the structure-profitability relationship. The second is to provide a statistical test of the impact of these factors on one aspect of U.S. food industry performance: price-cost margins.

I. FOREIGN TRADE, FOREIGN DIRECT INVESTMENT AND INDUSTRY PROFITABILITY

Economic theory predicts that in long run competitive equilibrium, resources will be allocated efficiently when the prices of all goods equal their marginal cost and producers earn only normal rates of return. Since departures from the competitive norm lead to inefficient allocations of resources and result in some producers earning greater than normal returns, it has been one objective of industrial organization research to determine what particular market characteristics can be identified with the earning of excess economic profits. Traditionally, this type of analysis has related industry profitability to dimensions of

market structure, such as the degree of seller concentration, the growth and elasticity of demand, and the conditions of entry.

If an economy were closed, these variables would theoretically be sufficient to describe the major determinants of inter-industry differentials in profitability. In an open economy a more complete specification of the structure-profitability relationship should account for foreign factors, since industries differ with respect to international trade and investment activity. In particular, attention should be given to the impact of actual and potential import competition, the availability of export opportunities, and the extent of foreign direct investment and multi-national activity.

The role of actual import competition is straightforward: the presence of foreign suppliers increases the number of competitors in the domestic market. In effect, this reduces domestic seller concentration and should result in more competitively determined prices and lower profits for the domestic firms. Modern oligopoly theory suggests, however, that the existence of potential competition may produce similar results. That is, the threat of entry and, by extension, the threat of foreign entry may constrain domestic firms to adopt entry fore-stalling prices which more closely approximate competitive levels. In this regard, Esposito and Esposito [5] have pointed out that foreign producers may more easily overcome barriers to entry, common to both potential domestic and foreign entrants. As a result, foreign firms may pose the most "immediate" threat of entry and exert the strongest influence on the pricing decisions of the established domestic firms. To the extent, therefore, that actual or potential import competition limits the ability of established firms to maintain prices avove long run average cost, it would be expected, other things equal, that profit rates would be lower in industries facina the greatest degree of import competition.

While it has been generally recognized that import competition could improve domestic market performance, the impact of export opportunities has been almost totally overlooked. Recent work by Caves [2, 3], however, suggests that if domestic firms are unable to engage in price discrimination between the domestic and foreign markets, the existence of export markets may serve to constrain domestic industries to a more competitive pricing behavior. This result also prevails if export opportunities weaken oligopolistic interdependence in the domestic market by flattening the demand curve facing the individual sellers. The share of exports in total sales should be positively related to profitability if exporters, due to tariff protection, can engage in international price discrimination, if the industry enjoys international product differentiation, or if export sales, by increasing the sizes of plants and enterprises, lead to increased technical efficiency.

The other international factor influencing the profitability of domestic firms is the extent of their foreign investment and multinational activity. Several studies [2,3,8] suggest that foreign investment occurs mainly in industries characterized by oligopoly in both the parent and host countries. In addition, "horizontal" investment, which results in firms producing abroad the same or similar products to those produced in the domestic market, is likely to prevail in industries where product differentiation is prevalent, while "vertical" investment, undertaken in order to produce raw materials or other inputs for the production process at home, more typically arises in undifferentiated oligopoly.

The effects of direct foreign investment of a vertical nature are analogous to those of vertical integration in the domestic market. Upstream foreign investment, in order to produce a necessary input, for example, may allow domestic processing firms to achieve lower input costs via importation of semi-finished goods and/or raw materials from foreign subsidiaries. This would be especially

important in cases in which firms integrate backward into less developed countries to obtain raw materials which otherwise might not be forth-coming, because of shortages in overhead capital or entrepreneurial talent in the host country. Furthermore, vertical investment abroad, which gives established firms control over sources of non-ubiquitous raw materials, substantially raises the barriers to entry in the domestic market at the processing level. The profit rates earned by the established firms can thus be elevated without attracting new rivals. All of these factors suggest that vertical direct foreign investments would increase industry profitability in the domestic market.

It was indicated earlier that horizontal direct foreign investments typically arise in oligopolistic industries characterized by product differentiation. More specifically, it is argued that horizontal investments take place when a firm possesses a unique rent-earning asset, such as a patented invention, a differentiated product, or specialized managerial expertise in the production and distribution of a product, on which maximum profits can be earned in foreign markets only through foreign production. The establishment of foreign subsidiaries is, therefore, seen as a strategy providing for growth and the earning of further rents on these unique forms of capital without imparing the high rents currently being earned in the domestic market. Industries characterized by horizontal direct foreign investment, therefore, are those likely to be able to earn and maintain supra normal profits in the domestic market.

The above arguments reveal that profit margins are expected to be influenced by international factors in addition to the more traditional domestic structure variables. This suggests the following profit equation and the following expected signs for the foreign variables:

$$PMG^i = f (Z^i, MN^i, X^i, M^i, T^i)$$
$$ + \quad + \quad - \quad +$$

where PMG is an indicator of profitability for industry i, Z is a vector of domestic structure variables, MN is an index of the extent of multinational involvement, X and M are measures of export and import activity, and T is an index of the level of tariff protection.

II. DESCRIPTION OF VARIABLES AND DATA

This section presents empirical evidence on the nature of the structure-profitability relationship when account is made for the influence of inter-national trade and multi-national activity. The industry sample consisted of the 47 U.S. food processing industries defined by the Census at the four-digit level of aggregation for the year 1972.

The dependent variable used in the analysis to represent profitability was the price-cost margin, defined as the gross return (before taxes) expressed as a percentage of industry value added. Gross margin on value added was used in preference to the more frequently used gross margin on sales, because it is less sensitive to differences in both the degree of vertical integration and the stage in the production process of the sample industries. Utilizing Census data the margin was estimated as:

$$\text{Price-cost margin (PCM)} = \frac{\text{Value added - Payroll - Rentals}[1]}{\text{Value added}}$$

Oligopoly theory suggests that the ability of firms to collude (tacitly or overtly) in order to maintain prices above long-run average cost of production is greater in industries in which there are few sellers that dominate the market. Price-cost margins are thus expected to be positively related to some measure of the degree of seller concentration. The four-firm concentration ratio (CR) was utilized as a measure of seller concentration.

An implicit assumption regrading the published concentration ratios is that markets are national in scope. A number of industries, however, are more properly classified as regional or local in nature. In order to account for differences in the

geographic dimension of industries in our sample, a dummy variable was constructed from information presented by Siegfried and Grawe [11] to distinguish regional and local markets. The regional dummy (RD) was constructed to take the value of one, if the industry were regional or local in nature, and a value of zero otherwise.

Two market characteristics, price elasticity of demand (EL) and growth rate in output (GVA) were also included in the profit equation. Lower absolute value of demand elasticity should result in higher margins. Unfortunately, estimates of demand elasticity were not available. Nonetheless, within the food processing sector, sufficient data were available to make independent estimates of demand elasticity [10].[2] The absolute values of the coefficents obtained from the independent estimation of elasticities were then introduced into the equation and were expected to be inversely related to margins.

Growth in output was expected to influence margins in a positive direction. Growth in output is reflective of increases in product demand, decreases in cost conditions, or some combination of the two. Reductions in cost conditions should lead directly to greater margins, while increase in demand should ultimately do likewise, via increases in products prices or reductions in unit cost due to improved capacity utilization. The growth variable was measured as the percentage change in value added over the 1967-72 period. In order to account for potential barriers to entry arising from product differentiation, the advertising to sales ratio (AD/S) was included in the equation.

Three alternative proxies that were adopted measure actual and potential import competition. First, the ratio of current imports to domestic value of shipments (M/S) was included, with the expectation that the higher the import share, the greater the degree of actual and potential import competition. Second, two alternative variables, nominal tariffs (NTAR) and effective tariffs (EFTAR), were included to represent barriers to entry faced by foreign producers.

Data for these variables were obtained from results published by the Committee for Economic Development $\begin{bmatrix} 4 \end{bmatrix}$ and Wipf $\begin{bmatrix} 12 \end{bmatrix}$.

Finally, to represent exporting opportunities, the ratio of exports to domestic value of shipments (X/S) was included. To represent the extent of multinational activity, a measure developed by Bruck and Lees $\begin{bmatrix} 1 \end{bmatrix}$ was utilized. Their measure of multi-national activity (MN), based upon data for Fortune's 500 largest industrial corporations, estimates the percentage foreign component of total economic activity for the largest firms within each industry. This variable was included in the model as a general proxy for direct foreign investment, with the expectation that it would exert a positive influence upon industry profitability.

III. EMPIRICAL RESULTS

The results of the multiple regression equations relating price-cost margins to various combinations of structural variables are presented in Table I. The equations were estimated in double-logarithmic form. Equation (1) includes only domestic structural variables as independent variables, while equations (2) through (4) contain additional variables that represent various formulations of the foreign factors.

Inspection of Table I indicates that, in general, the coefficients for the traditional market structure variables all possess the hypothesized signs. Price-cost margins were positively related to concentration, and the coefficient for this variable was significant in all cases at the 1% level. The coefficient for the advertising intensity displays the expected positive sign and the elasticity coefficient has the expected negative sign with both variables being significant at the 5% level or better. Finally, the coefficients for the growth rate in demand and the regional dummy display the expected positive sign, but neither was significant in any formulation of the model.

While these results confirm the importance of traditional domestic structural variables in affecting industry profitability, the interest lies more with the results obtained for the foreign factors. The regression coefficients for the multi-national activity variable were positive as expected and were significant in all cases at the 10% level. Unfortunately, the rather crude construction of this variable does not allow the disentanglement of the precise relationships and linkages involved. For example, the variable does not distinguish between investment which is horizontal versus that which is vertical. Nonetheless, our results suggest that multi-national expansion has augmented the market power and profits of the already profitable U.S. food processing firms as was also observed by Horst [7]. Further analysis of a time series nature is warranted in this area as more detailed industry statistics become available. The results obtained for the export share variable provide some support to the Caves proposition that export opportunities can lead to higher profits. This variable was significant in all cases at the 5% level.

The coefficient for the import share variable has a negative sign but was not statistically significant. Contrary to results obtained in other studies of manufacturing industries, this suggests that import competition has had little impact in affecting profitability of U.S. food processing firms. The differing results found here probably reflect some special aspects of the U.S. food processing sector. Many industries within the sector, for instance, are highly protected via tariffs, quotas, and government inspection standards [12]. Thus in many of the industries, virtually no imports entered at all, which apparently rendered import competition ineffectual in influencing domestic profits. This conclusion is supported by the results obtained utilizing nominat tariffs and effective tariffs as proxies for barriers to foreign competitors. Both tariff variables display the expected positive sign and were significant at the 10%

level. The above results, therefore, do support the hypothesis that protection from import competition has allowed industries to maintain margins in excess of what would have been obtained if the economy were more open to foreign producers.

A final test was undertaken in order to evaluate the overall impact of the foreign factors in the structure profit relationship. The error sum of squares was computed for the restricted form of the model which only included domestic variables and for the various unrestricted forms of the model which included combinations of the foreign variables. The significance of the foreign factors was then determined by an F test for the reduction in error sum of squares between the restricted and unrestricted regression models.[3] The F statistics obtained are presented in Table I and are all significant at the 5% level. This result further reinforces the conclusion that foreign influences are important determinants fo price-cost margins in U.S. food processing industries.

IV. CONCLUSIONS

This paper has investigated the role of international trade and investment activity on domestic industry profitability in U.S. food processing. The results suggest that, even in U.S. food industries where the foreign sector constitutes a small percentage of sales, foreign factors represent a fruitful addition to conventional structure variables in explaining inter-industry differentials in price cost margins. Although the relationship appears to be complex, the greater the degree of actual or potential foreign competition, the lower the price cost margins. In this regard, it appears that tariff barriers and the exploitation of export opportunities have the most significant effects upon industry profitability. Furthermore, industries which have become more multinational exhibit significantly higher domestic price cost margins.

From the point of view of promoting effective competition, our analysis generally supports a policy of openness towards entry via international trade.

In contrast, tariffs and other government imposed impediments to trade reduce the scope for the elimination of monoploy distortions through foreign entry.

FOOTNOTES

1. Value added is obtained by subtracting the total cost of materials (including supplies, fuel, electricity, cost of resales, and miscellaneous receipts) from value of shipments. Subtracting payroll and expenditures for rentals of equipment and machinery from value added yields a figure which approximates profits before taxes plus interest.

2. The variable denoting price elasticity of demand was obtained from regression estimates of demand equations for the industries in our sample. For each industry category a consumer demand equation was estimated using annual data for the 1952-75 period. The only exceptions were the chewing gum (1957-75) and soft drink (1960-75) industries where only a smaller sample was available. The general equation estimated was:

$$Q^i = a_0 + a_1 p^i + a_2 Y$$

where:

Q^i = an index of per capita consumption of goods in industry i (1967=100)

p^i = an index of retail prices for goods in industry i deflated by the retail food price index (1967=100)

Y = an index of disposable personal income per capita deflated by the implicit GNP deflator (1967=100)

The estimated value of the price elasticity of demand was calculated as $EL^i = \hat{a}_1 \ (\bar{p}^i / \bar{Q}^i)$, where $\bar{p}^i$ and $\bar{Q}^i$ are the mean values of the two variables.

3. The F-statistic is calculated as follows:

$$F_{(m,n-k)} = \left[(ESS_r - ESS_u) / m \right] / \left[ESS_u/(n-k) \right]$$

where ESS_r and ESS_u are the sums of squared residuals in the restricted and unrestricted equations respectively, m is the number of additional parameters estimated in the unrestricted equations, n is the sample size and k is the number of estimated parameters.

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Table I: Regression Equations Relating Price-Cost Margins (Log) to Domestic and Foreign Structure Variables, 1972

(t - values in parentheses)

Equation Number	Intercept	Domestic Market Structure					Foreign Variables					R^2	F-tests
		LnCR	LnGVA	RD	LnAD/S	LnEL	LnMN	LnX/S	LnM/S	LnNTAR	LnEFTAR		F (3,38)
(I.1)	3.38^a (6.85)	$.167^a$ (3.71)	.050 (.595)	-.047 (1.04)	$.045^a$ (3.29)	$-.029^b$ (2.01)						.643	
(I.2)	3.03^a (6.27)	$.186^a$ (4.28)	.083 (1.03)	.019 (.389)	$.044^a$ (3.04)	$-.031^b$ (2.31)	$.042^c$ (1.44)	$.019^b$ (2.14)	-.006 (.845)			.712	3.04^b
(I.3)	3.03^a (6.44)	$.182^a$ (4.26)	.066 (.843)	.042 (.847)	$.044^a$ (3.08)	$-.029^b$ (2.16)	$.045^c$ (1.57)	$.018^b$ (1.96)		$.029^c$ (1.45)		.722	3.61^b
(I.4)	3.06^a (6.52)	$.174^a$ (4.02)	.063 (.804)	.024 (.505)	$.048^a$ (3.34)	$-.029^b$ (2.15)	$.047^c$ (1.63)	$.016^b$ (1.82)			$.021^c$ (1.43)	.721	3.58^b

The significance of the coefficients was tested using a one-tail t test.

a indicates that the coefficient is significant at the 1% level, while b and c indicate significance at the 5% and 10% level, respectively.

The independent variables are:

CR   = 4-firm concentration ratio
GVA = percentage growth of value added from 1967 to 1972
RD   = a regional industry dummy
AD/S = the advertising to sales ratio
EL   = price elasticity of demand

MN   = index of multinational activity
X/S = exports as a percent of value of shipments
M/S = imports as a percent of value of shipments
NTAR = nominal tariff rate
EFTAR = effective tariff rate