Determinants of Foreign Direct Investment in the Food Manufacturing Industry

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Abstract

This paper examines firm-level characteristics in the food manufacturing industry as they affect decisions to access foreign markets via foreign direct investment (FDI). We also assess variations in the *intensity* level of multinational enterprise (MNE) involvement in FDI given these characteristics. We find that capital-intensive firms with higher levels of intangible assets, profitability, and knowledge capital are more likely to become MNEs. The findings also suggest that intangible assets and knowledge capital underlie the tendency of MNEs to invest more intensively abroad. Firm size plays an important, but not a dominant, role in predicting FDI activity in the food manufacturing industry.

Introduction

An increasing globalization of markets and firms has intensified interests in investigating determinants of foreign direct investment (FDI) in recent years. First, policy liberalization has led countries to make the investment climate more favorable to inbound FDI. Second, rapid technological change, with its rising costs and risks, has motivated firms to tap world markets and to share these costs and risks. In addition, falling transport and communication costs have made it more economical to integrate distant operations. Third, as a result of the previous two, increasing competition induces firms to explore ways to increase their efficiency, by reaching out to international markets and shifting certain production activities overseas to reduce marginal costs due to economies of scale (UNCTAD, 2001).

FDI in the food manufacturing industry has been replacing the role of traditional trade where the comparative advantage rationalization is dominant. Indeed, trade in processed foods represents a large volume of international exchange of capital and technology, a strong incentive of FDI. Therefore, analyzing firm- and industry-specific factors that predict FDI behavior may enhance our understanding of these matters.

The objectives of this paper are; to identify firm-specific characteristics that differentiate multinational firms from national firms in terms of their FDI motivation, and to assess variations in the *intensity* level of multinational firm involvement in FDI given these characteristics. The analysis focuses on the determinants of FDI in the food manufacturing industry from a firm-level perspective. That is, we investigate how do factors such as ownership and the potential advantages of internalization motivate food manufacturing firms to invest abroad.

Conceptual Framework

FDI is defined by ownership of ten percent or more of a firm by a foreign entity for exercising control over the use of assets. Foreign investment refers to investment in a foreign affiliate, where a parent firm holds a substantial, but not necessarily a majority, ownership interest. The parent firms are the multinational enterprises (MNE). Foreign direct investment is distinctly different from foreign portfolio investments and other international capital flows such as bank deposits, since portfolio investors do not have control over decision-making within the foreign enterprise.

There is a large and growing literature that addresses foreign investment and MNE activities. Regarding the motivation of an MNE, there are three main currents of thought. The "imperfect markets hypothesis" asserts that there are two conditions for FDI to exist (Hymer, 1960; Kindleberger, 1969; Horstmann and Markusen, 1989). Foreign firms must possess a countervailing advantage over the local firms to make such investment viable and the market must be imperfect due to exogenous trade regulations that distort the full rents.

The "intangible assets hypothesis" posits that there are intangible attributes such as brand names, trademarks, and production technology that are associated with a firm's unique products (Caves, 1982). Firms may find it profitable to operate overseas due to imperfect markets, asymmetry of information, and public goods characteristics of their production process and the technology that is transferable within a firm over space at low costs.

Dunning (1980) synthesizes these concepts and advances the "ownership-location-internalization" paradigm as an eclectic theory of FDI. Ownership advantages are firm-specific assets that give the firm a competitive edge over its host-country rivals. Such assets are usually in intangible forms, such as information superiority, technological advantages, or better

organizational and managerial skills. Location considerations include factors such as certain import/export policies – from both home and host countries – and the potential for exploiting the native endowments of the host countries. Finally, internalization gains accrue to factors that make it more profitable to carry out transactions within a firm than to rely on external markets. In short, the FDI decision rests at the firm and industry level while the decision to export depends on outside (market-driven) factors.

Of the three conditions in the OLI framework, the location-specific endowment is external to the firm while ownership and internalization of gains are within firms. We assume that location is fixed and, when firms consider investing abroad, they take into account the existing conditions of the foreign marketplace and access global markets based on their own capacity and profit-maximizing strategies. The "ownership hypothesis" predicts that firms will invest overseas directly if they possess knowledge capital, specific technology with differentiated products, management and merchandising experience, and other intangible assets such as brand names and firm reputation. Therefore, given ownership advantages and the characteristics of foreign markets, the "internalization hypothesis" emphasizes that firms will internalize the public-good characteristics of their products and the production process to avoid market imperfections[1] and the "public authority fiat" (Dunning, 1980).

With increasing globalization of economic activities, countries become more open to FDI and firms are forced to tap into foreign resources, technology, and markets to exploit economies of agglomeration (Krugman, 1991). Particularly, firms find it increasingly necessary to capture

[1] For explanations of the various kind of market failure and the response of firms and governments to these, see Calvet (1981)

new markets to finance the escalating costs of R&D and marketing activities, both of which are considered essential for preserving or advancing firm competitiveness (Dunning, 1999).

Food Industry Characteristics as Predictors

Our conceptual approach is that several characteristics of the food industry are useful predictors of the MNE status of a firm and the corresponding intensity of FDI involvement.[2] These characteristics fall into five main categories; product differentiation, capital intensity, intangible assets, product diversity, and firm profitability.

Product Differentiation

Processed foods are "value-added" products, because raw commodities are transformed to processed products through use of labor and technology with multiple inputs in their formulation. On a global scale, sales of processed food make up about three-fourths of the total value of food sales (about $3.2 trillion). Moreover, in recent years U.S. food companies have sold about five times more through FDI than through export sales (Regmi and Gehlhar, 2005).

There are several reasons why FDI among food manufacturing firms plays a more important role in accessing foreign markets than does exporting. Due to the hierarchical structure of the food system (from farm inputs to food manufacturing to retail, wholesale, and foodservice), there is a strong incentive for firms to vertically integrate. Vertical integration allows MNEs to better control their sources of supply, potentially reducing the risks of interruptions in supply and variations in quality of the final product. Second, due to the perishable nature of foods, efficient transportation and distribution systems are necessary to maintain food quality. Through internalization, firms can monitor the production and distribution of the final product. Third, firms can utilize centralized information control systems to deliver uniform final products to

[2] Intensity of FDI involvement is defined as the percentage of foreign assets (or sales) in total firm assets (or sales).

consumers at a premium price. Finally, they can better coordinate stages in the value chain than can independent contractors (Krugman, 1998).

Unlike bulk commodities, production of processed foods is less likely to be location specific because capital, information, and technology are mobile in the world food economy. However, the proximity of production and markets is essential for the food industry because demand is highly consumer-driven. Food producers need to monitor closely the food trends that reflect the demand for their products in host markets. Therefore, they are location specific in the sense that tailoring processed foods to local food trends and tastes is essential. Coca-Cola is known for its beverage reformulation according to the taste of local consumers. Consequently, marketing strategies such as advertising and knowledge seeking such as R&D expenditure play a vital role in the behavior of food manufacturing firms.

According to the Food Institute, the R&D activities of U.S. food firms in 2003 were mostly devoted to identifying consumer trends, modifying/reforming existing products, changing packing processes, extending product lines, and creating healthy products. Thus, compared to other manufacturing industries, the focus of R&D in food manufacturing is not production technology, as usually defined in previous cross-industry studies. A higher level of R&D in the food industry does not necessarily reflect the intensity of technology employed in the production process. Rather, R&D focuses relatively more on marketing, since food consumption trends can vary greatly from one country to another. Thus, among food manufacturing firms both the MNE status of a firm and the intensity of its FDI activities are expected to be positively related to the expenditure of firms on advertising and R&D.

Capital Intensity

Capital intensity is a concentration-promoting factor because of the implied requirement of large minimum investments in the food manufacturing industry. Given imperfections in capital markets, large firms can more easily raise the funds needed to establish efficient facilities (Lall, 1980). This provides an advantage which MNEs can exercise anywhere.

Since horizontal FDI is prevalent (Reed and Marchant, 1992; Handy and Henderson, 1996) and there is a strong trend of acquisition instead of "greenfield" investment in the food manufacturing industry. Thus, theories of complementary assets (Teece, 1992; Teece et al., 1997) may apply when explaining the FDI motivations of food manufacturing firms. In addition to asset-augmenting activities and strategic networking, MNEs may take advantage of joint production and marketing plans since existing firms clearly possess advantages in terms of knowledge of local markets. Therefore, it is reasonable to expect that capital intensity is positively related to both the likelihood of being an MNE and the intensity of FDI involvement.

Brand Name and Intangible Assets

The ownership advantage hypothesis suggests that firms with a high level of intangible assets are more likely to be involved in foreign investment activities and with a higher level of intensity. Since intangible assets are highly proprietary, easily transferable and adaptable at low opportunity costs, they serve as an incentive for firms to invest abroad. These intangible values may include production technology, management know-how, marketing skills, and access to capital resources (Pugel, 1981; Pagoulatos, 1983; Grubaugh, 1987; Markusen, 1995; Denekamp 1995). Moreover, a survey by Handy and Henderson (1994) shows that there is considerable support for expecting a positive correlation between the level of intangible assets and FDI intensity for multinational food firms operating in the U.S. market.

Food products are highly substitutable. One of the more obvious aspects of this substitution is the high level of choices among brands of the same product. The battle between brand names is common in the food industry. While regional, national, and international brand names rely heavily on image and quality, local and private labels mostly rely on lower price. In 1996, Prepared Foods indicated that the volume of store brands in the U.S. grew by 6.8 percent during the second quarter compared to 1995. This private label growth rate outpaced national brand growth by a 3-to-1 margin. However, after several years of losing revenue growth to store brands, food firms appear to have gained back their share. Nestle, the world's leading food firm, has annual average growth of brand investment of 10.5 percent compared to its overall sales growth of 3.6 percent during 1997-2000. Unilever is another example of firms using brand name strategies in their marketing system. Unilever does not retail under its own name, since brand names such as Knorr, Ben & Jerry's, Lipton, Slim-Fast and its top international food brands are more familiar to consumers (CorporateWatch). Thus, we expect to see positive relationships between the level of intangible assets and the MNE status and intensity of FDI of food manufacturing firms.

Product diversity

Connor (1983) suggests that firm diversity is positively related to propensity to invest abroad. The main reason is that diversified firms can take advantage of unique combinations of industry-specific inducements to FDI due to their differentiated product portfolios. Industry-specific factors include growing demand, machinery or other inputs available from other industries, and availability of market information. Empirical studies across industries have supported this point (Lall & Siddharthan, 1976; Pugel, 1981; Grubaugh, 1987; Denekamp 1995). However, Handy and Henderson (1994) compare a panel of U.S. and non.-U.S. food MNEs and conclude that

there is no support for the hypothesis that product diversity is positively associated with being a leading world food manufacturer. Beverage firms, alcohol and non-alcohol, fat and oil, or confectionery producers have narrow product lines, yet many of them are MNEs.

The difference between the findings of previous studies and those of Handy and Henderson might be due to problems with the measure of product diversity. Although the number of brand name products is a more precise measurement of product diversity of a firm, it is often difficult to obtain that number, due to rapid changes in the product lines withdrawn or introduced to the market. Therefore, SIC codes[3] are often used to indicate diversification. Branded products often fluctuate, partly due to the merger and acquisition activity in the food industry and partly due to different reporting standards between firms and between countries. Thus, while there might not be significant differences between MNEs and national firms in terms of product diversity, this ownership characteristic is expected to affect the intensity level of FDI among multinational food firms. It is a strategy to achieve economy of scale once the initial foreign investment is established.

Firm Profitability

Profits that firms expect to earn through their international operations appear to be a motivation for foreign investment because firms can exploit their ownership advantages in areas such as technology, market power, and product diversification in foreign markets. Thus, a higher level of profits and rents is expected to increase the likelihood of being an MNE.

MNEs have a more dispersed business structure, in terms of both physical locations and business strategies. Therefore, they can utilize a more flexible configuration of their business by

[3] The SIC was changed to NAICS codes for the North American Free Trade Agreement partners: America, Canada, and Mexico in 1997 and was updated in 2002. This study uses the SIC because we collect data on food manufacturing firms in other countries also.

taking part in different *strategic groups* (Caves, 1982 and 1996). This strategy gives rise to the monopoly profits earned by MNEs. Various arguments have been advanced. The technology developed at home and used abroad may yield higher rents (Severn and Laurence, 1974). Location diversification of an MNE may allow it to undertake potentially riskier activities with higher potential returns. Market power of an MNE might allow it to intimidate rivals in host countries (Horst, 1972).[4]

Methodology

Our empirical models are applications of Logit and Tobit analysis. In order to identify firm-specific characteristics that differentiate MNEs from national firms, a Logit model is used to categorize the FDI *status* of a firm, and the Tobit model is used to examine the *intensity* of a firm's foreign assets. Dunning (1980, 1988 and 1999); Caves (1982 and 1996); and Horstmann and Markusen (1989) provide the general framework for the FDI decisions of firms. Horst (1972); Grubaugh (1987); Pugel (1981); Connor (1983); Denekamp (1995); Reed and Ning (1996); and Henderson et al. (1996) provide empirical analyses that confirm the theoretically predicted relationship between FDI and firm-specific characteristics.

The Logit Model

A cumulative logistic probability function is used to identify the relationship between the MNE status of a firm and various ownership characteristics. This method provides a generalized

[4] However, a review of previous studies indicates that there is no clear relationship between FDI intensity and the level of profitability. Business strategies used to enter foreign markets are mostly unique to each firm, such that it is difficult to identify the tendency at the industry level.

framework that is consistent with multinational models and previous empirical studies.[5] The model has the specification

$$\ln\left(\frac{p_1}{1-p_1}\right) = \beta_0 + \beta_1 INTANG + \beta_2 PROPEQPSAL + \beta_3 RDPSAL + \beta_4 SGAPSAL + \beta_5 ROA + \beta_6 REGION + \beta_7 SIC + \varepsilon_1 \quad (1)$$

where p_1 is the estimated probability that a firm will choose to become an MNE. The dependent variable, $\ln\left(\frac{p_1}{1-p_1}\right)$, is the log odds ratio (i.e., the log of the ratio of the conditional probabilities of the two outcomes). In Table 1 we list and describe the set of variables.

The Tobit Model

A Tobit model is used to predict the intensity of FDI involvement among the subset of food manufacturing MNEs. This model predicts the level of international involvement as measured by the ratio of foreign assets/total assets of a firm. The correct econometric approach would be use censored data[6] to account for all firms in the food industry where there might be self-selection bias, i.e., firms that choose not to be MNEs for reasons beyond the factors that are specified here. This method is different from the truncated sample process because we are interested in the FDI intensity of all food manufacturing firms. That is, we observed firm-specific characteristics for both MNEs and national firms, yet the values of foreign assets for national firms are either zero or not observable. The truncated sample method is more appropriate when we can observe firm characteristics only when the dependent variable is observable.

[5] Grubaugh (1987) specified that logit model is more appropriate for this type of study. We do not apply OLS as linear probability function as done in Horst (1972)

[6] See Deaton (2000) for a discussion of treatment of dataset that have zero value for the dependent variable

Table 1: Description of Variables

Variable	Abbreviation	Description
Dependent variables		
Status of a firm	MNE	Coded 0 for national firms, and 1 for multinational firms
Asset Intensity	FA/TA	Ratio of foreign assets/total assets of a firm. Real values reported for MNEs and zeros for national firms
Sales Intensity	FS/TS	Ratio of foreign sales by affiliates/total sales of a firm. Real values reported for MNEs and zeros for national firms (a)
Independent variables		
Intangible asset	INTANG	Intangible other assets, compiled by Worldscope database
	INTANGD	The difference between market value and book value of assets
Size	SIZE	Number of employees
Knowledge capital	R&DPSAL	Expenditures on research and development per dollar of sales
Product Differentiation	SGAPSAL	Total selling, general, and administration expenditure per dollar of sales
Capital intensity	PROPEPSAL	Value of property, plant, and equipment per dollar of sales
	KEXPSAL	Capital expenditure used to acquire fixed assets (other than those associated with acquisition) per dollar of sales
Profitability	ROA	Return on assets
Country of (parent) firm	REGION	Coded 1 for firms from developed countries and 0 for firms from rest of the world (b)
Product diversity	SIC	Coded 0 for firms with 1-2 SIC codes (less diverse) and 1 for firms with 3-5 SIC codes (more diverse)

(a) In some cases, foreign sales by affiliates are not separable from foreign sales via exporting in the data source. Some variables have two measurements since we use the alternatives for the purpose of robustness testing, based on the literature and previous empirical results.

(b) Developed countries are identified in two ways: the first group includes the US, Canada, EU15, and Japan, the second group includes Norway, Switzerland, Australia, New Zealand, and Israel in addition to the ones listed above. Both methods are used and the results are robust.

The Tobit model specification is

$$FA/TA = \beta_0 + \beta_1 INTANG + \beta_2 PROPEQPSAL + \beta_3 RDPSAL + \beta_4 SGAPSAL + \beta_5 ROA + \beta_6 REGION + \beta_7 SIC + \varepsilon_2 \quad (2)$$

where FA/TA is the value of foreign assets over total assets of a firm, an indicator of foreign asset intensity[7]. All variables are described in Table 1.

While the two models contain basic variables to test our hypotheses, other possible firm- and industry-specific attributes might affect FDI decisions of firms. Perhaps one of the most tested characteristics is firm size. Although firm size has been shown to be a strong predictor of FDI propensity by a number of empirical studies (Horst 1972, Connor 1983, Grugbaugh 1987, Henderson et al. 1996), it does contain a lot of information about a firm that is not easily examined in the form of separate variables. First, firm size is an endogenous factor that explains total involvement of MNEs at the country level (Lall, 1980). Second, since size provides the resources needed to absorb costs, large firms might have an advantage over small firms in terms of financing the fixed costs needed to invest abroad (Horst, 1972). Indeed, Horst finds that *only* firm size is significant in explaining FDI, while R&D, advertising, and labor costs are not. Other studies report mixed results for the firm size variable. While the majority of studies find that firm size is positively correlated with FDI, Lipsey and Weiss (1984) find that parent size (total sales) positively predicts exports, while FDI and exports do not substitute for each other. Therefore, due to the lack of clear theoretical guidance of the role of firm size in explaining FDI activities, we include size in one version of each model and report both versions for the purpose of comparison. Country fixed- and random-effect models are used to test for potential unmeasured country-specific effects when examining the influence of measured covariates on either status of a firm or FDI intensity. Finally, we apply the Heckman two-step procedure to test for selection bias that might exist in this type of self-reported data.

[7] This is the same criterion used by Grubaugh (1987) and we follow the same definition for categorizing MNE status. This is different from Horst's approach (1972).

We interpret the parameters based on predictions from the theory literature described above for FDI in the food industry. Table 2 summarizes the predicted signs for each functional form expressed in (1) and (2).

Table 2: Expected Signs of Model Coefficients in Equations (1) and (2).

Variables	Abbrev.	MNE Status	Intensity of FDI
Intangible assets	INTANG	Positive	Positive
R&D expenditure	RDPSAL	Positive	Positive
Differentiated product	SGAPSAL	Positive	Positive
Capital intensity	PROPEQPSAL	Positive	Positive
Profitability	ROA	Positive	(a)
Region	REGION	Positive	(a)
Product diversity	SIC	(b)	Positive

Notes: (a) Theoretical predictions of parameter sign are ambiguous. (b) Since beverage companies are studied together with food firms, this result is ambiguous in sign

Data

The dependent variables are measured using cross-section data[8] for both foreign assets and sales. Although foreign assets seem to be a more reliable measure of FDI in our dataset, foreign sales is used as a robustness check, since assets and sales are highly correlated and there are concerns about measurement errors in previous studies.[9] We measure the independent variables

[8] Due to the merger and acquisition phenomenon that is common in the food industry, cross-sectional data at firm level seem to have an advantage over time-series ones since the identity of a given firm is more consistent.

[9] Handy and Henderson (1994) use sales figures, since asset valuations are difficult to compare over time. However, micro-level data sometimes cannot distinguish foreign sales due to export from foreign sales due to affiliate sales. Therefore, using foreign sales might lead to biased results. The ratio of foreign sales/total sales, an indication of FDI intensity, might be upwardly biased. Lall (1980) and Handy and MacDonald (1989) show that both measures are statistically significant at the 95 percent level. We find that both measures have the same level of significance and sign.

using cross-sections on firm-level accounting data from a sample of 811 international food companies that file reports with the Global Worldscope Database (GWD) during 1999-2003. Although this dataset only includes public enterprises who file annual reports, and it is not necessarily a representative sample of worldwide food manufacturers, it does include many of the leading firms that have headquarters in those 46 countries.

Since most of firm-level information is proprietary, missing data is a common and persistent problem. In some cases, up to two thirds of the variables are missing for a company. Most of the missing data is due to lack of R&D numbers, which may be due to competitiveness among firms. However, since theory shows that R&D plays a vital role in FDI decisions of firms, we retain that variable at the cost of reduction in the total number of observations. We eliminate cases with even one missing value and cases with unreasonable values (such as zeros for the number of employees or total sales).

Moreover, after a thorough check of each firm in the sample, we find that there is some inconsistency in the data reported. For example, the use of N/A and the entry of zeros are not clear. In some cases, although a firm would be classified as an MNE from its business description, its foreign business variables show "N/A." Those cases are deleted for two reasons. First, we cannot say for sure if these firms intentionally withdraw foreign business data or if there are some unobservable structural changes during this period. Second, even if we could use the business description as a signal for their MNE status, there is no data to study the FDI *intensity* and using those observations would present an unbalanced sample between the two models.

Empirical Results

In this section, we discuss the results from estimating the two equations, compare them with other studies, and draw implications for firm-specific characteristics and FDI behavior among international food manufacturing firms.

MNE Status

First, we examine the status of a firm – being a national firm or an MNE – given the hypothesized business characteristics that underline the propensity to invest abroad. In other words, we ask how firm-specific characteristics that represent *ownership* and *internalization* advantages distinguish an MNE from a national firm. Equation (1) is estimated using a Logit model.[10] Since the Hausman test rejects fixed effects and shows support for random effects, we report both pooled- and random-effects Logit models in Table 3.

The statistical findings provide support to the predictions summarized in Table 2 above. Both versions of the Logit model, when firm size is excluded, show strong effects of intangible assets, R&D, capital intensity, and profitability in predicting the probability that a food firm will be an MNE. In the pooled-Logit model, if the (natural) log of intangible asset of a firm is increased by one unit (e.g., if the value of its intangible asset is increased by 2.72 times), the odds of it being an MNE is estimated to be 1.61 times, or 61 percent higher than before. Likewise, as capital intensity is increased by one unit, the odds that the firm is an MNE increase by 2.21 times. Similarly, the odds of a firm being an MNE increases by 47 percent for R&D expenditures and 10 percent for firm profitability, as each factor is increased by one unit, *ceteris paribus*.

[10] We choose Logit (over Probit) estimation because in testing for fixed and random effects the Logit model has an important advantage over the Probit model. We can obtain a consistent estimator of coefficients without any assumptions about how unobserved country-specific effects are related to the independent variables (see Wooldridge, 2002).

Table 3: Results of the Pooled Logit and Random Effect Logit Models

Variable	Pooled Logit		Random Effect Logit	
	Without Size	With Size	Without Size	With Size
SIZE		1.15 (0.06)***		1.10 (0.05)**
INTANG	1.61 (0.15)***	1.35 (0.13)***	1.83 (0.27)***	1.50 (0.22)***
PROPEQPSAL	2.21 (1.06)*	1.35 (0.68)	0.94 (0.86)	0.59 (0.53)
RDPSAL	1.47 (0.25)***	1.44 (0.26)***	1.74 (0.41)***	1.76 (0.41)***
SGAPSAL	0.85 (1.27)	1.11 (1.69)	0.59 (1.23)	0.67 (1.44)
ROA	1.10 (0.06)*	1.06 (0.59)	1.14 (0.08)**	1.10 (0.07)
REGION	1.42 (1.13)	1.94 (1.37)	n/a	2.75 (3.39)
SIC	0.83 (0.36)	0.55 (0.28)	1.68 (1.07)	1.26 (0.80)
Wald χ^2	37.67	42.48	24.78	25.67
Log-likelihood	-73.04	-66.46	-60.83	-58.48
Sample size	194	194	194	194

Notes: Robust standard errors are in parentheses. *** Significant at the 99% level, ** Significant at the 95% level, * Significant at the 90% level. Variable INTANG is in log scale. Since Heckman procedure shows that we do not have problem with selection bias, we do not report it here. The coefficients are reported as odds ratio.

Both versions of the pooled-Logit model show the strong effects of intangible assets, R&D expenditures, and firm size on MNE status, while capital intensity and profitability variables become insignificant as firm size is included in the specification. The significance of firm size when included in predicting MNE status of a firm demonstrates that it may inhibit other characteristics of a firm when explaining the MNE propensity of a firm. Since the coefficients and significance of intangible assets and R&D expenditures are relatively stable in all scenarios (with and without firm size, and in both versions of the Logit model), these results confirm that they have significant power when predicting the FDI decision among food manufacturing firms. These results are in line with those of Caves (1974), Grubaugh (1987), Pugel (1981), Yu (1990).

However, they contrast with those reported by Reed and Ning (1996) where R&D, productivity (measured by sales per employee) and size are insignificant in explaining MNE status of a firm.

Both versions of this Logit model imply no significant difference between MNEs and national firms in their efforts to differentiate their products and the breadth of their product lines. These results contrast with Reed and Ning (1996) and Henderson et al. (1996). One possible explanation is that Reed and Ning sampled only 34 U.S. food firms which might have systematically different strategies from food manufacturing firms in other countries. Another reason might be due to the imprecise measure of product diversity by using the number of SIC codes, as explained by Handy and Henderson (1994). Moreover, beverage firms (which often carry narrow product lines) and food firms are all included in our dataset. Thus, the result might not fully reflect the meaning of diversity of food firms.[11] Henderson et al. do not control for other key FDI motivation factors such as intangible assets, R&D, and capital intensity. These factors have been shown in the literature to strongly affect the FDI decisions of firms.

FDI Intensity

To extend our understanding of the effect of firm-specific characteristics on FDI activity we estimate a Tobit model. [12] Due to self-selection bias, a firm might choose not to make foreign investments for reasons other than those represented by the factors in our specification. Thus, the Tobit model results provide a more detailed specification of FDI intensity . The Hausman test

[11] A dummy variable that differentiates food from beverage companies was tested. However, because there are also other multinational food firms that have narrow core product lines such as spices, grain milling, and/or canned foods, this method might yield biased results. Therefore, a generic coding is applied, as described in the specification and data section.

[12] The Tobit model response variable is left-censored for all national firms that have zero foreign asset and MNEs that have positive value of foreign assets up to 100 percent of their total assets. The Tobit model used in this study has a type I extreme distribution, which applies the maximum likelihood function. We did not test for other types of Tobit models (e.g., type II ML or Double hurdle). The normalization assumption passes the specification test.

indicates that the random effect in this model does not yield stable results. Therefore, we report only the regular pooled-Tobit model results. Firm size is also included in one version for the purpose of comparison.

Table 4: Results of the Pooled Tobit Model

Variables	Intensity of FDI	
	Without Size	With Size
Intercept	-213.49 (33.44)***	-190.83 (33.64)***
SIZE		0.42 (0.24)*
INTANG (in logs)	9.92 (1.76)***	8.67 (1.79)***
PROPEQPSAL	20.34 (8.84)**	17.24 (8.78)**
RDPSAL	6.04 (3.28) *	6.26 (3.21)**
SGAPSAL	6.96 (32.25)	1.79 (31.85)
ROA	0.96 (0.78)	0.86 (0.77)
REGION	16.80 (11.0)	18.30 (10.80)*
SIC	-0.25 (8.89)	-1.88 (8.74)
Pseudo-R^2	.11	.11
Sample size	194	194

Notes: Robust standard errors are in parentheses.

*** Significant at the 99% level,

** Significant at the 95% level.

* Significant at the 90% level.

The model results generally support our earlier hypotheses, except for the product diversity variable (which is expected to carry a positive sign). However, the estimated coefficient on product diversity is highly insignificant. The results are stable whether firm size is included or not. This means that the hypothesized firm characteristics have independent explanatory power of FDI intensity beyond that of firm size alone. In particular, if the (natural) log of intangible

asset of a firm is increased by one unit (e.g., if the value of its intangible asset is increased by 2.72 times), it is expected to induce a 9.92 percent increase in foreign assets of an MNE. Likewise, a unit increase in capital intensity is expected to result in more than a 20 percent increase in FDI intensity. Similarly, a unit increase R&D per dollar of sales increases FDI intensity by just over 6 percent.

Profitability, product diversity, and product differentiation do not seem to have direct effects on FDI intensity. Developed countries (as defined in Table 1) seem to have a more intense level of foreign investment, but that factor is only significant in the model that includes firm size. These findings are generally in line with earlier studies, but some differences are worth noting. Reed and Ning (1996) find that capital intensity, product diversity, and export competitiveness are significant factors that explain FDI intensity. Henderson et al. (1996) find firm size, degree of specialization, and product diversity are significant factors that explain the level of FDI (as measured by shipments from the foreign affiliates of the food-manufacturing firms. These differences may be due to variations in the sample data used (U.S. food firms versus international food firms). However, it may also due to differences in model specification (e.g., OLS versus Tobit) and the set of controlled variables.

Nevertheless, the findings in this study are robust with alternative measures. For example, we also utilized alternative measures of intangible asset and capital intensity (see Table 1). The results generally hold, although with less significance in some cases. All models were also estimated using the ratio of foreign sales instead of foreign assets, and the results are robust. However, since we do not observe the exact source of foreign sales, we report only foreign assets as the indication of FDI among food manufacturing firms in all models.

Conclusions

Our empirical results support the view that several factors that affect firm-level decisions relating to MNE status and FDI intensity. Intangible assets and knowledge capital are strong predictors of MNE status among food manufacturing firms. Capital intensity and firm profitability have a positive effect on multinational firm status when firm size is not included in the set of explanatory variables. In contrast, product differentiation and diversification seem to have little effect on MNE status. Specifically, food manufacturing firms that have a high level of intangible assets, invest extensively in knowledge capital, experience higher levels of profit, and have a more capital-intensive range of products.

Intangible assets, capital intensity, and knowledge capital are positively associated with the intensity of FDI activity. Product differentiation and firm profitability have little effect on FDI intensity. Since this study uses cross-sectional data, we are unable to identify when firms become MNEs. The switch in MNE status is expected to have an important effect on their cost structures, because MNEs typically experience large amount of fixed costs when they first access foreign markets either by greenfield investments or by merger and acquisition. Thus, there is a lag effect on firm profits, which is likely to be more identifiable in a panel data study. There is a high concentration of MNEs in developed regions such as North America, Western Europe, and Japan. That is, food firms with headquarters in those regions are more likely to be involved in FDI compared to firms originating in other regions. This regional effect holds also in terms of differences in FDI intensity.

The results suggest that the determinants of FDI are complex and might vary due to different methods of quantifying firm-specific characteristics. Nevertheless, the results in this study are consistent with Dunning's framework. Ownership advantages, and the firm-level tendency to

internalize them, are factors that explain FDI involvement. This paper does not examine Dunning's location advantage hypothesis.

As previous studies have shown, the complexity of FDI issues may not be fully analyzed when using firm-level data, due to the lack of specific information. When financial data is used to proxy for certain characteristics of firms, different methods employed might yield different results. Moreover, a cross-section analysis such as this relies on the assumption that firms have adjusted to their equilibrium positions. Yet, due to the merger and acquisition of firms or rapid changes in food consumption trends, these equilibrium assumptions may not be satisfied.

We conclude that continued research on FDI involvement of food manufacturing firms will create an increasing demand for a common reporting protocol on financial and operating data by firms across countries. Problems with missing data, mismatched data format, and selection bias in the reported information present significant problems in econometric analysis. Future empirical research might simultaneously study the effects of market structures on food products, in addition to the effects of firm-based factors. Conditioning on "market-factors" may enhance our understanding of the determinants of FDI in the food manufacturing industry. These factors are commonly incorporated into gravity models, where host- and home-market characteristics are included as explanatory variables. For example, a gravity model might include a variety of policy distortions such as openness to trade, patent rights, and foreign tax rates. Multiple equations models, using the same set of firm-specific characteristics to simultaneously study firm size and level of FDI intensity, might provide other insights into the foreign direct investment behavior of food manufacturing firms.

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