

Multinationality and Firm Performance: The Moderating Role of R&D and Marketing Capabilities

Masaaki Kotabe*
TEMPLE UNIVERSITY

Srini S. Srinivasan**
DREXEL UNIVERSITY

Preet S. Aulakh***
TEMPLE UNIVERSITY

Researchers in international business have long been interested in understanding the relationship between the multinationality of a firm and its market performance. This article contributes to this research stream by incorporating firm heterogeneity in examining the multinationality-performance relationship.

The findings, based on a time series cross-sectional analysis of firms from 12 different industries over a seven-year period, indicate that the impact of multinationality on both financial and operational performance is moderated by firm's R&D and marketing capabilities.

Does multinationality ensure firm performance? This question has been of interest to international business scholars for a long time. The relationship

between multinationality and performance in the contemporary environment of global integration has of late generated a flurry of empirical studies (Tallman

*Masaaki Kotabe holds the Washburn Chair of International Business and Marketing and is the director of research at the Institute of Global Management Studies at the Fox School of Business and Management, Temple University. His research interest includes international marketing, global sourcing strategies, international alliances, and issues related to product and process innovations. His most recent books include *Global Marketing Management*, 2nd ed. (2001) and *Market Revolution in Latin America: Beyond Mexico* (2001).

**Srini Srinivasan is an Associate Professor at Drexel University, Philadelphia. His research interests include international business, marketing strategy and marketing research.

***Preet S. Aulakh is Associate Professor of Strategy and International Business and the Washburn Research Fellow at the Fox School of Business and Management, Temple University. His research focuses on international technology licensing, cross-border alliance, interorganizational governance, and firm strategies in emerging economies.

Partial funding for this research was provided by LeBow College of Business Administration, Drexel University, Philadelphia.

and Li, 1996; Hitt, Hoskisson and Kim, 1997; Mishra and Gobeli, 1998; Gomez and Ramaswamy, 1999; Geringer, Tallman and Olsen, 2000). That is, increasing market liberalization around the globe, especially in erstwhile-protected economies, has made it easier and sometimes necessary for firms to expand into foreign markets (Aulakh, Kotabe and Teegen, 2000). This liberalization has coincided with economic integration, success of international organizations such as GATT/WTO and UNCTAD, and advances in information and communication technologies. These environmental trends and the popular buzzwords, such as “globalization of markets,” “global economy,” and “think global, act local,” found in both academic literature and popular press, point toward the growing necessity for firms to find international markets for their products and services as well as configure their value chain activities around the globe in order to achieve scale, learning and location economies—in essence, to increase their multinationality.

Multinationality generally refers to the extent to which firms operate beyond their national borders and benefit from product and geographical diversifications through economies of scale and scope (e.g., Hitt, Hoskisson, and Kim, 1997). For firms that are becoming increasingly multinational by taking advantages of liberal trade regimes, some of the relevant normative issues that continue to be asked are: Does the increase in multinationality enhance performance? Do firms need to have some threshold of R&D or marketing intensity to benefit sufficiently from multinationality? How should they make the tradeoff in resource allocations between geographical expansion into several overseas markets on one hand and develop-

ment of R&D and marketing on the other hand? The existing literature offers conflicting empirical findings on the performance implications of multinationality. We develop an argument that coherently piece together seemingly conflicting findings, empirically test and explain the reasons for those findings, and provide managerial implications.

PERFORMANCE IMPLICATIONS OF MULTINATIONALITY

The literature on multinationality generally points to the thesis that multinational expansion allows firms to transfer “rent yielding” resources into foreign markets to achieve both economies of scale and scope (Tallman and Li, 1996), exploit market imperfections across countries (Dunning, 1988), expand market opportunities (Buhner, 1987), and maximize location economies by configuring value-chain activities (Kogut, 1985), among others. However, expansion into diverse foreign markets increases the costs (transaction, managerial, coordination) of managing far-flung operations, especially for those firms that are located in different cultural environments (Gomez and Ramaswamy, 1999). Thus, performance advantages of multinationality will reach their limit when “internal governance costs exceed the benefits provided by the economies achieved and thus, the range of resources used and scope of governance exceeds managerial capabilities” (Hitt, Hoskisson, and Kim, 1997, p. 773).¹

Existing studies examining the performance implications of multinationality have used different theoretical arguments as well as diverse data sources, resulting in mixed and sometimes contradictory results (see Ramaswamy (1995) for an extensive review of this literature). The findings range from a

positive and linear/curvilinear relationship between multinationality and performance (Daniels and Bracker, 1989; Geringer, Beamish and DaCosta, 1989; Tallman and Li, 1996) to negative impact (Al-Obaidan and Scully, 1995), along with some studies finding no impact of multinationality on firm performance (Buhner, 1987). More recent studies have examined a curvilinear relationship between multinationality and performance with the underlying argument that multinationality improves firm performance up to a certain point, beyond which the costs of multinationality outweigh the potential benefits, thus lowering performance (Hitt, Hoskisson, and Kim, 1997; Katrishen and Scordis, 1998; Mishra and Gobeli, 1998; Gomez and Ramaswamy, 1999).

While the above-mentioned empirical studies have provided new insights into the performance impact of multinationality, most of the existing studies do not incorporate *heterogeneity* among firms' ability to manage their respective multinationality. That is, these studies examined multinationality–performance linkages without incorporating the individual firm resources and capabilities that are required to effectively maximize the advantages of international expansion.² The issue at hand is whether some firms are more capable of increasing their performance through multinationality than others. For instance, Hitt, Hoskisson, and Kim (1997) suggest that product-diversified firms are better able to achieve synergies across product markets and thus more effectively achieve profitability goals of international diversification. Accordingly, they found that the international diversification–performance relationship is positive and linear for high product-diversified firms, while single business firms reached an optimal point

after which international diversification had a negative impact on performance. Similarly, Kim, Hwang and Burgers (1989) found that geographical diversification has a positive impact on performance for firms following certain types of global strategies. Daniels and Bracker (1989) found a positive association between dependence on foreign operations and profits. Though they posited that marketing intensity could affect this relationship, they could not test their hypothesis due to the lack of variance in marketing intensity in their data.

These findings point to the fact that the multinationality–performance relationship is much more complex than is commonly presumed, since individual firm strategies moderate the strength and direction of this relationship. Also, many of the past studies investigating firm performance have been based upon the cross sectional data at one point in time period. However as noted by Geringer, Tallman and Olsen (2000), such relationships are likely to change over time, and hence one needs to use both a time series and cross sectional data to analyze the impact of multinationality on firm performance.

The purpose of this study is to build upon existing research and to examine the role of firm-specific capabilities on the performance impact of multinationality. By drawing from the resource-based view of the firm, we suggest that internal capabilities allow firms to achieve differential advantages of multinationality. In particular, we examine the moderating role of R&D and marketing capabilities on the multinationality–performance relationship. The main argument put forth in this article is that firms having marketing and/or R&D capabilities are better able to realize the inherent benefits of multinationality. In

the following sections, we first discuss the role of R&D and marketing capabilities in enhancing performance benefits of multinationality. Next we describe our empirical analysis and interpret our model results. Finally, we discuss the implications and limitations of the current study.

THEORETICAL BASES

According to the resource-based view, firms are bundles of resources and capabilities (Barney, 1991; Peteraf, 1993). When these resources are unique (i.e., there is heterogeneity among firms), valuable, rare, and inimitable, the deployment of these resources allows firms to achieve sustainable competitive advantage. Hitt, Hoskisson, and Kim (1997) and Tallman and Li (1996) use the implications of the resource-based view to understand the benefits of international expansion. In particular, these studies suggest that besides the ownership, location, and internalization advantages of international expansion (e.g., Buckley and Casson, 1976; Dunning, 1988), other motivations for geographical diversification stem from the resource-based view. That is, firms with unique internal capabilities will apply these in international markets to increase profitability by achieving economies of scale, rationalizing production, amortizing investments over broad market bases, and achieving greater organizational learning (Bartlett and Ghoshal, 1989; Hitt, Hoskisson, and Kim, 1997). Thus, the underlying theoretical underpinning is that firms with unique resources can leverage these resources across national markets.

While unique resources as motivators of international expansion have been examined, existing research has paid relatively scant attention to the ability of internal capabilities and resources to fa-

cilitate in the implementation of firm strategies. However, as suggested by Peteraf (1993, p. 189), "firms are seen as adopting strategies that their resources can support. . . . For an individual firm, whether it is a single-line business or widely diversified, the critical task is to use its available resources to the greatest end they can support." The argument made in this study is that certain internal resources and capabilities are needed to successfully implement various strategies, including that of geographical diversification. This view is alluded to by Hitt, Hoskisson, and Kim (1997) who point out that the performance enhancing properties of geographical diversification (i.e., the point where the benefits exceed the associated costs) will vary according to the managerial skills contained within the firm. In essence, firms will achieve differential benefits of international expansion based on their capability to maximize the gains of multinationality while minimizing the relevant costs of expansion. We posit that R&D and marketing capabilities of internationalizing firms are two factors that will allow firms to achieve greater benefits of multinationality.

Marketing capability of a firm is reflected in its ability to differentiate products and services from competitors and build successful brands. Thus, a firm that spends money on advertising and promoting its products can increase sales both by expanding the sales of the product category and by getting customers to switch to their brands. Firms with strong brand names can charge premium prices in foreign markets to enhance their profitability as well. Given the globalization of markets and the presence of intermarket segments across countries for many products, firms that emphasize differentiation by heavy advertising and

marketing activities are more likely to succeed in a multitude of diverse markets than those that do not (Helsen, Jedidi and DeSarbo, 1993). Thus, these firms can not only enhance the revenues in foreign markets because of a better fit and targeting to the customer needs of their products and services, but can also achieve greater efficiency by developing standardized marketing programs across foreign markets and having better bargaining power with both distributors and consumers (Levitt, 1983; Takeuchi and Porter, 1986). In essence, we propose that firms with higher marketing intensity will achieve greater gains from multinationality than firms with a lower level of marketing intensity since such firms could simultaneously increase revenues in foreign markets and have lower coordination costs than those with a lower level of marketing intensity.

A similar logic applies to firms with strong research and development orientation. Several previous studies (e.g., Hufbauer, 1970; Mansfield, 1981; Kotabe, 1990b) have found positive relationship between R&D intensity and firm performance. Companies can improve their performance by focusing on product design/development and by improving their manufacturing processes (Kotabe, 1990a). A firm with superior product design gains advantage by differentiating its products from competitors, and can achieve greater returns. Similarly, a firm innovating on manufacturing processes can lower its production costs and improve product quality relative to competitors. Thus, innovativeness, as reflected in R&D intensity, allows firm to achieve efficiency in its operations (Hitt, Hoskisson and Ireland, 1994). This becomes important when it expands into international markets since it can either charge premium prices for its innovative prod-

ucts or further lower production costs by applying its manufacturing processes and achieving economies of scale (Porter, 1986). Thus, the more innovative firms are, the better they will be at leveraging the multinationality advantages.

Based on the above discussion, we propose that marketing and innovation capabilities of firms accentuate the impact of multinationality on firm performance. Since marketing and innovative capabilities collectively allow firms to enhance their performance through premium pricing and superior products, we test the individual as well as joint moderating effects of R&D and marketing capabilities on the multinationality-performance relationship. Accordingly, we propose an overriding hypothesis:

Hypothesis: The impact of multinationality on firm performance will be stronger for firms with higher R&D intensity and/or marketing intensity than those with lower R&D intensity and/or marketing intensity.

DATA

To test the hypothesis, we need firm-level data on firms' performance, their R&D intensity, and marketing intensity. In testing the hypothesis across different industries and over time, we used both time series and cross-sectional data. Using time series cross-sectional data allows for generalizability of results over time. In contrast, pure cross-sectional studies provide a "snapshot" picture specific to a given time period and inferences drawn from such data could potentially be biased by idiosyncrasies associated with that specific time period. As firm performances could vary across industries, and also over time, time series cross-sectional studies can capture both of these variations simultaneously (Dielman, 1983).

The data used for this research were obtained from the COMPUSTAT database, which contains firm level data on different industries (at the 4-digit SIC classification level). We chose SICs based upon the following two criteria: 1) data should be available for at least three companies in each SIC, and 2) for each company, data should be available for at least 7 years. Our study used data on 49 US companies in 12 different industries (over a 7-year time period ending in 1993) for which COMPUSTAT had complete data on all the variables of interest. The details of the industries and the number of time series and cross-sectional observations used are provided in Table 1.

The variables used in the analysis were operationalized as follows. Performance was measured in both financial and operational terms in a manner similar to that of Gomes and Ramaswamy (1999). Financial performance was measured in terms of return on assets (ROA). Operational outcomes were assessed

as a ratio of sales to operating costs (OPSALINV). Many researchers have indicated that variance in firm performance is partly explained by firm size (DeCarolis and Deeds, 1999). Hence, in the analysis of the data, we need to control for firm size, or else the parameters estimated might be biased. To avoid the confounding effect of firm size on firm performance, we used firm size (SIZE), measured as a logarithmic function of sales, as a covariate.

Multinationality (MULTI) has been operationalized in a number of ways by different researchers. Some researchers have used sales/profit based measures, such as, ratio of foreign sales to total sales (Grant, 1987; Tallman and Li, 1996), foreign income to total income, ratio of foreign sales to total assets (Daniels and Bracker, 1989; Ramaswamy, 1995), number of foreign countries in which a firm has subsidiaries (Tallman and Li, 1996). Sullivan (1994) examined the different ways to measure multinationality their associated problems.

TABLE 1
DETAILS OF INDUSTRIES INCLUDED IN THE ANALYSIS

SIC	Description of the Industry	Number of Companies	Number of Years	R&D Intensity (%)	Marketing Intensity (%)
2621	Paper Mills	5	7	1.2	0.4
2670	Packaging Paper, Plastic Film	4	7	3.1	1.8
2800	Chemicals and Allied Products	5	7	5.9	3.7
2851	Paints, Varnishes, Lacquers, Enamels and Allied products	3	7	2.4	3.1
3270	Concrete, Gypsum, Plaster	3	7	0.7	0.0
3570	Computer and Office Equipment	5	7	9.5	1.3
3571	Electronic Computers	3	7	10.5	1.3
3640	Electric Lighting, Wiring	3	7	4.5	0.5
3674	Semiconductor, Related Devices	9	7	9.1	0.7
3822	Automatic Regulating Controls	3	7	2.4	0.0
3944	Games, Toys	3	7	3.5	16.8
3950	Pens, Pencils, Artistic Materials	3	7	0.7	6.6

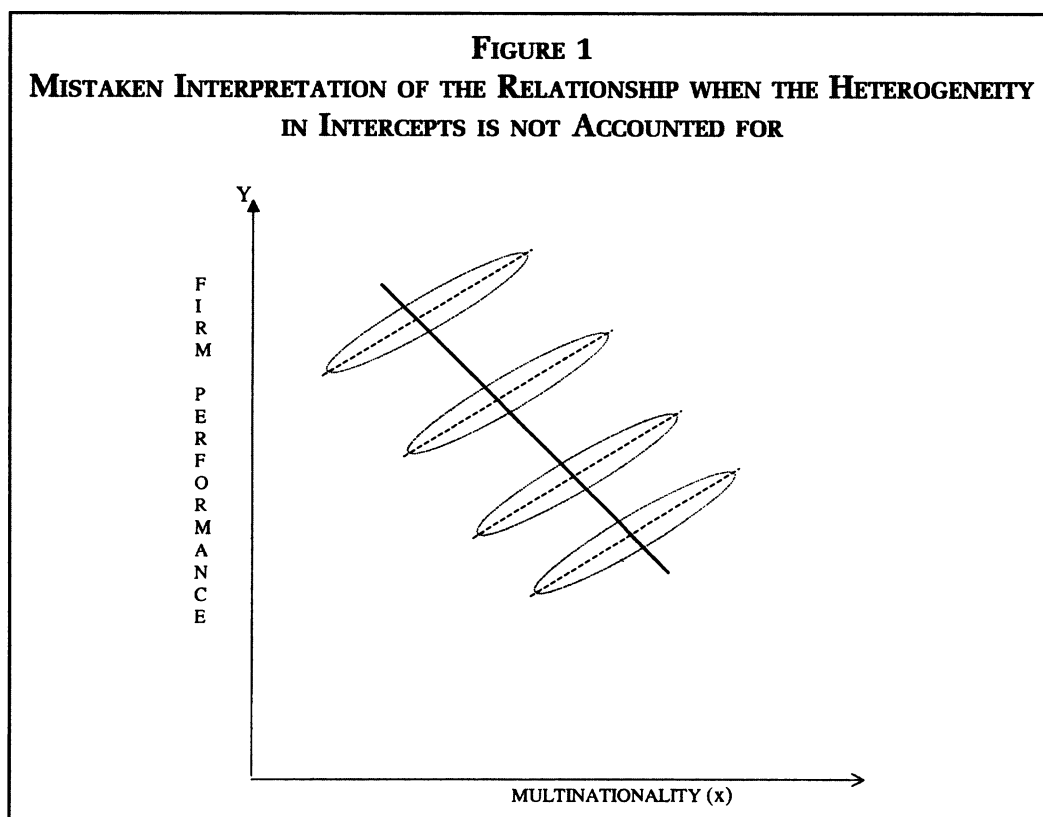
Based on his suggestion, and the availability of appropriate data, we measured multinationality as a ratio of foreign income to total income. Consistent with earlier studies (e.g., Hufbauer, 1970; Mansfield, 1981; Kotabe, 1990b), R&D intensity and marketing intensity are defined as the annual expenditure on R&D divided by sales and the advertising expenditure divided by sales, respectively.

METHODOLOGY

To extend the generalizability of the findings of this research to a number of industries, we use data from different industries. Cross-sectional studies not taking into account variations across industries might lead us to wrong conclusions. For the sake of simplicity, let us consider the relationship between two

variables X and Y across four industries as shown in Figure 1.

In the above figure, the broken-line ellipses represent the point scatter for individual industries over time, and the broken straight lines represent the individual regressions for the different industries. The solid line represents the least-square regression using the data points for all the industries. As is illustrated by the solid line, even if the two variables are positively related, aggregating the data (without accounting for differences in the intercepts across industries) and estimating an aggregate model might lead us to wrongly conclude that the two variables are negatively related.³ Therefore, when we pool data from different industries, we need to control for the industry to avoid biased inferences



about the impact of multinationality on firm performance.

Examining the cross relationship between multinationality and firm performance over a single period of time does not allow us to generalize about the findings over time. Therefore, we used a Time Series Cross-Sectional (TSCS) data analysis to test our hypothesis. The TSCS analysis not only takes into account variation across industries and over time, but also permits us to increase the degrees of freedom. It also increases the degrees of freedom available for estimation (analyzing m firms over t periods gives mt observations as opposed to m observations in the case of a cross-sectional study) (Dielman, 1983).

To test the hypothesis that the impact of multinationality is moderated by both the marketing intensity and the R&D intensity, we estimated the following equation:

$$Y_{it} = \beta_0 + \sum_{i=1}^{11} \beta_i D_i + \beta_{12} X_{2it} + \beta_{13} X_{3it} + \beta_{14} X_{4it} + \beta_{15} X_{5it} + \beta_{16} X_{6it} + \beta_{17} X_{7it} + \beta_{18} X_{8it} + \beta_{19} X_{9it} + u_{it} \quad (1)$$

Where:

- Y_{it} = performance of firm i in time period t (ROA or OPSALINV)
- D_i = dummy variable for i th SIC (11 dummies for 12 industries)
- X_{2it} = size of firm i in time period t (SIZE)
- X_{3it} = multinationality of firm i in time period t (MULTI)
- X_{4it} = R&D intensity of firm i in time period t (RDINT)
- X_{5it} = marketing intensity of firm i in time period t (ADINT)
- X_{6it} = ($X_{4it} * X_{5it}$) of firm i in time period t (RDAD)

X_{7it} = ($X_{3it} * X_{4it}$) of firm i in time period t (MULTIRD)

X_{8it} = ($X_{3it} * X_{5it}$) of firm i in time period t (MULTIAD)

X_{9it} = ($X_{3it} * X_{4it} * X_{5it}$) of firm i in time period t (MULADRD)

β_1 through β_{19} = parameters to be estimated

μ_{it} = random error of firm i in time period t .

Ordinary least square regression assumes that u_{it} are independently and identically distributed with a constant variance. As we have data on a number of firms i ($i = 1, 2, \dots, n$), over a number of years t ($t = 1, 2, \dots, T$), the assumption of constant variance of the error term is untenable. The error term u_{it} can be decomposed as

$$u_{it} = v_i + e_t + \epsilon_{it} \quad (2)$$

where the errors v_i , e_t and ϵ_{it} are independently distributed. The details of this popular TSCS model and estimation procedures are given in Fuller and Battese (1974).

ANALYSIS AND RESULTS

We estimated equation 1 using the Fuller and Battese method (implemented by the TSCS procedure in SAS) and the results are given in Table 2.⁴

To ensure that the interaction effects indeed significantly add to the model fit, we ran the following two regression models: 1) Model with the main effects only, given by equation (3), and 2) Model with the main effect and two way interaction effects, given by equation (4).⁵

$$Y_{it} = \beta_0 + \sum_{i=1}^{11} \beta_i D_i + \beta_{12} X_{2it} + \beta_{13} X_{3it} + \beta_{14} X_{4it} + \beta_{15} X_{5it} + u_{it} \quad (3)$$

TABLE 2
TIME SERIES—CROSS SECTIONAL (TSCS) REGRESSION ANALYSIS
OF FIRM PERFORMANCE*

Variables	ROA		OPSALINV	
	Parameter	Prob > T	Parameter	Prob > T
Intercept	-0.1949	0.0014	1.2971	0.0001
SIZE (X ₂)	0.0332	0.0001	0.0114	0.6183
MULTI (X ₃)	-0.0097	0.6619	-0.0726	0.0284
RDINT (X ₄)	-0.3191	0.2396	1.4775	0.0514
ADINT (X ₅)	0.2196	0.7322	-0.1150	0.9365
RDAD (X ₆)	-6.3330	0.4904	6.9012	0.7448
MULTIRD (X ₇)	0.1013	0.6609	0.7601	0.0273
MULTIAD (X ₈)	-3.0723	0.0405	-1.6805	0.4757
MULADRD (X ₉)	100.0757	0.0030	132.3350	0.0131
R ²		22.5%		21.3%

*Industry dummy variables are included in the models, but regression coefficients are not shown in this table.

$$\begin{aligned}
 Y_{it} = & \beta_0 + \sum_{i=1}^{11} \beta_i D_i + \beta_{12} X_{2it} + \beta_{13} X_{3it} \\
 & + \beta_{14} X_{4it} + \beta_{15} X_{5it} + \beta_{16} X_{6it} + \beta_{17} X_{7it} \\
 & + \beta_{18} X_{8it} + u_{it} \tag{4}
 \end{aligned}$$

Equation 3 is nested within equation 4, and equation 4 is nested within equation 1. As suggested by Jaccard, Turrisi and Wan (1990), to test if the two-way interaction term indeed adds more power than the main effects model only we did the incremental fit test given by:

$$F = \frac{(R_2^2 - R_1^2)/(k_2 - k_1)}{(1 - R_2^2)/(N - k_2 - 1)} \tag{5}$$

Where:

R₂² = Fit statistics for the model with the two-way interaction with k₂ predictors

R₁² = Fit statistics for the model with the main effects model with k₁ predictors

Then we compared the incremental fit statistics of the equation 1 with the model without the three-way interaction. Our results indicated that the three-way interaction effect indeed significantly (p<.05) adds to the predictive power of the model.⁶ The incremental fit statistics are provided in Table 3.

First of all, firm size is found to have a positive impact on ROA (return on assets) (p<.0001) but no significant impact on OPSALINV (sales to operating costs). This finding is consistent with earlier findings (DeCarolis and Deeds, 1999). Our research objective is to investigate how multinationality, R&D intensity and marketing intensity jointly affect two of the popular measures of firm performance-ROA (return on assets) and OPSALINV (sales to operating costs). As

TABLE 3
PREDICTIVE POWER OF THE THREE-WAY INTERACTION MODEL OVER THE
MAIN EFFECTS AND TWO-WAY INTERACTION MODELS

Model	ROA* R ²	OPSALINV** R ²
Main Effects only (model 1)	.1835	.1689
Main Effect + 2 Way Interaction (model 2)	.1909	.1915
Main Effect + 2 Way Interaction + 3 Way Interaction (model 3)	.2249	.2133

*Model 2 does not provide significantly incremental fit over Model 1 ($F_{3,323} = 0.99$; Model 3 provides significantly higher fit over Model 1 ($F_{4,322} = 2.37$ ($p < .05$))

**Model 2 provides significantly higher fit over Model 1 ($F_{3,323} = 3.009$ ($p < .05$)). Model 3 provides significantly higher fit over Model 2 ($F_{1,322} = 8.92$ ($p < .05$))

equation 1 contains the interaction terms of MULTI with RDINT and ADINT, care should be exercised in interpreting the impact of MULTI on firm performance. Accordingly, the parameter estimate of the variable MULTI alone does not capture the impact of multinationality on firm performance. In the case of the regression with OPSALINV as the dependent variable, the independent variables MULTI, MULTIRD and MULADRD are significant. To understand the impact of multinationality on firm performance, we need to partially differentiate equation 1 with respect to X_{3it} (MULTI). The partial derivative of Y_{it} with respect X_{3it} is given below:

$$\frac{\partial Y_{it}}{\partial X_{3it}} = \beta_{13} + \beta_{17}X_{4it} + \beta_{18}X_{5it} + \beta_{19}X_{4it}X_{5it} \quad (6)$$

As can be seen from the above equation, the impact of MULTI on firm performance depends on both the R&D intensity and marketing intensity of the firm.

IMPACT OF MULTINATIONALITY ON FIRM PERFORMANCE

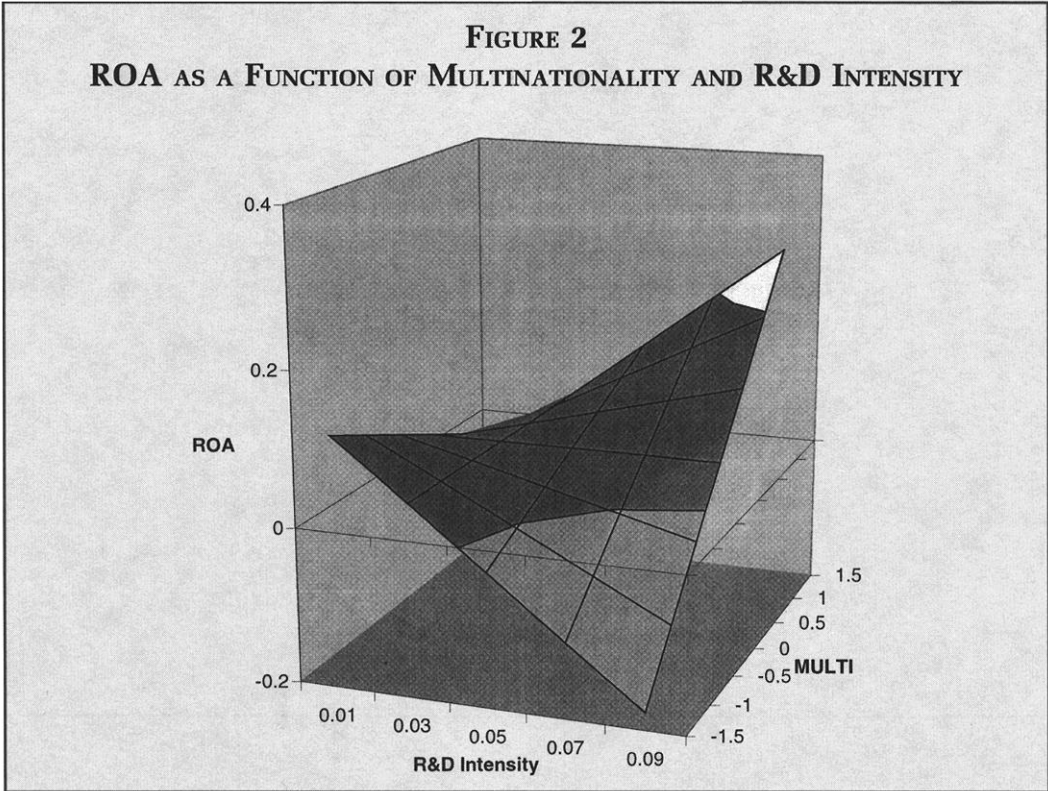
Equation 6 above is a general equation derived for isolating the impact of multinationality on firm performance, irrespective of whether we want to use ROA or OPSALINV to capture firm performance. Equation 7⁷ and equation 8⁸ give the marginal impact of multinationality on ROA and OPSALINV respectively.

$$\frac{\partial ROA_{it}}{\partial MULTI_{3it}} = -3.0723 * ADINT + 100.0757 * ADINT * RDINT \quad (7)$$

$$\frac{\partial OPSALINV_{it}}{\partial MULTI_{3it}} = -0.0726 + 0.7601 * RDINT + 132.3350 * ADINT * RDINT \quad (8)$$

As can be seen from equation 7 and equation 8, the impact of MULTI on firm performance depends upon both the RDINT and ADINT of the firm under consideration. The main effect of MULTI on firm performance (for an average firm)

FIGURE 2
ROA AS A FUNCTION OF MULTINATIONALITY AND R&D INTENSITY



can be evaluated from equation 7 and equation 8 by substituting the average RDINT and ADINT values for all the firms in the data set. The average ADINT for all the firms in the data set is 0.025 and the average RDINT is 0.051. Substituting these values in equation 7 and equation 8, results in $\frac{\partial ROA_{it}}{\partial MULTI_{3it}} = 0.05$ and $\frac{\partial OPSALINV_{it}}{\partial MULTI_{3it}} = 0.135$. This confirms our expectations that, *ceteris paribus*, multinationality leads to higher firm performance.

The impact of multinationality on ROA depends both on the R&D intensity and advertisement intensity. As it is not possible to visually capture all the four dimensions in a single figure, we illustrate the same in two figures. In Figure 2 (Figure 3), we illustrate the impact of

RDINT and MULTI on ROA (OPSALINV) after holding the ADINT at the average level.

As can be seen from the above figures, at very low levels of R&D intensity, increasing MULTI does not have a positive impact on firm performance. However, at higher levels of R&D intensity, higher level of MULTI leads to higher firm performance.

In Figure 4 (Figure 5), we illustrate the impact of ADINT and MULTI on ROA (OPSALINV) after holding the RDINT at the average level. This graph visually captures equation 1, when RDINT is held constant at the average value (0.051). As can be seen from the above figures, the impact of MULTI is higher at higher levels of ADINT than at lower levels of ADINT.

FIGURE 3
OPSALINV AS FUNCTION OF MULTINATIONALITY AND R&D INTENSITY

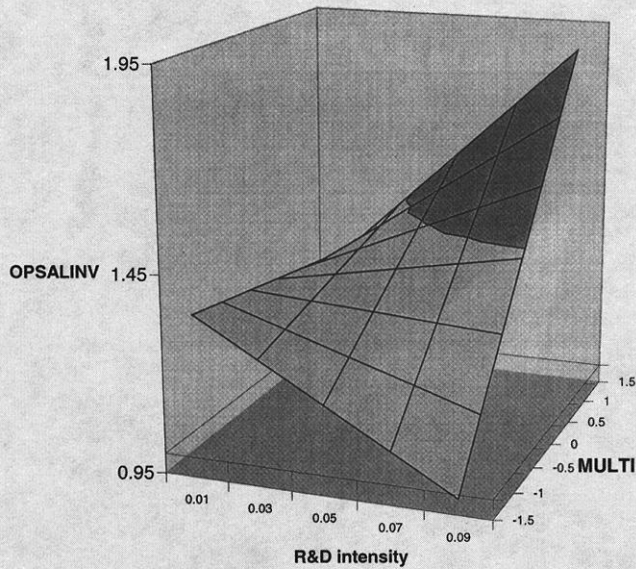


FIGURE 4
ROA AS A FUNCTION OF MULTINATIONALITY AND ADVERTISING INTENSITY

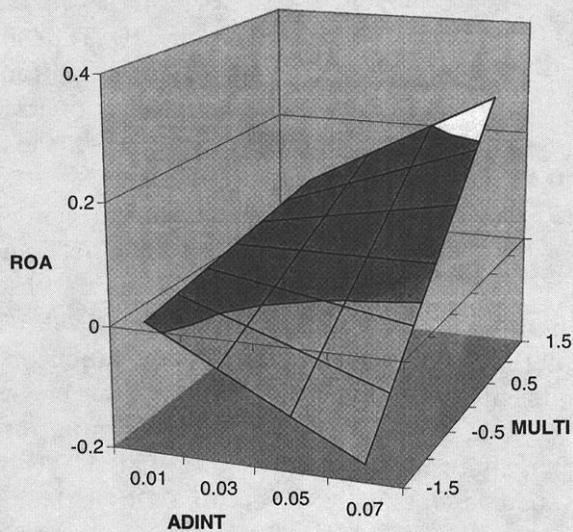
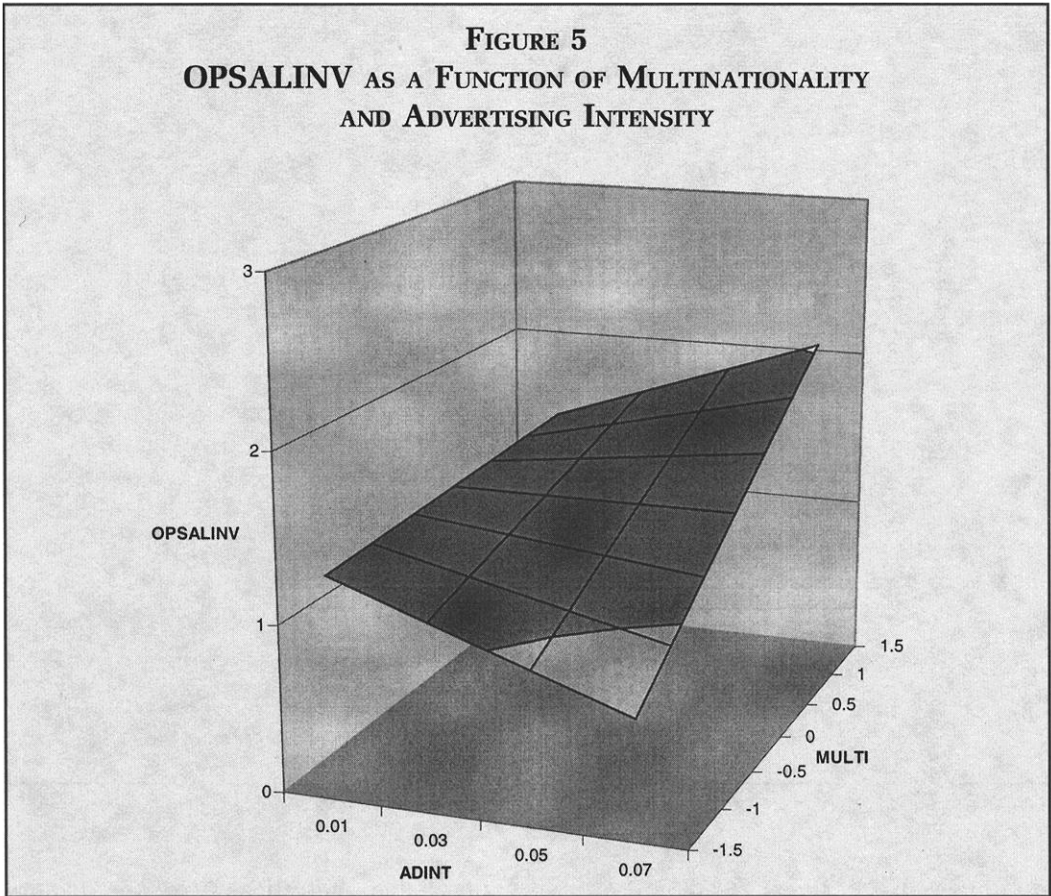


FIGURE 5
OPSALINV AS A FUNCTION OF MULTINATIONALITY
AND ADVERTISING INTENSITY



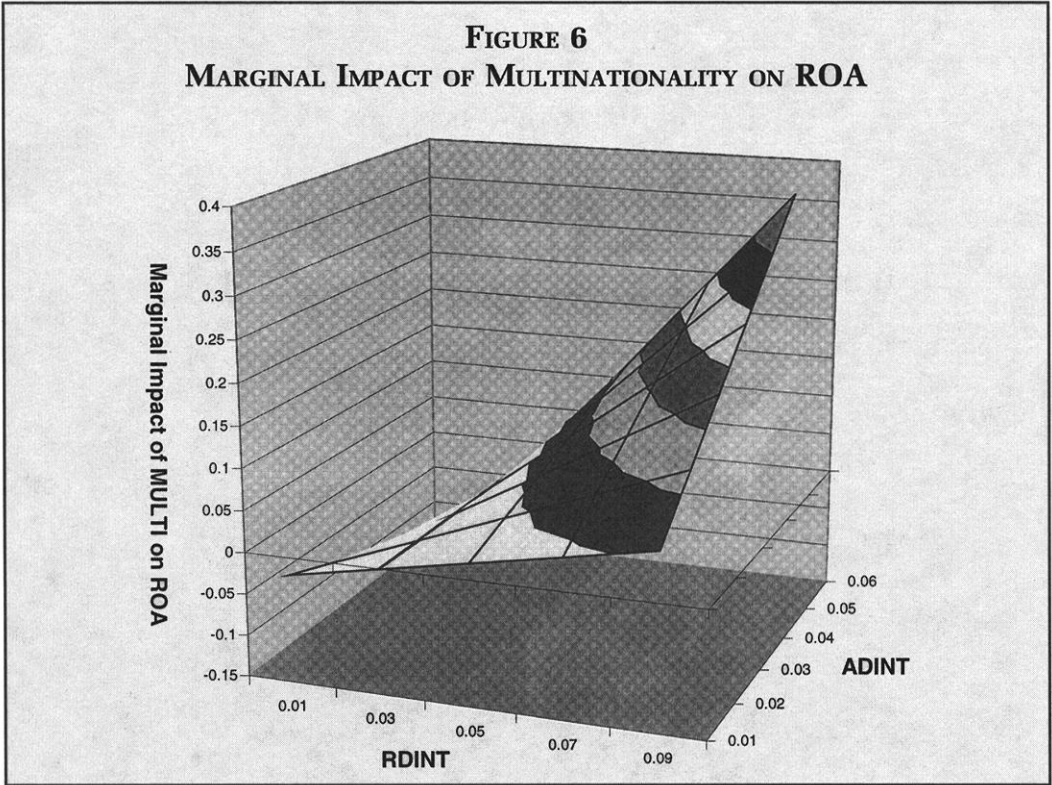
NECESSARY CONDITIONS FOR POSITIVE MARGINAL IMPACT OF MULTINATIONALITY (MULTI)

Marginal Impact of MULTI on ROA and OPSALINV. For the sake of brevity, we illustrate how to derive and visualize the marginal impact of MULTI on ROA. The same procedure can be used to explain the marginal impact of MULTI on OPSALINV. For an average firm, the RDINT required so that the marginal impact of MULTI is positive can be obtained by equating $\frac{\partial ROA_{it}}{\partial MULTI_{3it}} > 0$. The impact of RDINT and ADINT on $\frac{\partial ROA_{it}}{\partial MULTI_{3it}}$ is shown in Figure 6.

The partial derivative of ROA with respect to MULTI is given in equation 7, presented earlier. Setting equation 7 to > 0 , and solving for RDINT, the partial derivative of ROA with respect to MULTI, $\frac{\partial ROA_{it}}{\partial MULTI_{3it}}$, is positive when RDINT exceeds 0.0306. As can be seen in Figure 6, firms are required to spend at least 3.06% of their sales in R&D activities, so that the marginal impact of MULTI on ROA will be positive.

Similarly, in the case of OPSALINV, the RDINT required so that the marginal impact of MULTI is positive can be obtained by solving $\frac{\partial OPSALINV_{it}}{\partial MULTI_{3it}} > 0$, and

FIGURE 6
MARGINAL IMPACT OF MULTINATIONALITY ON ROA



it equals .0178 (or 1.78%). In other words, firms are required to spend at least 1.78% of their sales in R&D activities so that the marginal impact of MULTI on OPSALEINV will be positive.

CONCLUSIONS AND DISCUSSION

The findings of this research suggest that the impact of multinationality on firm performance is not unequivocal. Rather, the impact of multinationality on firm performance depends on a number of firm-specific factors. Two such factors that moderate this relationship are the R&D intensity and the marketing intensity.

While the existing literature amply provides evidence that R&D and marketing intensities positively influence firm performance, our study further advances

knowledge that these two key factors moderate the impact of multinationality on firm performance. It sensitizes managers on the need to focus not just on overseas expansion activities, but also to focus on their R&D and marketing activities in order for their overseas expansion to be successful. However, care must be taken in interpreting the absolute values of threshold R&D intensity calculated from equation 7 and equation 8. These threshold values are calculated based upon the average marketing intensity for all the firms in the sample. The threshold R&D intensity for any particular industry can be calculated by using the average marketing intensity for that particular industry.

At the aggregate level (assuming away industry differences), the threshold R&D

intensity level is 1.78% for the positive effect of multinationality on firms' operational performance (OPSALINV), but it takes a threshold R&D intensity level of 3.06% for multinationality to exhibit a positive effect on firms' financial performance (ROA). This finding implies that the increase in R&D intensity begins to affect the operational performance of multinationality much earlier than the financial performance of multinationality. In other words, companies tend to enjoy operational improvement (i.e., positional strengths) from foreign expansion before financial improvement as they increase their R&D intensity. This implication is consistent with the literature in strategic marketing and management that strategy (multinational expansion in our case) builds firms' positional strengths and then subsequently leads to improved financial performance (e.g., Porter, 1986; Day and Montgomery, 1999). Our study has added empirical credence to the existing literature by examining the performance implications of multinationality with the time series data across industries. However, there are also limitations that would beg for further research inquiries on this issue.

The conceptualization of multinationality of a firm has created enough controversy in the academic literature. Despite the wide body of research in the international business area, there is no single accepted method of measuring multinationality of firms. The range of measures includes percentage of sales that are from overseas operations, percentage of profit measures from overseas operations, number of countries in which firms operated, foreign assets as a percentage of total assets or a summated measure of these above indicators. Both Sullivan (1994) and Ramaswamy, Kroeck

and Renforth (1996) discuss the limitations of these various measures. In this research we used percentage of overseas income to total income as an indicator of multinationality. As data on other measures of measuring multinationality were unavailable in the COMPUSTAT database, we were unable to replicate this study using these other possible measures of multinationality. However, future researchers could replicate this research using other measures of multinationality.

The R&D intensity measure that we used measures the fraction of sales that are spent on the research and developmental activities of the firm. As disaggregate data on primary research expenditures and applied developmental expenditures are unavailable, we did not isolate the impact of research activities and developmental activities in this study.

The marketing efforts of a multinational firm are routinely operationalized by their advertising intensity (Capon, Farley, and Hoenig, 1990), as firms are reluctant to disclose their total marketing expenditures. In this study we used advertising intensity as a surrogate for the marketing efforts of a multinational firm. As data on total marketing activities are unavailable, we could not use the ratio of marketing expenditures to total sales as an indicator of marketing efforts. Due to competitive reasons, organizations are reluctant to disclose finer accounting details of their operations and hence researchers have to contend with such limitations.

The R&D intensity and advertising intensity measures used in this research are only limited proxies for the rent yielding capabilities of the firms. One possible extension of this research is to

model how the R&D expenditures and marketing expenditures improve the rent yielding capabilities of multinational firms.

The entry strategy and mode of operation of a multinational company also will have an impact on firm performance. Companies that aggressively source abroad through contractual arrangements, instead of just focusing on domestic suppliers, might show higher profitability, although the measure of multinationality used in this research could not capture this dimension. In this research we do not control for the entry strategies of multinational companies or how they operate in foreign countries. Assuming appropriate data availability, researchers could investigate if the impact of R&D and marketing intensities systematically differs across firms using different methods of operations in foreign countries.

Another possible extension is to investigate the lagged effect of R&D intensity. As R&D activities might take several years to yield financial benefits, future researchers might want to investigate how the lagged effects of R&D intensity interact with multinationality of the firm in determining firm performance. Lagging the R&D activities by one or two periods when estimating the model implicitly assumes that all the R&D spending will uniformly have an impact after one or two years. This assumption hides the fact that some projects might take longer to yield results while some other projects might yield financial returns in a short term. Further lagging the independent variables by a couple of time periods will result in a loss of degrees of freedom. Future researchers with richer data set can try to estimate the optimal lag that could be used in modeling the

impact of R&D intensity on firm performance.

NOTES

1. Also, as noted by Daniels and Bracker (1989), the association between foreign operations and foreign performance need not be the same across all industries. As domestic markets are also an important source of revenues and profits for any company, one would normally not expect a company whose profits are entirely from abroad to out-perform a company with some combination of foreign and domestic profits. We thank an anonymous reviewer for pointing this out.

2. Past studies have, at the most, incorporated firm-specific variables as control variables in the empirical analyses.

3. Depending upon the intercept and slope of the individual industries, the pooled model, estimated without controlling for industry differences, might show positive, negative or no relationship between the dependent and independent variables.

4. For the sake of brevity, the parameter estimates for industry dummies are not reported in the table. Readers interested in these parameter estimates can get them from the authors.

5. Adding each of the three two-way interactions, one at a time, to the main effects model (equation 3) does not significantly increase the model fit.

6. We thank the anonymous reviewer for suggesting the use of the incremental fit statistics to test for the impact of the interaction term.

7. As β_{13} and β_{17} are not significantly different from zero, they are excluded from equation 8.

8. As β_{18} is not significantly different from zero, it is excluded from equation 8.

REFERENCES

- Al-Obaidan, Abdullah & Gerald Scully. 1995. The Theory and Measurement of the Net Benefits of Multinationality: The Case of the International Petroleum Industry. *Applied Economics*, 27(2): 231-38.
- Aulakh, Preet S., Masaaki Kotabe & Hildy Teegen. 2000. Export Strategies and Performance of Firms from Emerging Economies: Evidence from Brazil, Chile, and Mexico. *Academy of Management Journal*, 43(3): 342-361.
- Barney, J. 1991. Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17: 99-120.
- Bartlett, Christopher A. & Sumantra Ghoshal. 1989. *Managing Across Borders: The Transnational Solution*, Boston: Harvard Business School Press.
- Buckley, Peter J. & Mark Casson. 1985. *The Economic Theory of the Multinational Enterprise*. New York: St. Martin's Press.
- Buhner, C.H. 1987. Assessing International Diversification of West German Corporations. *Strategic Management Journal*, 8: 25-37.
- Capon, Noel, John U. Farley, & Scott Hoenig. 1990. Determinants of Financial Performance: A Meta-Analysis. *Management Science*, 36(October): 1143-1159.
- Daniels, John D. & Jeffrey Bracker. 1989. Profit Performance: Do Foreign Operations Make a Difference? *Management International Review*, 29: 46-56.
- Day, George S. & David B. Montgomery. 1999. Charting New Directions for Marketing. *Journal of Marketing*, 63(Special Issue): 3-13.
- DeCarolis, Donna Marie & David L. Reeds. 1999. The Impact of Stock and Flows of Organizational Knowledge on Firm Performance: An Empirical Investigation of the Biotechnology Industry. *Strategic Management Journal*, 20(10): 953-968.
- Delios, Andrew & Paul W. Beamish. 1999. Ownership Strategy of Japanese Firms: Transactional, Institutional, and Experience Influences. *Strategic Management Journal*, 20: 915-933.
- Dielman, Terry E. 1983. Pooled Cross-sectional and Time Series Data. *A Survey of Current Statistical Methodology*, 37 (2), 111-122.
- Dunning, John H. 1988. The Eclectic Paradigm of International Production: A Restatement and Some Possible Extensions. *Journal of International Business Studies*, 19(1): 1-32.
- Fuller, W.A., & G.E. Battese. 1974. Estimation of Linear Models with Cross-error Structure. *Journal of Econometrics*, 2: 67-78.
- Geringer, J. Michael, Paul W. Beamish & Richard C. DaCosta. 1989. Diversification Strategy and Internationalization: Implications for MNE Performance. *Strategic Management Journal*, 10: 109-20.
- _____, Stepher Tallman & David M. Olson. 2000. Product and International Diversification among Japanese Multinational Firms. *Strategic Management Journal*, 21: 51-80.
- Gomes, Lenn & Kannan Ramaswamy. 1999. An Empirical Examination of the Form of the Relationship Between Multinationality and Performance. *Journal of International Business Studies*, 30(1): 173-88.
- Grant, Robert M. 1987. Multinationality and Performance Among British Manufacturing Companies. *Journal of International Business Studies*, 22: 249-63.

- Helsen, Kristiaan, Kamel Jedidi & Wayne S. DeSarbo. 1993. A New Approach to Country Segmentation Utilizing Multinational Diffusion Patterns. *Journal of Marketing*, 57 (October): 60-71.
- Hitt, Michael, Robert Hoskisson & Hicheon Kim. 1997. International Diversification: Effects on Innovation and Firm Performance in Product-Diversified Firms. *Academy of Management Journal*, 40(4): 767-98.
- _____, _____ & R. Duane Ireland. 1994. A Mid-Range Theory of the Interactive Effects of International and Product Diversification on Innovation and Performance. *Journal of Management*, 20(2): 297-326.
- Hufbauer, G.C. 1970. The Impact of National Characteristics and Technology on the Commodity Composition of Trade in Manufactured Goods. In Raymond Vernon, editor, *The Technology Factor in International Trade*. New York: Columbia University Press. 145-231.
- Jaccard, James, Robert Turrisi & Choi K. Wan. 1990. *Interaction Effects in Multiple Regression*. Newbury Park, Calif: Sage Publications
- Katrishen, Frances A. & Nicos A Scordis. 1998. Economies of Scale in Services: A Study of Multinational Insurers. *Journal of International Business Studies*, 29(2): 305-323.
- Kim, W.C., P. Hwang & W.P. Burgers. 1989. Global Diversification Strategy and Corporate Profit Performances. *Strategic Management Journal*, 10: 45-57.
- Kogut, Bruce. 1985. Designing Global Strategies: Comparative and Competitive Value Added Chains. *Sloan Management Review*, 27(Summer): 15-28.
- Kotabe, Masaaki. 1990a. Corporate Product Policy and Innovative Behavior of European and Japanese Multinationals: An Empirical Investigation. *Journal of Marketing*, 54 (April): 19-33.
- _____. 1990b. The Relationship Between Offshore Sourcing and Innovativeness of U.S. Multinational Firms: An Empirical Investigation. *Journal of International Business Studies*, 21(4): 623-638.
- Levitt, Theodore. 1983. The Globalization of Markets. *Harvard Business Review*, 61 (May-June): 92-102.
- Mansfield, Edwin. 1981. Composition of R&D Expenditures: Relationship to Size of Firm, Concentration, and Innovative Output. *Review of Economics and Statistics*, 63 (November): 610-615.
- Mishra, Chandra S. & David H. Gobeli. 1998. Managerial Incentives, Internationalization, and Market Valuation of Multinational Firms. *Journal of International Business Studies*, 29(3): 583-597.
- Peteraf, Margaret A. 1993. The Cornerstones of Competitive Advantage. *Strategic Management Journal*, 14(3): 179-192.
- Porter, Michael E., editor. 1986. *Competition in Global Industries*. Boston: Harvard Business School Press.
- Ramaswamy, Kannan. 1995. Multinationality, Configuration, and Performance: A Study of MNEs in the U.S. Drug and Pharmaceutical Industry. *Journal of International Management*, 1(2): 231-53.
- _____, K. Galen Kroeck, & William Renforth. 1996. Measuring the Degree of Internationalization of Firms: A Comment. *Journal of International Business Studies*, 27(1): 167-77.
- SAS/ETS User's Guide. Version 6. SAS Institute Inc. Cary, NC.

Sullivan, Daniel. 1994. Measuring the Degree of Internationalization of a Firm. *Journal of International Business Studies*, 25(2): 325-42.

Takeuchi, Hirotaka & Michael E. Porter. 1986. Three Roles of International Marketing in Global Strategy. In M.E. Porter, editor., *Competition in Globa-*

lindustries. Boston, MA: Harvard Business School Press: 111-146.

Tallman, Stephen & Jiatao Li. 1996. Effects of International Diversity and Product Diversity on the Performance of Multinational Firms. *Academy of Management Journal*, 39(1): 179-196.