International and product diversification: their interrelationship and impact on firm performance

the Autonomous Management School of
Ghent University and Katholieke Universiteit Leuven

Vlerick Leuven Gent Working Paper Series 2007/06

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D/2007/6482/08

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ABSTRACT

Corporate strategic decisions regarding the international and product market scope of a firm's activities are the essence of corporate strategy, and how these choices in turn affect performance is the subject of a large body of research in the fields of international business and strategic management. When making these strategic decisions, managers are likely to take into account that these decisions are interrelated since they will require allocating a firm's fixed bundle of resources. Yet, the international business and strategy literatures have mostly treated these two scope decisions as independent strategies, and have also largely ignored the interrelated nature of these strategic scope decisions vis-à-vis their expected impact on performance. As a result, little is known about the nature of the relationship between these strategic choices - whether they are substitute or complementary strategies - or how they jointly impact firm performance. To address this important gap in our understanding of corporate strategy, this paper examines the joint and simultaneous nature of the relationships among these strategic scope decisions and firm performance in a unified framework. Our analysis serves to integrate prior international business and strategy research, and our model and empirical methods address a number of shortcomings of prior empirical studies. Our results indicate that the relationship between a firm's international and product market strategies and its performance is nonlinear, with performance first rising but then falling as the firm's international or product diversification rises, implying that the performance impact of these strategies is path dependent. Our results also provide the first evidence that, within the firm, international and product diversification are substitute strategies for performance.

Keywords: Corporate Strategy, International Diversification, Product Diversification

INTRODUCTION

A central focus of corporate strategy research is to gain a better understanding of the relationship between a firm’s strategic choices and its financial performance. A core aspect of corporate strategy is a firm’s choice of the scope of its activities in terms of their geographic or international reach (international diversification) and the industries or product markets in which to participate (product diversification). How these choices in turn affect performance has been the subject of a large body of research in the fields of strategic management and international business (see Hoskisson and Hitt, 1990; Ramanujan and Varadarjan, 1989 for reviews and Lu and Beamish, 2004).

However, most prior empirical research on this issue has examined only the relationship between one of these strategic choices and firm performance, and has either omitted the other dimension of choice from the analysis or simply included it as a control variable in the single strategic choice-performance relationship examined. Such an approach effectively treats a firm’s choices of its international and product diversification as independent strategies. Yet, these two scope decisions are likely to be interdependent since both will require investment commitments and the leveraging of the firm’s fixed bundle of resources (Penrose, 1959; Teece, 1982; Thomas, 2004). Moreover, managerial choices regarding the firm’s international and product diversification are likely to be made concurrently and with recognition of their potential performance implications. This means that a firm’s choices regarding these strategic dimensions are endogenous with respect to its performance. This fact raises questions about the statistical reliability of the results of most prior empirical studies since endogeneity (and attendant bias) arising from simultaneity of the decision process has been almost universally ignored when deriving estimates of the strategy-performance relationships.

In addition to questions regarding statistical reliability, the treatment of international and product diversification as independent strategies suggests the results of most prior empirical studies do not take into consideration how these two strategies simultaneously interact to impact firm performance or the nature of their interdependency.

Specifically, does the firm regard these strategies as substitutes with respect to firm performance due to inherent tradeoffs or, as some have suggested, are they complementary with respect to firm performance in that experience gained in managing a more diversified firm on one dimension (e.g., industry scope) can raise the benefit of, or lower the cost of managing, higher diversity on the other dimension (e.g., geographic scope) (Delios and Beamish, 1999).

Our paper addresses these gaps in the literature by examining the joint and simultaneous nature of the relationships between international diversification, product diversification and firm performance. In doing so, the paper makes three major contributions. First, our model and analysis serves to integrate the disparate strategy and international business research streams that, partly for historical reasons, have not examined simultaneously the impact of strategic scope decisions on firm performance within a unified framework.

Second, by examining the joint and simultaneous nature of the relationships between international and product diversification we are able to identify directly the nature of their interdependency. Most prior empirical research has not directly examined the relationship between international and product diversification, but has instead inferred their relationship based on examining their linkage to firm performance, often using an interaction variable between international and product diversification in the performance relationship. We argue that this approach cannot identify the nature of the direct relationship between international and product diversification.

Finally, our model and estimation methods directly address the issue that, by ignoring the endogeneity of strategic choices with respect to firm performance, past empirical findings are subject to a "simultaneity bias" (e.g. Greene, 2003) and hence unreliable. Moreover, our empirical investigation uses longitudinal (panel) data on U.S. firms from 1986 to 1999. This allows us to not only capture the dynamic evolution of corporate strategic choices and firm performance over time, it also permits the use of estimation methods that obviate another source of bias that has potentially afflicted the results of most prior empirical studies: the failure to take account of heterogeneity across firms that arises from differences in (unmeasured) firm specific characteristics or capabilities. That many prior empirical studies fail to address the issue of firm heterogeneity is due largely to their use of cross-section data for a single year, an approach increasingly questioned in the empirical strategy literature (Bergh, 1995; Bowen and Wiersema, 1999).

Overall, our study is the first empirical analysis to systematically capture the interrelated and simultaneous nature of a firm's international and product diversification strategies and their joint impact on firm performance. Moreover, by using more comprehensive models of international and product diversification we are able, for the first time, to examine the direct relationship between these two strategies at arises when variation in firm performance have been controlled. In these respects, our research design, estimation methodology, and analysis of results constitute important methodological contributions to both the empirical strategy and international business streams of research.

THEORY AND HYPOTHESES

Corporate strategic choices regarding the firm's international and product-market scope are central elements of corporate strategy, and how these choices in turn affect performance is the subject of a large body of research in the international business and strategic management fields. Manager's decisions regarding the strategic scope or boundary of the firm in terms of its geographic reach or product market participation are likely to be considered concurrently since choice regarding these two strategies will involve allocating the firm's fixed resources toward new domains. Yet, prior research has largely treated these strategic choices as independent and has lead to two separate research streams: one examining the impact of international diversification on performance and the other examining the impact of product diversification on performance. The historical development of the multi-business firm led strategy researchers to focus on the performance implications of product diversification strategies with little regard to the international scope of the firm. While we do not provide a review of the product diversification literature since this has been provided elsewhere (Hoskisson and Hitt, 1990; Ramanujan and Varadarjan, 1989), this work has by and large ignored the international scope of the firm and thus omitted consideration of indirect effects associated with this dimension of corporate strategy. In contrast, international business researchers have often taken into account that firms may pursue both international and product diversification when examining the relationship between international diversification and firm performance (Tallman and Li, 1996), either by including product diversification as a control or by including an interaction term between these two forms of diversification in the performance relationship.

Our review of international diversification–performance studies conducted over the past 17 years (Table 1) indicates that most studies have found no significant interaction between international diversification and product diversification in terms of their impact on firm performance, and have thus concluded that these strategic choices are independent.

Insert Table 1 About Here

Hamilton and Nickerson (2003) recently admonished strategy research for failing to recognize when firms make strategic choices they consider the potential impact of their choices on their performance, and that this simultaneity of the decision process means that strategic choices are endogenous with respect to performance. In this regard, prior empirical studies that focused only on the relationship between international diversification and firm performance, or only on the relationship between product diversification and firm performance, have without exception failed to capture or control for the simultaneity among international diversification, product diversification and firm performance. In general, the endogeneity arising from simultaneity, if not taken into account when estimating a strategic choice-performance relationship, will result in biased estimates. Given this, the plethora of mixed empirical results generated by prior studies is not surprising since prior research has universally ignored the simultaneity between strategic choices and firm performance in their analyses. Hence, despite the wealth of empirical research to date, understanding how firms' strategic choices impact performance remains one of the major, unresolved research questions in both the strategy and international business fields (Rumelt, Schendel, and Teece, 1994; Peng, 2004).

Both the international business and strategy literatures have also given little attention to understanding the direct relationship between international and product diversification strategy. Most prior studies have instead only inferred the relationship between international and product diversification by examining their linkage to firm performance, usually by incorporating an interaction effect in the performance equation. However, this approach is fundamentally flawed since it fails to control for variation in firm performance when attempting to detect whether or not the firm considers international and product diversification to be complementary or substitute strategies.

To empirically detect the direct relationship between these two strategic dimensions one must control for variation in firm performance (i.e., hold performance constant) in order to assess how the firm trades-off these two strategic dimensions with respect to its performance.

The above indicates that an integrated understanding of the impact of the firm's strategic choices on its performance is still lacking due to the failure to acknowledge the interdependence between these strategic choices. We suggest that a firm's choices regarding its international and product diversification strategies are not independent and hence that there are both direct and indirect effects of product and international diversification on firm performance as depicted in the model in Figure 1.

Insert Figure 1 About Here

To full assess the impact of the firm's strategic choices on its performance requires that one examine not only the direct relationships between international and product diversification and firm performance, but also the indirect relationships through which the choices of international and product diversification will, via their direct relationships with one another, also impact firm performance as depicted in Figure 1. In this model, firm specific factors, industry specific factors, and business environment factors directly influence both a firm's performance and its international and product diversification strategy. In turn, these choices directly influence, and are themselves influenced by, performance. In addition, a firm's international and product diversification strategies directly influence each other, and hence also indirectly affect its performance.

The following sections specify the theoretical propositions behind Figure 1. In addition, we also theorize that resource constraints within the firm imply that international and product diversification are likely to represent substitute strategies.

International Diversification and Firm Performance

The relationship between a firm's international diversification strategy and its performance is one of the most examined empirical linkages in international business. As more firms expand beyond their domestic market, researchers are increasingly interested in whether or not international diversification pays off.

Theoretically, researchers have postulated that firms gain benefits from international diversification by realizing economies of scale due to spreading fixed costs of production, marketing, and R&D over a larger global market (Caves, 1971; Hymer, 1976; Kobrin, 1991), as well as by exploiting and leveraging firm-specific intangible assets into international markets (Buckley, 1988; Barlett and Ghoshal, 1989; Caves, 1971; Hymer, 1976; Teece, 1982). Resource based theory would argue that leveraging excess firm specific resources into new markets creates economies of scope advantages (Penrose, 1959; Teece, 1982).

Researchers have also postulated that firms can gain exploration benefits from geographic diversification (Buckley and Casson, 1976). International expansion can enhance the firm's knowledge base and capabilities through the experiential learning it gets from operating in foreign markets (Barkema & Vermeulen, 2001; Zahra, Ireland, and Hitt, 2000). Industrial organization arguments have also been used to postulate that firms can gain greater market power over suppliers, distributors and customers by expanding overseas (Kogut, 1985). Finally, some researchers have suggested that firms can diversify risks by operating across international markets (Kim, 1993). The benefits from the exploitation of economies of scale and scope, organizational learning through exploration, and greater market power implies that firms with greater international diversification should experience higher financial performance.

Researchers have also proposed that there are costs associated with international diversification. As firms operate in more diverse market environments, they face a greater need to integrate their activities and as a result encounter an escalation in the cost of coordinating their activities (Lawrence and Lorsch, 1967; March and Simon, 1957). With greater international diversification, diseconomies can set in due to escalating costs of coordination and from the greater information processing demands on managers and administrative systems (Gomes and Ramaswamy, 1999; Hitt, Hoskisson, and Kim, 1997; Tallman & Li, 1996). With continued international diversification, the complexities of managing information and communication among widespread units imply that extensive international diversification is likely to result in net costs (Gomes and Ramaswamy, 1999).

Transaction cost theory can shed light on the increasing costs of governance as firms expand overseas. When firms expand overseas they are likely to face increasing uncertainty in their geographic markets.

Increases in environmental uncertainty make integration and coordination more difficult and result in increases in governance costs which reduce the benefits of internalization (Hill and Hoskisson, 1987; Jones and Hill, 1988). The challenges of a new environment include costs associated with the liability of newness (Hymer, 1976).

The costs associated with the liability of newness and with foreignness should decrease with greater international diversification (Lu and Beamish, 2004), while the governance costs of managing increasing complexity and uncertainty should increase with greater international diversification.

As shown in Table 1, the findings from studies that have empirically examined the relationship between international diversification and firm performance are mixed. Initial studies generally found evidence of a positive relationship (Bergsten, Horst, and Moran, 1978; Buhner, 1987; Franko, 1987; Grant, 1987; Grant, Jammine, and Thomas, 1988) and some recent studies have reinforced this finding. In their study of Japanese manufacturing firms, Delios and Beamish (1999) found that firms with a higher number of foreign direct investments in a greater number of countries experienced higher firm performance. Goerzen and Beamish (2003) found that firms with greater asset dispersion and country environment diversity experienced higher firm performance. Hsu and Boggs (2003) tested for both a linear and non-linear relationship and found that international diversification, as measured by percentage of foreign sales, has a positive relationship with firm performance. Similarly, Kotabe, Srinivasan, and Aulakh (2002) found a positive relationship between a firm’s international strategy as measured by its foreign income to total income and firm performance, although the results may be due to the high degree of correlation that is likely to exist between these two measures.

However, other recent studies have found that greater international diversification is either negative related, or not significantly related, to firm performance. In their longitudinal examination of Japanese firms, Geringer, Tallman, and Olsen (2000) found that international diversification is negatively related to firm performance, contrary to what they had hypothesized. Similarly, Doukas and Lang (2003) found that foreign direct investment announcements, in general, generated negative stock market returns. In addition, Denis, Denis, and Yost (2002) found that global diversification led to a reduction in the market value of the firm while Doukas and Kan (2006) found that multinational firms outperformed firms that were purely domestic.

Other studies have found that a positive correlation between geographic diversification and performance reverses itself only in firm with extensive internationalization (Geringer, Beamish, and daCosta, 1989; Hitt, et al., 1997). Finally, Tallman and Li (1996) found that the extent of a firm's foreign sales was not significantly related to firm performance.

In response to these mixed empirical findings, recent research has also postulated and found that the relationship is likely to be non-linear, implying that the costs and benefits of international expansion are not constant but instead vary with the extent of a firm's international diversification (Capar and Kotabe, 2003; Gomes and Ramaswamy, 1999; Lu and Beamish, 2004). In their sample of service firms, Capar and Kotabe (2003) found that the relationship between international diversification and firm performance is U-shaped, with international diversification having a positive impact on firm performance in firms with very extensive international diversification. In contrast, Gomes and Ramaswamy (1999) found an inverted U-shaped relationship while Lu and Beamish (2004) postulated and found an S-shaped relationship. Specifically, Gomes and Ramaswamy (1999) found that performance rises with international diversification up to a point, beyond which performance falls as greater international diversification creates organizational costs that exceed the additional benefits of diversification. Lu and Beamish (2004) postulated that in the early stages of a firm's internationalization that the costs associated with the liability of newness would outweigh the benefits of internationalization resulting in negative firm performance. However, as the firm expands its international presence it is likely to benefit from exploitation of economies of scale and scope so that further international diversification will have a positive effect on firm performance. Finally, further international expansion will eventually entail diseconomies of scale and higher organizational costs of managing complexity which would reduce firm performance. This S-shaped relationship can be considered an extension of the inverted U-shaped relationship found by Gomes and Ramaswamy (1999).

In summary, prior empirical investigations of the relationship between international diversification and firm performance have found mixed results, with evidence to suggest that the relationship is nonlinear. The resource-based theory, as well as the leveraging of economies of scale and exploration benefits from organizational learning, would indicate that firms should benefit from expansion overseas. As firms become more international, the efficiencies gained from scale and scope advantages should enable higher performance.

However, with more extensive international diversification the complexity and coordination costs of managing a more internationally diverse firm are likely to outweigh the benefits of international diversification resulting in lower performance. We therefore expect the relationship between a firm's international diversification and firm performance to be nonlinear, starting out positive but becoming negative with more extensive international diversification.

> Hypothesis 1a: The relationship between international diversification and firm performance will be nonlinear, with the relationship changing from positive to negative as the firm's international diversification increases.

Transaction costs theory would suggest that the firm's product diversification would moderate the relationship between international diversification and firm performance. Greater diversification (product or geographic) imposes additional costs of coordination and control over a firm's activities such that "the firm is constantly trading off the economic benefits associated with a corporate strategy against the bureaucratic costs of implementing that strategy" (Jones and Hill, 1988: p.165). Given that expansion by a firm into new product and/or geographic markets will require greater coordination and control by management over the activities of the firm (Penrose, 1959) it follows that firms with already diversified product market portfolio will incur additional costs when seeking to diversify internationally. Indirectly, the organizational costs of greater complexity as the firm pursues both product and geographic expansion implies that greater product diversification would decrease the positive performance effect of international diversification. Indeed, prior empirical research indicates that pursuing both types of diversification leads to sub par performance (Delios and Beamish, 1999; Geringer, et al., 1989; Kim, Hwang, and Burgers, 1989; Tallman and Li, 1996). We therefore expect that the more product diversified is the firm, the smaller will be effect of higher international diversification on firm performance.

> Hypothesis 1b: A firm's product diversification will moderate the relationship between international diversification and firm performance. The greater the firm's product diversification, the smaller will be the magnitude of the relationship between international diversification and firm performance.

Product Diversification and Firm Performance

The linkage between firm diversification and performance is perhaps the single most studied relationship is the empirical strategy literature. Initial studies of this relationship were confounded due largely to alternative operationalizations of the key constructs of diversification and firm performance, and not controlling for industry membership (see Hoskisson and Hitt, 1990; Ramanujam and Varadarajan, 1989 for reviews). More recent studies have shown consistent evidence that capital markets value firms with corporate strategies involving greater focus more highly than firms with more diversified portfolios (Lang and Stulz, 1994; Montgomery and Wernerfelt, 1988; Villalonga, 2004). Additionally, firms that have undergone corporate refocusing have improved their financial performance and market value (Berger and Ofek, 1995; Bhagat, Shleifer, and Vishny, 1990; Comment and Jarrell, 1995; John, Lang, and Netter, 1992; Markides, 1992). The distinction between related and unrelated diversification has also been examined extensively and measures of relatedness have been a key source of discrepancies. When a resource-based approach was utilized to model and test the relationship it was found that firms with more highly interrelated portfolios of businesses outperformed firms with lower relatedness (Robins and Wiersema, 1995). This finding is consistent with the premium (discount) that Villalonga (2004) found in her market value analysis of firms that pursued related (unrelated) diversification.

Resource-based theory provides a basis for why a firm would diversify into related activities. By leveraging excess resources and managerial capabilities into new product markets the firm can achieve economies of scope (Peteraf, 1993; Teece, 1982) which results in higher performance. However, portfolio diversification without the benefit of shared underlying assets or resources would not provide this type of advantage. Portfolio diversification leads to greater diversity with respect to the industry environments in which the firm participates, leading to higher costs of coordination (Lawrence and Lorsch, 1967) and higher internal governance costs than if these businesses operated independently via the market. Thus, as a firm increases its portfolio diversity, the monitoring and governance costs of managing its portfolio of businesses will adversely impact firm performance (Jones and Hill, 1988).

In summary, transaction cost economics, with its theoretical distinction between the governance costs of internal hierarchies (e.g. the multi-business firm) versus the market, indicates that as firms become more diversified they face increasing internal costs of coordination and monitoring. Resource-based theory explanations for the existence of a multi-business firm are premised on shared underlying assets or resources and suggest that such shared assets or resources are more likely to exist in firms with more related business units. Thus highly diversified firms are not likely to benefit from shared underlying resources, yet they face increased internal costs of governance. Empirical evidence examining the nature of the relationship has indeed found evidence of a nonlinear relationship. Palich, Cardinal, and Miller (2000), in their meta-analysis of the empirical studies on product diversification and performance, found that firms with moderate product diversification strategies had the highest performance, while extensive diversification was associated with lower firm performance. As a result, we propose that the relationship between product diversification and firm performance will be nonlinear, starting out positive, but becoming negative as the firm becomes more product diversified.

> Hypothesis 2a: The relationship between product diversification and firm performance will be nonlinear, with the relationship changing from positive to negative as the firm's product diversification increases.

Symmetric to our expectation that the firm's product diversification will moderate the relationship between international diversification and firm performance, the existence of transaction costs associated with higher levels of complexity and coordination that result when a firm is excessively diversified on both the product and geographic dimensions suggest that we should also expect a moderating effect of international diversification on the relationship between product diversification and firm performance.

> Hypothesis 2b: A firm's international diversification will moderate the relationship between product diversification and firm performance. The greater the firm's international diversification, the smaller will be the magnitude of the relationship between product diversification and firm performance.

International Diversification and Product Diversification

Both the resource-based view (RBV) and transaction cost economics (TCE) theories suggest that there will be trade-offs in the pursuit of international and product diversification, and as a result these decisions are likely to be interdependent. Resource-based theory posits that the basis and motive for corporate strategic expansion via product diversification or international diversification provides the opportunity to leverage the firm's excess resources into new markets (Penrose, 1959; Peteraf, 1993; Teece, 1982; Wernerfelt, 1984). However, the amount of resources available to a firm is limited and, especially in the case of managerial attention, cannot be readily incremented. For example, researchers have found that, with regard to investment decisions, there are tradeoffs in that firms are not limitless in terms of their ability to pursue new investment opportunities (Thomas, 2004). Similarly, researchers have postulated that the firm's proprietary assets are in fixed supply and that since both geographic and product market expansion will require leveraging these assets into new markets these choices are likely to represent a trade-off to the firm (Davies, et al., 2001; Delios and Beamish, 1999). In their examination of foreign direct investment, product diversification and firm performance, Doukas and Lang (2003) found that firms that pursued foreign direct investment unrelated to their core business suffered losses, while firms with focused FDI benefited. Limits on a firm's key resources suggest that a decision by the firm to expand its business portfolio places a real constraint on its ability to also expand geographically and vice-versa.

Transaction cost economics (Coase, 1938; Williamson, 1985) posits that an expansion of corporate scope will involve a comparison of the relative costs of negotiating, monitoring, and enforcing contracts associated with carrying out the transactions internally (hierarchical) versus externally (via a market). As result, increased governance costs of pursuing both international and product diversification will make these decisions interdependent and likely reduce overall firm performance.

Studies that empirically examine the direct relationship between international and product diversification are scant. Most researchers have instead inferred the relationship between these two strategic choices indirectly through their relationship to firm performance.

For instance, by observing how higher product diversification impacts the relationship between international diversification and firm performance some researchers have proposed that they serve as complements (Geringer, et al., 1989 or Delios and Beamish, 1999), while others have concluded they represent tradeoffs (Doukas and Lang, 2003; Davies, et al., 2001; Denis, et al., 2002). However, the comparisons and analyses conducted in all these studies cannot empirically detect the direct relationship between international and product diversification since they fail to control for variation in firm performance. In particular, an analysis of the moderating effect of product diversification on the relationship between international diversification and firm performance cannot detect the direct relationship between these two diversification strategies since this analysis does not control, by definition, for variation in firm performance.[1]

Both resource based theory and transaction cost theory imply that a firm's decisions regarding its international and product diversification strategies are interdependent, and that the direct relationship between these two strategic dimensions will involve a tradeoff. We therefore expect that the direct relationship between a firm's product and international diversification will be negative.

> Hypothesis 3: A firm's international and product diversification will be negatively related.

METHODS

Model Specification

The focus of this study is to examine the effect of international and product diversification on firm performance, recognizing that a firm's choices regarding its international diversification and product diversification are not made independently, but rather simultaneously. In addition, when deciding which combination of international diversification and product diversification to choose, the firm simultaneously takes into account the expected impact of its choices on its future performance.

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[1] Formally, international diversification, product diversification and firm performance are all <u>variables</u>, that is, they are interrelated and jointly determined. Since there are three variables, the direct relationship between any two of them can only be detected if one controls for variation in (i.e., holds constant) the third variable (e.g. firm performance).

As Hamilton and Nickerson note, this simultaneity of a firm's decision process precludes the use of standard OLS estimation of a relationship between firm performance and its strategic choice(s) since it implies that the strategic choices are endogenous with respect to performance. The statistical issue created by this endogeneity is that any strategic choice variable included in a model of firm performance will be correlated with the model's error term (Hamilton and Nickerson, 2003)**.**

A common solution for endogeneity induced by simultaneity is to specify a set of relationships, commonly called a simultaneous equations model *(*Greene, 2003), that explicitly describe the underlying determinants of all relevant endogenous variables. In this study there are three endogenous variables (firm performance, firm international diversification and firm product diversification) and we accordingly specify a model that comprises a system of three equations to capture the interrelationships among these three endogenous variables. The specification of each equation in our model is as follows:

(1) Firm Performance = $\alpha_0 + \alpha_1$(International Diversification)
$+ \alpha_2$(International Diversification $)^2 + \alpha_3$(Product Diversification)
$+ \alpha_4$ (Product Diversification$)^2$
$+ \alpha_5$(International Diversification x Product Diversification)
$+ \alpha_6$(Lagged Firm Size) $+ \alpha_7$(Industry Concentration)
$+ \alpha_8$(Industry Economies of Scale) $+ \alpha_9$(Industry R&D Intensity) $+ \varepsilon_1$

(2) Firm International Diversification = $\delta_0 + \delta_1$ (Product Diversification)
$+ \delta_2$(Firm Performance) $+ \delta_3$(Lagged Firm Size) $+ \delta_4$(Lagged Firm R&D Intensity)
$+ \delta_5$(Lagged Industry Foreign Competition) $+ \delta_6$(Industry Capital Intensity)
$+ \delta_7$(Lagged World Industry Export Intensity) $+ \delta_8$(Lagged Intra-Industry Trade)
$+ \delta_9$(World Industry Growth) $+ \delta_{10}$(World Industry Trade Barriers) $+ \varepsilon_2$

(3) Firm Product Diversification = $\beta_0 + \beta_1$ (International Diversification)

$+ \beta_2$(Firm Performance) + β_3(Lagged Firm Size) + β_4(Lagged Firm R&D Intensity)

$+ \beta_5$(Lagged Core Business Performance) + β_6(Lagged Industry Foreign Competition)

$+ \beta_7$(Industry Growth) + β_8(Industry ROA) + β_9(Industry Economies of Scale) + ε_3

Each equation contains at least one endogenous right-hand-side variable as well as firm and industry level variables suggested by prior research.[2] Many of the exogenous (non-endogenous) right-hand-side variables are lagged; in particular, all exogenous firm level variables are lagged to obviate concern that these variables may also be endogenous with respect to a firm's strategic choices. We now sequentially discuss the specification of each equation and hence the variables included in each equation.

Equation 1: Firm Performance.

This equation specifies the dependence of firm performance on a firm's international diversification and product diversification. To capture the hypothesized nonlinear relationship between each variable and firm performance, the square of each variable is also included. The interaction between international diversification and product diversification captures the moderating effect that one of these variables is hypothesized to have on the relationship between the other variable and performance. As controls, the equation includes one firm level variable (lagged firm size) thought to positively influence a firm's performance (Bettis, 1981; Grant, et al., 1998) and three core industry variables (concentration, economies of scale, and R&D intensity) that capture the presence of economies of scale and scope at the industry level (Grant, 1991; Montgomery, 1985; Porter, 1980) and that are likely to be positively related to firm performance.

[2] As is discussed more fully later in the text, each equation implicitly also contains a set of dummy variables, one for each firm, to account for unmeasured firm specific characteristics.

Equation 2: Firm International Diversification.

This equation specifies the dependence of a firm's international diversification on its product diversification and performance. The equation also includes two firm level variables (firm size and firm R&D intensity) thought to positively influence firm international diversification (Bergsten, et al., 1978; Buckley and Pearce, 1981), and six core industry variables (foreign competition, capital intensity, world export intensity, intra-industry trade, world growth, and world trade barriers) to control for the presence of foreign competition and the extent of an industry's international trade linkages that are likely to be positively related to firm international diversification (Buckley and Ghauri, 2004; Caves, 1971; 1996; Hymer, 1960; 1976; Kogut, 1983; Lall, 1980; Lu and Beamish, 2004; Makhija, et al., 1997; Morrison and Roth, 1992; Pugel, 1978; 1981).

Equation 3: Firm Product Diversification.

This equation specifies the dependence of a firm's product diversification on international diversification and performance. The equation includes three firm level variables (firm size, firm R&D intensity and core business performance) expected to be positively related to firm product diversification (Grant, et al., 1988).

Three core industry variables (foreign competition, market growth, and ROA) are included to control for the presence of foreign competition in the core industry that is likely to be negatively related to firm product diversification (Bowen and Wiersema, 2005) as well as for differences in core industry characteristics likely to be negatively related to the firm product diversification (Christensen and Montgomery, 1981; Hill and Hansen, 1991). Finally, industry economies of scale captures scale economies in production as well as the presence of potential exit barriers created by substantial resource commitments that may not be fully recoverable (Porter, 1980); this variable is likely to be positively related to firm product diversification.

Data and Estimation

Our model is estimated using a panel data set of U.S. firms covering the period 1986-1999.[3] Our focus on U.S. firms reflects constraints on sourcing data on line of business and foreign sales for non-U.S. firms. We were prevented from extending the sample beyond 1999 due to limitations in sourcing data for world industry export intensity and world industry trade barriers. However, we believe that the time frame of our analysis has particular relevance since it covers a period of rapid globalization and internationalization; U.S. firms in particular faced dramatic increases in foreign competition and heightened international competition from industry globalization during the sample period (Sachs and Warner, 1995).[4] The dataset comprises 7,172 observations and includes both single and multi-business firms as well as domestic only and internationally diversified firms; excluded are single business firms that only sell in the domestic market.[5]

The coefficients in each equation of our model are estimated simultaneously and jointly using the three-stage least squares (3SLS) method (Greene, 2003).

This method uses instrumental variables to produce consistent estimates, and it uses generalized least squares to account for correlation in the disturbance terms across equations to produce more efficient estimates.[6] Because Equation 1 contains non-linear functions of the two endogenous variables International Diversification and Product Diversification, our implementation of 3SLS uses as instrumental variables not only the levels of all exogenous variables, but also the squares and cross-products of these variables (Kelejian, 1971; Greene, 2003, p. 403).

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[3] This time frame relates to the values of the endogenous and non-lagged exogenous variables; values of the lagged exogenous variables cover the period 1985-1998.
[4] For example, the OECD's index of "exposure to international competition" rose almost 78% between 1985 and 1999 (rising from 18.9% in 1985 to 33.6% in 1999).[4] Similarly, imports as a share of total U.S. purchases of manufactured goods rose 70% over the same time period (from 12.3% in 1985 to 21% in 1999%) (OECD, 2002a, 2002b and 2003).
[5] Our dataset contains varying numbers of firms in each sample year. This presents no special issues regarding estimation and inference (Wooldridge, 2002).
[6] An instrumental variable, or instrument, is a variable that is highly correlated with a model variable but uncorrelated with the model's error term. In the simultaneous equations framework the set of instrumental variables comprises all the exogenous variables in a model.

We also use as instrumental variables the lagged values of International Diversification and Product Diversification since our measures for these variables are indicator variables for the underlying and unobserved constructs of, respectively, international and product diversification (Greene, 2003).

Preliminary analysis of our model equations indicated the presence of significant cross-sectional firm heterogeneity (firm specific effects). Such heterogeneity reflects differences across firms with respect to attributes that are either not measurable (e.g., managerial effort) or not included in our model's equations. Correlation between these omitted firm specific characteristics and any of the variables in an equation is another source of endogeneity. In estimating our model we control for firm heterogeneity using the common "fixed effects" specification that effectively includes in each equation a set of firm specific dummy variables (Greene, 2003).[7]

Measures and Data Sources

The following discusses the definitions and sources of data for the three endogenous variables in our model: firm performance, international diversification and product diversification. Appendix A provides definitions and sources of data for all the exogenous variables in our model.

Firm Performance. As is evident from our review of prior studies in Table 1, most prior studies relied on accounting measures of firm performance. However, accounting measures such as ROA or ROS are problematic since they are subject to manipulation in the short-run by managers (Lang and Stulz, 1994). Nonetheless, we utilize one accounting measure of firm performance, ROA, but also two market based measures, Tobin's q and Total Stock Return, to account for long-term performance effects as well as expectations about future performance. ROA is a widely employed measure of performance (Keats and Hitt, 1988). Tobin's q is defined as the ratio of the total market value of the firm (both equity and liabilities) to the replacement cost of the firm's total assets.

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[7] For ease of computation, we do not include firm specific dummy variables in each equation but instead eliminate the unobserved firm specific effects from our equations using the equivalent "fixed effect transformation" of the data prior to estimation (Wooldridge, 2002 p. 267). By construction, this transformation removes the constant term from each equation. The estimation results obtained using this transformation are identical to those obtained if instead a dummy variable for each firm were explicitly included in each equation (Greene, 2003).

We measure Tobin's q as the ratio of the total market value of a firm's (common) equity plus the book value of total liabilities to the book value of a firm's total assets.[8]

Firm International Diversification. We capture both the level and scope of a firm's international diversification through, respectively, two measures: the Foreign Sales Ratio and Geographic Entropy. The Foreign Sales Ratio (FSR), defined as a firm's foreign sales divided by its total sales, captures the level of a firm's international diversification. The FSR is regarded as the most valid and reliable measure of the importance of foreign activity to a firm, and as a result is also the most commonly used measure (Geringer, et al., 1989; Denis, et al., 2002). Annual data on firms' foreign sales were taken from COMPUSTAT's geographic segment database. In this database, export sales by a U.S. based firm are not consistently reported separately from sales made by the firm's foreign-based subsidiaries. Hence, the Foreign Sales Ratio includes both types of foreign sales activity.

The scope or breadth of a firm's international diversification distribution is another important dimension of a firm's international diversification strategy. Following Hitt, et al. (1997), the scope of a firm's international diversification is captured using an entropy measure of the distribution of a firm's foreign sales across the regions in which it participates:

$$\text{Geographic Entropy} = \sum_{i=1}^{4} P_i \ln(1/P_i) \ .$$

In this formula, P_i is the share of a firm's total sales in region *i.* Since COMPUSTAT limits the number of geographic regions a firm can report we, like Hitt, et al. (1997), were only able to identify four comparable geographic regions: Domestic (U.S.), Asia and Pacific, Europe and a residual "Other" region.

[8] In COMPUSTAT this is constructed as (DATA 24*DATA 25 + DATA181)/(DATA6). A firm's total stock return measures the one-year total return to shareholders including dividends. In COMPUSTAT this measure is constructed as the end of fiscal year closing stock price plus dividends per share divided by the prior year's closing stock price ((DATA199[t] + DATA26[t])/DATA 199[t-1]).

Firm Product Diversification. Firm product diversification is measured using Jacquemin and Berry's (1979) entropy measure of diversification that captures the extent of diversity across a firm's activities. Annual data on firm sales in each of 10 possible 4-digit SIC business segments were taken from the COMPUSTAT Line of Business database.

RESULTS

Table 2 presents variable means, standard deviations, and correlations for all variables based on the sample of 7,712 observations. Table 3 presents 3SLS estimates of the Firm Performance equation. Tables 4 and 5 present 3SLS estimates of the International Diversification and Product Diversification equations. Model fit across the alternative specifications of firm performance, firm international diversification, and firm product diversification is good, with significant Chi-square values ($p < 0.001$) and R-squares values ranging from 0.444 to 0.947.[9]

Insert Table 2, 3, 4 & 5 About Here

Figures 2a and 2b illustrate the estimated relationship between international diversification and firm performance as well as the moderating effect of a firm's product diversification on this relationship. Figures 3a and 3b illustrate the estimated relationship between product diversification and firm performance as well as the moderating effect of a firm's international diversification on this relationship.

Insert Figure 2a and 2b About Here

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[9] In 3SLS estimation, equation (model) significance is best judged by the significance of its Chi-square statistic testing the joint significant of the included variables (analogous to the overall F-test in OLS) since the R-square derived from an equation estimated using 3SLS is not bounded by zero and one (Greene, 2003).

Table 3 reports 3SLS estimates of Equation 1 – Firm Performance. The first two columns present results for firm performance measured by ROA, with international diversification measured by the Foreign Sales Ratio and Geographic Entropy in columns 1 and 2, respectively.[10] Columns 3 and 4 in Table 3 report the 3SLS estimates for firm performance measured by Tobin's q with international diversification measured by the Foreign Sales Ratio and Geographic Entropy in columns 3 and 4, respectively. Lastly, columns 5 and 6 in Table 3 report the 3SLS estimates for firm performance measured by Total Stock Return with international diversification measured by the Foreign Sales Ratio and Geographic Entropy in columns 5 and 6, respectively.

In Table 3, international diversification measured by both the Foreign Sales Ratio and Geographic Entropy is significant and negatively related to firm ROA, but significant and positively related to both Tobin's q and Total Stock Return. The square of international diversification measured by the Foreign Sales Ratio is significantly negatively related to all three measures of firm performance. The square of international diversification measured by Geographic Entropy is significantly negatively related to firm performance measured by Tobin's q and Total Stock Return. These results support Hypothesis 1a, that the relationship between international diversification and firm performance will be nonlinear and change from being positive to negative as a firm's international diversification increases when firm performance is measured by Tobin's q or the total stock return. In the case of ROA, the relationship is instead linear and negative.

Figures 2a and 2b depict graphically our findings for the hypothesized nonlinear relationship between international diversification and firm performance when firm performance is measured by firm ROA and Total Stock Return.[11] In Figure 2a, the relationship between international diversification and firm performance measured as ROA is negative (and significant) over the entire range of sample values of international diversification (the Foreign Sales Ratio).

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[10] We also utilized the Herfindahl index as an alternative measure of product diversification in all of our analyses. The results were qualitatively the same as those reported here using the Entropy measure.

[11] These figures are constructed using the coefficient estimates for Equation 1 and the sample mean value of all other equation variables. Graphs of the international diversification-performance relationship are not shown for firm performance measured by Tobin's q or international diversification measured by Geographic Entropy since they are essentially the same as those presented here for performance measured by Total Stock Return.

In Figure 2b, the relationship between international diversification and firm performance measured by Total Stock Return is positive (and significant) at low values of international diversification but negative (and significant) at high values of international diversification. This relationship is positive and significant at the sample mean value of international diversification (24.5%), indicating that for the average firm international diversification and firm performance are positively related.

In Table 3, the coefficient on the interaction between international diversification and product diversification is negative and significant for firm performance as measured by Tobin's Q and Total Stock Return. For firm performance measured by ROA, the interaction is negative and significant only for international diversification measured as Geographic Entropy. These results support Hypothesis 1b that a firm's product diversification will moderate the relationship between international diversification and firm performance. The greater the firm's product diversification, the smaller will be the magnitude of the relationship between international diversification and firm performance.[12]

Figures 2a and 2b depict graphically the moderating effect of product diversification on relationship between international diversification measured by the Foreign Sales Ratio and firm performance measured by firm ROA and Total Stock Return. In each figure, the moderating effect of product diversification is indicated by comparing, at a constant value of international diversification, the slope of the international diversification–performance relationship at different levels of product diversification. Figures 2a indicates the lack of a significant moderating effect on the relationship for firm ROA and the Foreign Sales Ratio. In contrast, Figure 2b shows that for firm performance measured by Total Stock Return, the magnitude of the relationship between firm international diversification and performance is smaller for more product diversified firms, supporting Hypothesis 1b that the greater the firm's product diversification, the smaller will be the magnitude of the relationship between international diversification and firm performance.

Turning to Hypotheses 2a concerning the relationship between product diversification and firm performance, the results in Table 3 for all three measures of firm performance indicate that product diversification is significantly positively related to firm performance and the square of product diversification is significantly negatively related to firm performance.

These results support Hypothesis 2a that the relationship between product diversification and firm performance will be nonlinear, changing from being positive to negative as the firm's product diversification increases.

Figures 3a and 3b depict graphically our findings for the hypothesized nonlinear relationship between product diversification and firm performance when firm performance is measured by firm ROA and Total Stock Return.[13] In both Figures 3a and 3b, the slope of the product diversification-performance relationship is positive (and significant) at the sample mean value of product diversification (17.6%), indicating that for the average firm, product diversification and performance are positively related. These figures also indicate that the relationship between product diversification and firm performance is negative for highly product diversified firms.

As noted previously, the coefficient on the interaction between product diversification and international diversification in Table 3 is, except in the case of the relationship between the Foreign Sales Ratio and firm ROA, negative and significant for all measures of performance and both measures of international diversification. These findings support Hypothesis 2b, that a firm's international diversification will moderate the relationship between product diversification and firm performance. The greater the firm's international diversification the smaller will be the magnitude of the relationship between product diversification and firm performance.[14]

Figures 3a and 3b depict graphically the significant moderating effect of international diversification on the relationship between product diversification and firm performance. Symmetric to the moderating effect of product diversification on the international diversification-performance relationship, both Figure 3a and Figure 3b show that the magnitude of the relationship between firm product diversification and performance is smaller for more internationally diversified firms, supporting Hypothesis 2b.

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[12] Moderating effects were analyzed at low, mean, and high values of firm international diversification and were significant and in the direction hypothesized.

[13] For ease of interpretation, product diversification is measured as a percent of its maximum value rather than the raw entropy score. The maximum attainable value is based on 10 lines of businesses, the maximum number reported by COMPUSTAT. This simple scaling of the raw entropy scores in no way impacts our results. Graphs of the international diversification-performance relationship are not shown for firm performance measured by Tobin's q or international diversification measured by Geographic Entropy since they are essentially the same as those presented here for performance measured by Total Stock Return.

Insert Figure 3a and 3b About Here

Turning to Hypotheses 3 concerning the relationship between international diversification and product diversification, Table 4 presents the 3SLS results of estimating the direct relationship between international and product diversification (Equation 2) while Table 5 presents the 3SLS results of estimating the direct relationship between product and international diversification (Equation 3). In Table 4, the first three columns present the results of estimating international diversification measured by a firm's Foreign Sales Ratio, the last three columns present the results for international diversification measured as Geographic Entropy. In Table 5, the first three columns present the results of estimating product diversification when international diversification is measured by a firm's Foreign Sales Ratio, the last three columns present the results for international diversification measured as Geographic Entropy. The results in Table 4 indicate that, for all three measures of firm performance, the relationship between product diversification and international diversification (measured both in terms of level and scope) is negative and significant. Similarly, in Table 5 the results indicate that, for all measures of firm performance, the relationship between international diversification (measured both in terms of level and scope) and product diversification is negative and significant. Since both Equations 2 and 3 include firm performance as an explanatory variable, the estimated relationships between international and product diversification shown in Table 4 and 5 are the direct relationships that arise while controlling for variation in firm performance (i.e., when performance is held constant). Given this, these results strongly support Hypothesis 3, that a firm's international and product diversification will be negatively related. Together, the results shown in Tables 4 and 5 suggest that within the firm, international and product diversification are alternative or substitute strategies for performance. Hence, controlling for variation in firm performance, strategies that involve extensive product diversification are likely to coincide with lower international diversification and vice versa.

[14] Moderating effects were analyzed at low, mean, and high values of firm product diversification and were significant and in the direction hypothesized.

A more detailed examination of the nature of the trade-off between international and product diversification when variation in firm performance has been controlled can be made directly using Equation 1. Specifically, the three-dimensional relationship between international diversification, product diversification, and firm performance can be examined graphically by first selecting a specific level of performance and then, holding this performance constant, plotting the combinations of international and product diversification associated with this performance outcome. Selecting a different level of performance to hold constant will imply a different set of combinations of international and product diversification associated with this different (constant) performance outcome. As shown in Figure 4, by plotting the combinations of international and product diversification at a given performance outcome, the result is a "family" of elliptical shaped curves; where each ellipse represents a different fixed level of performance. The elliptical shape arises due to the nonlinear relationship between international and product diversification and firm performance (i.e., it involves the squares of international and product diversification).[15]

Insert Figure 4 About Here

In Figure 4, the number associated with each ellipse denotes a level of performance that is being held constant along a given ellipse. Higher performance levels are associated with ellipses closer to the center while lower performance levels are associated with ellipses that lie further from the center. The inner most point of the family of ellipses indicates, in principle, the unique combination of international and product diversification that maximizes a firm's performance (i.e., maximizes the performance of the average firm in our sample). In Figure 4, this performance (measured as Total Stock Return) maximizing combination occurs at a Foreign Sales Ratio of approximately 42% and a level of product diversification of approximately 27%.

Figure 4 clearly indicates the substitute (negative) trade-off between international and product diversification when performance is held constant.

[15] The presence of the interaction term in equation 1 serves to rotate the entire family of ellipses in either a positive or negative direction.

Figure 4 also makes explicit that a firm's international and product diversification strategies are interdependent, and that alternative combinations can have very different performance implications. In this regard, Figure 4 indicates that firms can achieve the same performance outcome with different combinations of international and product diversification and that, depending on a firm's current international and product diversification, subsequent expansion in one dimension or the other alone could either increase or decrease performance.

SUMMARY AND CONCLUSION

This paper sought to provide a better understanding of perhaps the most important research questions in international business and strategic management: the impact of a firm's strategic choices on its performance. By examining the interrelated and simultaneous nature of the relationships between international diversification, product diversification and firm performance, our analysis integrated the international business and strategic management research streams that have largely focused on the performance impact of either geographic or product diversification, but which had not considered them jointly. In doing so, the paper addressed two important gaps in the literature. First, by focusing only on either international or product diversification strategy, the international business and strategy literatures have explicitly assumed that these are independent strategies and hence in general ignored the interrelated nature of the relationships among these strategies and firm performance. Yet managers faced with a fixed set of resources by which to grow and expand the firm are likely to take into account that decisions regarding geographic and product market expansion are in fact interrelated By acknowledging their interdependence, our study provides a much needed integration of our understanding of how these strategic choices jointly impact firm performance. Second, the results of prior research, given the focus only on the performance implications of expansion in only one strategic dimensions (e.g. geographic or product market), offers little information about the nature of the direct relationship between international and product diversification, and in particular whether these are substitute or complementary strategies for firm performance.

In this regard, our analysis makes clear that the predominant method used in the few studies that have attempted to infer the nature of this direct relationship – the use of an interaction variable between international and product diversification in the performance relationship - is fundamentally flawed since it fails to control for variation in firm performance.

Our paper addressed these important research gaps by specifying and estimating a simultaneous equations model to capture the interrelated and simultaneous nature of the relationships between international and product diversification and their joint impact on firm performance. By using more comprehensive models of international and product diversification we were able, for the first time, to estimate the direct relationships between international and product diversification and to therefore detect if they are substitute or complementary strategies.

Our model and estimation methods also addressed Hamilton and Nickerson's (2003) criticism that strategy research has failed to adopt models and estimation methods that can address the endogeneity bias that arises from simultaneity between a firm's strategic choice decisions and its performance. Estimation of our model using three stage least squares (3SLS) addressed this source of bias, but our analysis went further to also mitigate another source of bias likely to have afflicted the results from prior empirical studies: endogeneity arising from (unmeasured) firm specific attributes or characteristics that differ across firms. By mitigating the biases arising from simultaneity and firm heterogeneity, our analysis and results provide a much needed clarity in view of the confounding empirical results from prior studies that have examined the linkage between corporate strategic choices and firm performance.

A key finding of our analysis is that the relationship linking firm performance to international and product diversification strategies is nonlinear, with performance first rising but then falling as a firm expands its international or product diversification. The finding that both international and product diversification have a nonlinear relationship with performance means that the impact of either strategy on firm performance is path dependent, that is, it is dependent on a firm's current diversification posture.

For the international diversification-firm performance relationship, our finding that it is nonlinear (inverted U-shape) corroborates the recent finding of Lu and Beamish (2004) in a sample of Japanese firms. But our results go further by showing that this relationship exists once potential biases arising from simultaneity and firm heterogeneity have been addressed, and that it also exists for U.S. firms.

Our finding that the product diversification-firm performance relationship is also nonlinear - a possibility that has received only limited consideration in prior strategy research - is also consistent with the recent meta-analysis study of Palich, et al. (2000). Our robust findings that these strategic choice-performance relationships are nonlinear offers an explanation for the mixed results obtained in prior research that mostly investigated a linear relationship between international or product diversification strategy and firm performance.

Our findings also indicate that a firm's strategic scope on one dimension (e.g. product-markets) moderates the linkage between the firm's strategy on the other dimension (e.g. geographic markets) and its performance. For a firm that is already highly diversified internationally, expansion of its product market portfolio is likely to have a lower impact on performance compared to a firm this is less internationally diversified and may even reduce its performance. This is a new and significant finding in the context of the international business literature.

Similarly, for an already highly product diversified firm, international expansion is likely to have a less positive effect on its performance compared to a firm this is less product diversified and may even reduce its performance. Prior strategy research has by and large ignored international diversification strategy when examining the product diversification-performance relationship. Our finding that a firm's international diversification strategy has a significant moderating effect on this relationship suggests that firms' international scope should no longer be ignored.

Our model and analysis allowed, for the first time, an examination of the direct relationship between a firm's product and international diversification strategies. Our results indicate that this relationship is negative and significant, and hence that firms' view product and international diversification as substitute strategies for performance. A graphical analysis (Figure 4) based on our results was used to clarify the nature of this substitute relationship, and to illustrate the implications of alternative configurations of international and product diversification strategy for firm performance in view of this substitute relationship. This analysis revealed that the impact of expansion in either dimension of strategic scope on a firm's performance is dependent on the firm's existing mix of international and product diversification strategies and is therefore path dependent.

In this regard, our analysis indicates for a firm that is already over-diversified in one or both dimensions of strategic scope, further expansion in one dimension (e.g. international) would necessitate a contraction in the other dimension (e.g. product markets) if the firm is to maintain the same level of performance. For firms that are instead "under-diversified" on both dimensions, the substitute relationship implies that joint expansion on both dimensions can improve firm performance. This result helps to explain the finding of Delios and Beamish (1999) who found that firms appeared to be simultaneously pursuing both geographic and product diversification, which they interpreted to mean that these were complementary strategies. However, as our analysis demonstrates, firms may pursue both strategies simultaneously, even though international and product diversification are in fact substitute strategies. Our analysis also demonstrates that such complementary expansion would improve firm performance only up to the point at which the firm became over-diversified on one or both dimensions, beyond that point a firm would instead improve its performance by reducing its scope on one or both dimensions

The evidence that firms' view international and product diversification as substitute strategies for performance underscores the failure of past studies to control for variation in firm performance when seeking to detect the nature of the direct relationship between these two strategic dimensions. The interrelated nature of these strategic scope dimensions and their joint impact on firm performance suggests that careful analysis of a firm's current international and product diversification strategy is needed before any recommendation can be made regarding changes on either dimension. Our finding that the performance impact of alternative strategic scope configurations is path dependent clearly complicates the desire to universally prescribe corporate diversification or corporate refocusing as the means to higher performance.

In summary, our operationalization of key constructs, our model specification, and our estimation methods and use of panel data allowed us to more fully address the empirical limitations of prior work in this area. By using two different measures of international diversification we were able to capture both the level and scope of a firm's international activities. By specifying more complete and comprehensive equations to model a firm's choice of international and product diversification strategy we were able to adopt the much needed simultaneous equations framework, and our complete model allowed us to fully capture the interrelated and simultaneous nature of firms' choices regarding their international and product diversification strategies and the join impact of these strategies on their performance.

Our estimation methods directly addressed endogeneity biases arising from simultaneity and firm heterogeneity that often plague empirical research in both strategy and international business due to their reliance on cross-sectional data and a failure to explicitly model the simultaneous nature of the underlying relationships. In these respects, our research design, estimation methods, and analysis of results constitute important methodological contributions to the empirical strategy and international business literatures. We hope that our research methods and analysis can serve as a benchmark and a catalyst for future empirical study of the key questions and issues that are the focus of research in the fields of international business and strategic management.

APPENDIX A

This appendix provides definitions and the sources of data for all the exogenous variables in our model.

Firm Size. Following past research, firm size is measured as the logarithm of a firm's total revenue as taken from COMPUSTAT.

Firm R&D Intensity. Firm R&D intensity is measured as the ratio of the firm's R&D expenditures to total sales. Data for this measure were taken from COMPUSTAT.

Core Industry Identity. A firm's core business is traditionally defined as the firm's largest 4-digit SIC business segment in terms of revenue (Rumelt, 1974). Based on the identity of the firm's core business in 1986, the core industry was defined as the 4-digit SIC industry in which the core business operates.

Core Business Performance. Core business performance reflects the financial profitability of the firm's core business and is measured as the ratio of operating profit to assets in the 4-digit SIC core industry of the firm as reported in COMPUSTAT's line of business segment database.

Industry Foreign Competition. Foreign competition is measured by the ratio of imports to total domestic purchases (i.e., import penetration) in the 4-digit SIC level core industry of the firm lagged one year. Annual data on import penetration by 4-digit SIC were provided by Peter Schott (Bernard, et al., 2006).

Industry Growth. Industry growth is measured by the annual rate of growth in total U.S. domestic purchases in the 4-digit SIC core industry of the firm. Annual data on total U.S. domestic purchases by 4-digit SIC were provided by Peter Schott (Bernard, et al., 2006).

Industry ROA. Industry ROA is measured by the return on assets in the 4-digit SIC core industry of the firm and ROA data were taken from COMPUSTAT.

Industry Concentration. Industry concentration is measured by the 4-firm concentration ratio of the 4-digit SIC core industry of the firm; these data are only available every 5 years from the U.S. Census of Manufacturers.

Industry Economies of Scale. Economies of scale in a 4-digit SIC industry is measured using the "mid-point" method (Kobrin, 1991; Pugel, 1978; Weiss, 1963). This method computes the average employment size of establishments that produce the median level of industry output. This average employment figure is then divided by total industry employment.

Data on average employment by size of establishment in each 4-digit SIC are only available for the benchmark economic census years 1992 and 1997 as compiled by U.S. Census Bureau (1987 and 1992). Estimates of economies of scale based on 1992 data were used for all years between 1986 and 1996; estimates based on 1997 data were used for all years after 1996.

Industry Capital Intensity. Industry capital intensity is measured by the ratio of the real capital stock to total employment in the 4-digit SIC core industry of the firm. Real capital stock is measured in millions of 1987 dollars. Annual data on industry real capital stock and employment from 1987 to 1997 are from the NBER's Productivity Database (Bartelsman and Gray, 1996). This data series was extended to 1999 using data on industry investment and industry employment derived from the U.S. Annual Survey of Manufactures.

World Industry Export Intensity. We capture the extent of an industry's worldwide linkages using a world measure of export intensity calculated as follows:

$$\text{World Industry Export Intensity} = \frac{\text{World Industry Exports}}{\text{World Industry Sales}}$$

Annual data on worldwide industry sales and worldwide industry exports were derived from the World Bank's Trade and Production database (Nicita and Olarreaga, 2001), which contains data on the exports, imports, and production of 67 developed and developing countries over the period 1976-1999. The industry classification used by the database is the 3-digit level of the International Standard Industrial Classification (ISIC).[16]

Intra-industry Trade. The extent of intra-industry trade in an industry is measured by the Grubel and Lloyd (1975) index of intra-industry trade:

$$\text{Intra-industry Trade} = \frac{[(\text{Exports} + \text{Imports}) - \text{absolute value}(\text{Exports} - \text{Imports})]}{(\text{Exports} + \text{Imports})}$$

[16] The worldwide measures were calculated based on annual data for 67 countries that include those with the highest GDPs and trade volumes in the world. As no official correspondence between the 3-digit ISIC system and the 1987 3-digit U.S. SIC system is available, we matched world import and world production values (over the 67 countries) in each of the 28 3-digit ISIC industries to each of 126 3-digit SIC industries appearing in our sample of firms.

A zero value means that trade in the industry consists entirely of either exports or imports and that the firms in the industries lack global integration of their value added activities across national boundaries. A value of one occurs when exports equal imports so that all trade is intra-industry trade. Higher values of the intra-industry trade measure are indicative of industries where there is greater global integration of the firms' value added activities across national boundaries. Values of the intra-industry trade measure were calculated for each 4 digit SIC industry using annual data on U.S. exports and U.S. imports at the 4-digit SIC level taken from the United Nations Trade Data Bank.

World Industry Growth. Annual world industry growth is measured by the annual growth in the nominal value of world production derived from the World Trade and Production database (Nicita and Olarreaga, 2001). Since world production equals world consumption, this equivalently measures an industry's worldwide market growth. Values of world production at the 3-digit ISIC level were matched to the 3-digit U.S. SIC and the annual output growth in each 3-digit SIC industry was then assigned to a corresponding 4-digit SIC industry.

World Industry Trade Barriers. The tariff rate in an industry is a widely used indicator of international trade barriers (Anderson and Neary, 1994; Balassa and Balassa, 1984; Leamer, 1974; Nogués, et al., 1986). Annual data on the average worldwide tariff in a given 3-digit SIC industry were derived from the World Bank Trade and Production database (Nicita and Olarreaga, 2001). For each of 67 countries, the database reported a country's average MFN (Most Favored Nation) tariff rate in each of 28 3-digit ISIC industries, where these industry level tariff averages were derived from tariff rates at a detailed commodity level. Using these data, we matched each 3-digit ISIC industry to specific 3-digit SIC industry to obtain the average worldwide tariff rate in each 3-digit SIC industry. In our sample, world industry trade barriers as measured by the average tariff rate in a firm's core industry ranged from 0.007 to 0.138, with a mean of 0.003.

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Table 1. Review of Recent Studies on International Diversification, Product Diversification and Firm Performance

Study	Sample & Time Period	Performance Measures	ID Measure	Models Tested	Findings
Doukas and Kan JIBS, 2006	♦ Cross-Border Acquisition of US firms ♦ 1992-97 ♦ N=612	♦ Excess market value	♦ Dummy variable – yes if MNC ♦ Foreign sales percentage	♦ Linear model only ♦ ID and performance ♦ No control for PD ♦ No simultaneity ♦ No firm heterogeneity	♦ ID negatively related to performance.
Lu & Beamish AMJ, 2004	♦ Japanese firms ♦ 1986-97 ♦ n=159	♦ ROA, Tobin's q	♦ Count of number of overseas subsidiaries ♦ Count of number of countries	♦ ID and performance ♦ ID squared & performance ♦ ID cubed & performance ♦ PD a control variable ♦ No simultaneity ♦ No firm heterogeneity	♦ PD negatively related to performance ♦ ID negatively related to performance at high & low levels of ID ♦ ID positively related to performance at moderate levels of ID
Doukas & Lang JIBS, 2003	♦ US firms ♦ 1980-92 ♦ n=156	♦ Abnormal returns – event-study	♦ FDI announcements	♦ Linear model only ♦ FDI announcements & performance ♦ No simultaneity	♦ Core related FDI announcements are value increasing ♦ Unrelated FDI announcements are value decreasing
Hsu & Boggs MBR, 2003	♦ US Public companies ♦ 1996-98 ♦ n=118	♦ ROE, ROA	♦ Foreign sales percent ♦ Count of the number of countries	♦ ID and performance ♦ ID squared (non linear) ♦ No control for PD ♦ No simultaneity ♦ No firm heterogeneity	♦ ID positively related to performance ♦ ID squared is not significant
Capar & Kotabe JIBS, 2003	♦ German service firms ♦ 1997, 1999 ♦ n=81	♦ ROS	♦ Foreign sales percent	♦ ID and performance ♦ ID squared & performance ♦ No control for PD ♦ No simultaneity	♦ ID positively related to performance ♦ ID squared positively related to performance
Goerzen & Beamish SMJ, 2003	♦ Japanese MNEs ♦ 1999 ♦ n=290	♦ Jensen's alpha ♦ Sharpe's measure ♦ Market-to-Book ratio	♦ Asset dispersion entropy – based on distribution and number of employees across countries ♦ Count of the number of countries ♦ Count of the number of foreign subsidiaries	♦ Linear model only ♦ ID and performance ♦ PD as control variable ♦ No simultaneity	♦ ID (asset dispersion) positively related to performance.

Study	Sample & Time Period	Performance Measures	ID Measure	Models Tested	Findings
Denis, Denis, & Yost J. Finance, 2002	• US public firms • 1984-97 • Panel data • n=7520	• Excess market value	• Dummy variable – yes/no if globally diversified (having foreign sales)	• Linear model only • PD, ID and performance • No simultaneity • Firm and year fixed effects	• Increasing ID over time • Decreasing PD over time • PD (dummy) negatively related to performance • ID (dummy) negatively related to performance
Kotabe, Srinivasan, & Aulakh JIBS, 2002	• US companies • 1986-93 • n=49	• ROA	• Foreign income to total income	• Linear model only • ID and performance • No control for PD • No simultaneity • No firm heterogeneity	• ID positively related to performance
Davies, Rondi, & Sembenelli, JIO, 2001	• European firms • 1987 • n=277	• None	• Dummy variable (domestic vs. international)	• Linear model only • ID and PD	• PD and ID complementary if firm already PD
Geringer, Tallman, & Olsen SMJ, 2000	• Japanese MNEs • 1981 • n=108	• ROA, ROS	• Export sales to total firm sales • Foreign Sales Ratio	• PD and performance • PD squared & performance • ID and performance • ID and PD interaction on performance • No simultaneity	• ID negatively related to performance • No significant interaction effects • PD not significantly related to performance
Gomes & Ramaswamy JIBS, 1999	• US MNEs from 4 industries • Multiple years • n=95	• ROA, operating cost to sales	• Composite index of sales, assets, and countries of operations	• ID and performance • ID squared & performance • No control for PD • No simultaneity	• Find support for a curvilinear relationship between ID and performance
Delois & Beamish SMJ, 1999	• Japanese manufacturing firms • 1995 • n=399	• ROA, ROS, ROE	• Number of FDIs made by the firm • Number of countries in which FDI occurred	• Linear model only • ID, PD, & performance • No simultaneity	• ID positively related to performance
Tallman & Li AMJ, 1996	• US MNEs • 1987 • n=192	• ROS	• Foreign sales percentage • Number of foreign countries in which the firm operates	• ID, PD, and performance • PD squared & performance • No simultaneity	• PD is not significantly related to performance • ID positively related to performance

Study	Sample & Time Period	Performance Measures	ID Measure	Models Tested	Findings
Geringer, Beamish, & daCosta SMJ, 1989	• MNEs from Europe & US • 1982 • n=189	• ROS, ROA	• Foreign sales percentage classified into categories	• Linear model only • ID and performance • PD and performance • 2 way ANOVA to examine joint effect of ID and PD on performance • No simultaneity	• ID positively related to performance • PD – certain types of PD positively related to performance • No significant interaction between ID and PD for performance
Kim, Hwang, & Burgers, 1993 SMJ, 1989	• US MNEs • 1982-85 • n=62	• ROA growth • Operating Profit growth	• Grouped firms into categories that combined PD and ID	• Linear model only • ID, PD & performance • No simultaneity • No firm heterogeneity	• PD and performance relationship varies depending on level of ID
Kim, Hwang, & Burgers SMJ, 1989	• US MNEs • 1982 • n=125	• ROA	• Entropy measure of global diversification	• Linear model only • ID and performance • PD and performance • No simultaneity	• ID positively related to performance

Table 2. Variable Means, Standard Deviations and Correlations [a]

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. Firm ROA	0.086	0.126	1											
2. Tobin's q	1.365	0.474	0.311	1										
3. Total Stock Return	1.050	0.424	0.236	0.251	1									
4. Foreign Sales Ratio	0.245	0.197	-0.067	0.150	0.006	1								
5. Geographic Entropy	0.399	0.262	-0.007	0.193	0.015	0.865	1							
6. Product Diversification	0.176	0.199	0.174	-0.059	0.015	-0.250	-0.219	1						
7. Firm Size	5.730	2.012	0.265	0.215	0.060	0.198	0.312	0.333	1					
8. Firm R&D Intensity	0.047	0.056	-0.312	0.085	-0.071	0.236	0.217	-0.251	-0.171	1				
9. Core Business Performance	0.097	0.248	0.552	0.161	0.128	-0.043	-0.008	0.149	0.134	-0.168	1			
10. Industry Foreign Competition	0.213	0.198	-0.107	-0.032	-0.019	0.076	0.072	-0.183	-0.120	0.100	-0.084	1		
11. Industry Growth	0.063	0.188	-0.047	0.052	0.010	0.064	0.063	-0.127	-0.035	0.168	-0.036	0.150	1	
12. Industry ROA	0.084	0.145	0.035	0.003	-0.001	-0.018	-0.011	-0.029	-0.043	-0.052	0.020	0.015	-0.019	1
13. Industry Concentration	0.359	0.174	-0.027	0.006	0.006	-0.055	-0.037	0.072	0.249	0.009	0.003	-0.006	0.048	-0.068
14. Industry Economies of Scale	0.145	0.190	-0.035	0.090	-0.044	0.096	0.107	-0.054	-0.013	0.092	-0.029	0.144	0.047	-0.059
15. Industry Capital Intensity	1.002	1.215	0.012	0.029	0.026	0.098	0.107	0.114	0.407	-0.068	-0.001	-0.034	-0.003	-0.097
16. Industry R&D Intensity	0.054	0.053	-0.128	0.019	-0.010	0.045	0.004	-0.110	-0.128	0.317	-0.050	-0.098	0.119	-0.101
17. World Industry Export Intensity	0.375	0.160	-0.100	0.067	-0.011	0.108	0.095	-0.181	-0.158	0.183	-0.069	0.351	0.118	0.010
18. Intra-Industry Trade	0.700	0.217	-0.017	0.005	-0.012	0.100	0.100	-0.133	-0.129	0.153	-0.012	-0.036	0.088	-0.002
19. World Industry Growth	0.052	0.092	0.016	-0.117	-0.008	-0.100	-0.107	0.049	-0.108	-0.009	0.021	-0.129	-0.010	-0.007
20. World Industry Trade Barriers	0.030	0.015	0.024	0.152	0.063	0.034	0.054	-0.047	0.064	-0.037	-0.005	0.105	0.036	0.031

Variable	13	14	15	16	17	18	19
13. Industry Concentration	1						
14. Industry Economies of Scale	0.041	1					
15. Industry Capital Intensity	0.129	-0.004	1				
16. Industry R&D Intensity	0.260	0.031	-0.121	1			
17. World Industry Export Intensity	-0.042	0.529	-0.186	0.091	1		
18. Intra-Industry Trade	-0.126	0.026	-0.119	0.156	0.104	1	
19. World Industry Growth	0.013	-0.358	-0.148	0.091	-0.399	-0.004	1
20. World Industry Trade Barriers	0.017	0.229	-0.030	-0.123	0.294	-0.026	-0.596

N = 7172

[a] A correlation coefficient whose absolute value exceeds 0.0232 is significantly different from zero at the 5% level.

Table 3. 3SLS Results Predicting Firm Performance [a]

Variable	Return on Assets		Tobin's q		Total Stock Return	
	Foreign Sales Ratio	Geographic Entropy	Foreign Sales Ratio	Geographic Entropy	Foreign Sales Ratio	Geographic Entropy
International Diversification	-0.299***	-0.328***	2.955***	2.082***	6.856***	4.636***
International Diversification Squared	-0.348**	0.055	-3.889***	-2.144***	-5.757***	-3.302***
Product Diversification	0.405***	0.711***	3.764***	3.519***	6.786***	5.947***
Product Diversification Squared	-0.643***	-0.801***	-8.726***	-7.900***	-6.733***	-5.481***
Interaction: International x Product Diversification	-0.203	-0.276**	-1.070†	-1.577**	-6.921***	-4.310***
Firm Size (lagged)	0.029***	0.023***	0.131***	0.145***	-0.123***	-0.098***
Industry Concentration	0.020†	0.039**	0.595***	0.478***	0.378***	0.250**
Industry Economies of Scale	0.013**	0.014**	0.113***	0.203***	-0.215***	-0.121***
Industry R&D Intensity	0.076**	0.079*	0.743***	0.549***	0.798***	0.541**
R-square	0.444	0.468	0.934	0.938	0.829	0.850
Model Chi-Square	8446***	8582***	102769***	111669***	39441***	43949***

N = 7172; † p<.20, * p<.10, ** p<.05, *** p<.01

[a] Estimation uses firm fixed effects to account for unobserved heterogeneity across firms.

Table 4. 3SLS Results Predicting International Diversification [a]

Variable	Foreign Sales Ratio			Geographic Entropy		
	ROA	**Tobin's q**	**Total Stock Return**	**ROA**	**Tobin's q**	**Total Stock Return**
Product Diversification	-0.399***	-0.524***	-0.545***	-0.387***	-0.582***	-0.566***
Firm Performance	-0.888***	-0.035***	0.043***	-0.849***	-0.066***	0.020**
Firm Size (lagged)	0.058***	0.051***	0.039***	0.075***	0.076***	0.061***
Firm R&D Intensity (lagged)	0.028	0.190***	0.156***	0.027	0.160***	0.130***
Industry Foreign Competition (lagged)	-0.019**	-0.017*	-0.019**	-0.032***	-0.030***	-0.031***
Industry Capital Intensity	0.007*	0.020***	0.015***	0.016***	0.028***	0.022***
World Industry Export Intensity (lagged)	0.120***	0.151***	0.137***	0.218***	0.252***	0.222***
Intra-Industry Trade (lagged)	0.015**	0.017**	0.010+	0.029***	0.039***	0.032***
World Industry Growth	0.039***	0.013	-0.004	0.062***	0.043**	0.021
World Industry Trade Barriers	-0.034	0.033	-0.081	0.042	0.266**	0.111
R-square	0.852	0.910	0.904	0.929	0.946	0.947
Model Chi-Square	62272***	87337***	86293***	124690***	149170***	151104***

N = 7172; † p<.20, * p<.10, ** p<.05, *** p<.01

[a] Estimation uses firm fixed effects to account for unobserved heterogeneity across firms.

Table 5. 3SLS Results Predicting Product Diversification [a]

Variable	Product Diversification (Foreign Sales Ratio)			Product Diversification (Geographic Entropy)		
	ROA	Tobin's q	Total Stock Return	ROA	Tobin's q	Total Stock Return
International Diversification	-0.472***	-0.644***	-0.715***	-0.309***	-0.443***	-0.481***
Firm Performance	0.087*	-0.065***	0.070***	0.318***	-0.072***	0.062***
Firm Size (lagged)	0.051***	0.074***	0.048***	0.048***	0.079***	0.053***
Firm R&D Intensity (lagged)	0.080**	0.128***	0.082**	0.069*	0.085**	0.025
Core Business Performance (lagged)	0.005	0.007*	0.010**	0.003	0.008*	0.011***
Industry Foreign Competition (lagged)	-0.044***	-0.036***	-0.037***	-0.046***	-0.042***	-0.044***
Industry Growth	0.000	0.005	0.002	-0.001	0.006	0.003
Industry ROA	-0.010+	-0.006	-0.007	-0.010+	-0.006	-0.007
Industry Economies of Scale	0.022***	0.037***	0.044***	0.028***	0.042***	0.049***
R-square	0.832	0.809	0.782	0.821	0.813	0.798
Model Chi-Square	38942***	39829***	38428***	37574***	39539***	38471***

N = 7172; † p<.20, * p<.10, ** p<.05, *** p<.01

[a] Estimation uses firm fixed effects to account for unobserved heterogeneity across firms.

FIGURE 1

Model Framework

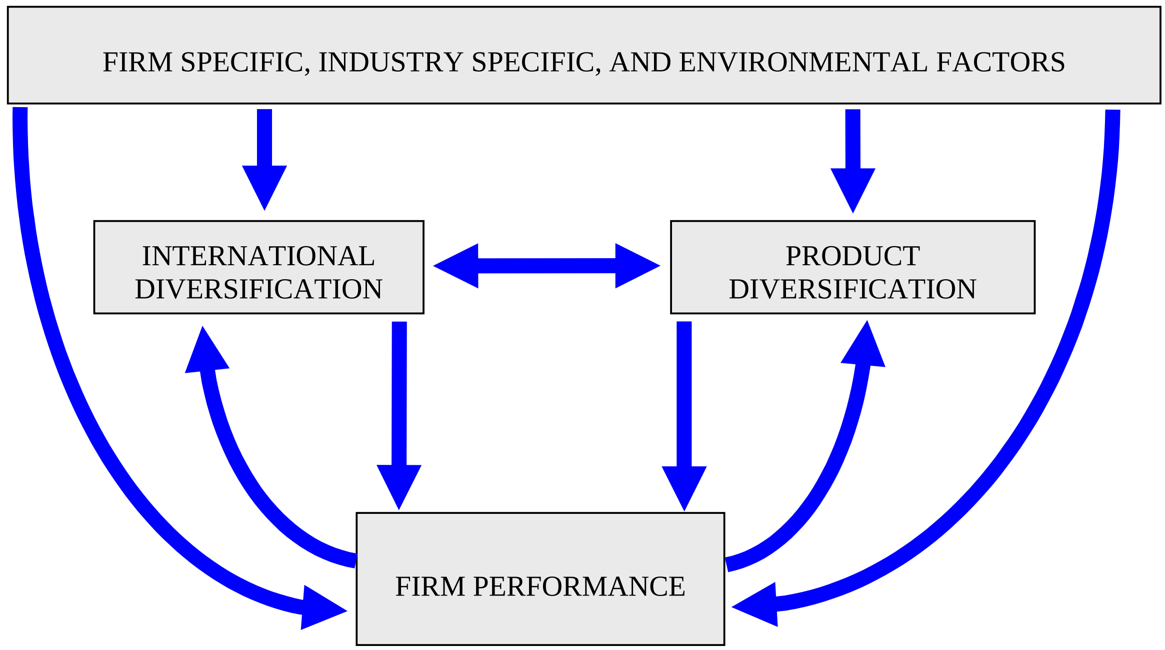


FIGURE 2A

Moderating Effect of Product Diversification on the Relationship Between International Diversification and Firm Performance (Firm ROA)

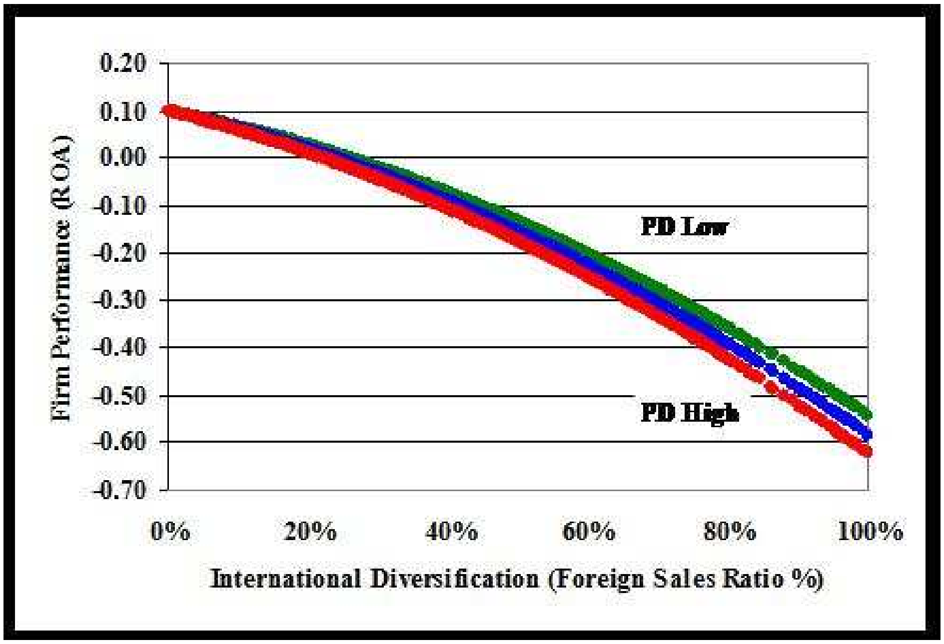


FIGURE 2B

Moderating Effect of Product Diversification on the Relationship Between International Diversification and Firm Performance (Total Stock Return)

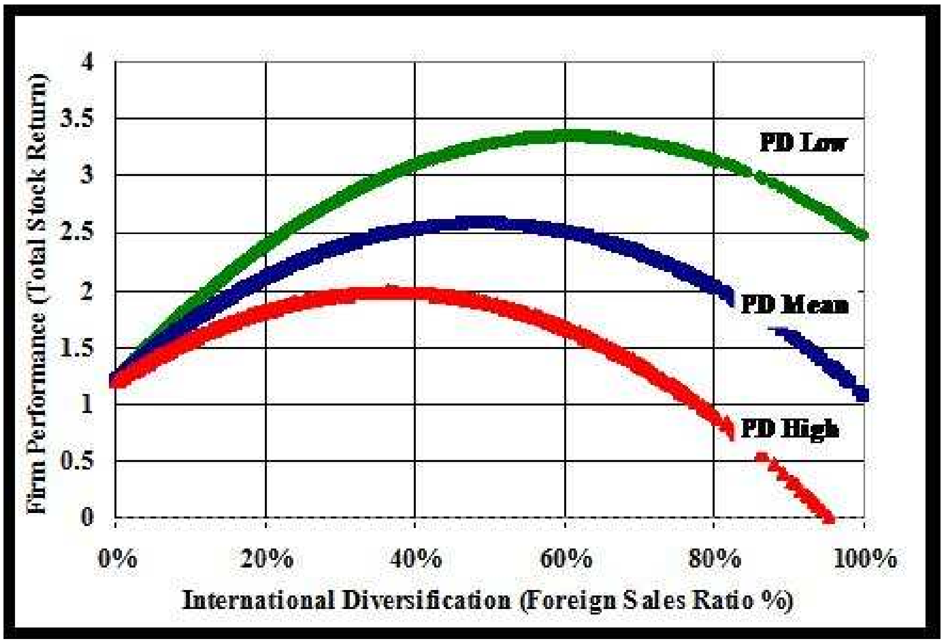


FIGURE 3A

Moderating Effect of International Diversification on the Relationship Between Product Diversification and Firm Performance (Firm ROA)

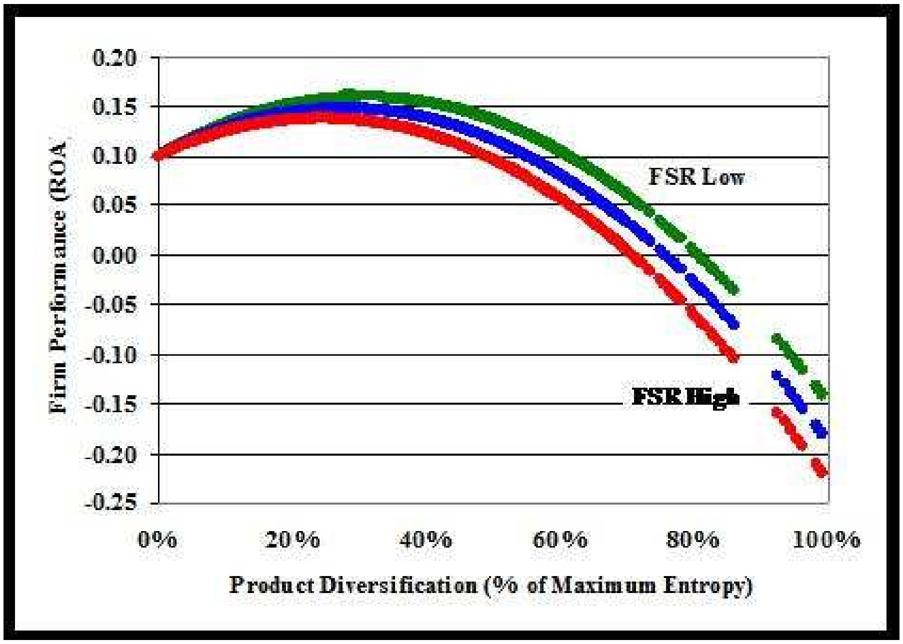


FIGURE 3B

Moderating Effect of International Diversification on the Relationship Between Product Diversification and Firm Performance (Total Stock Return)

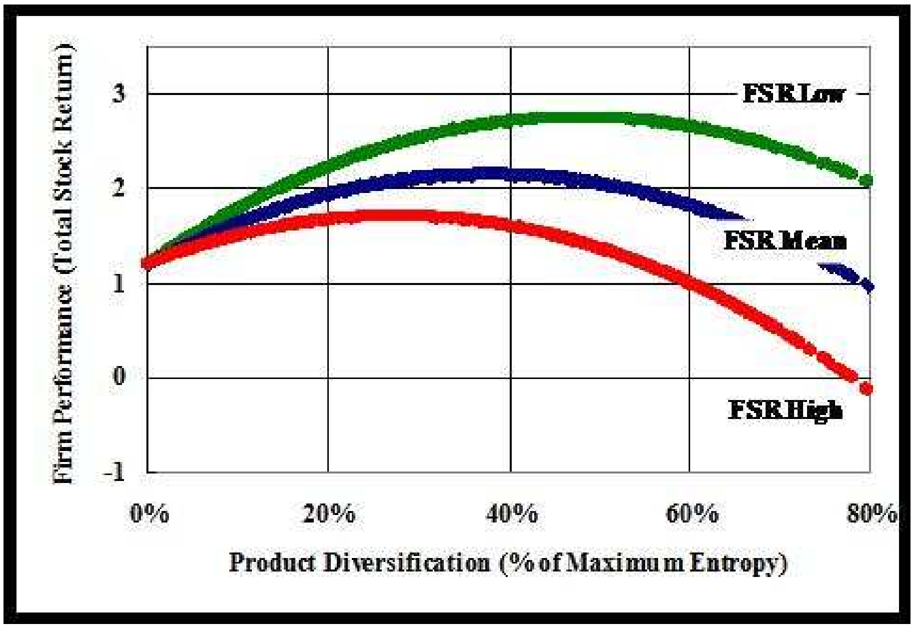
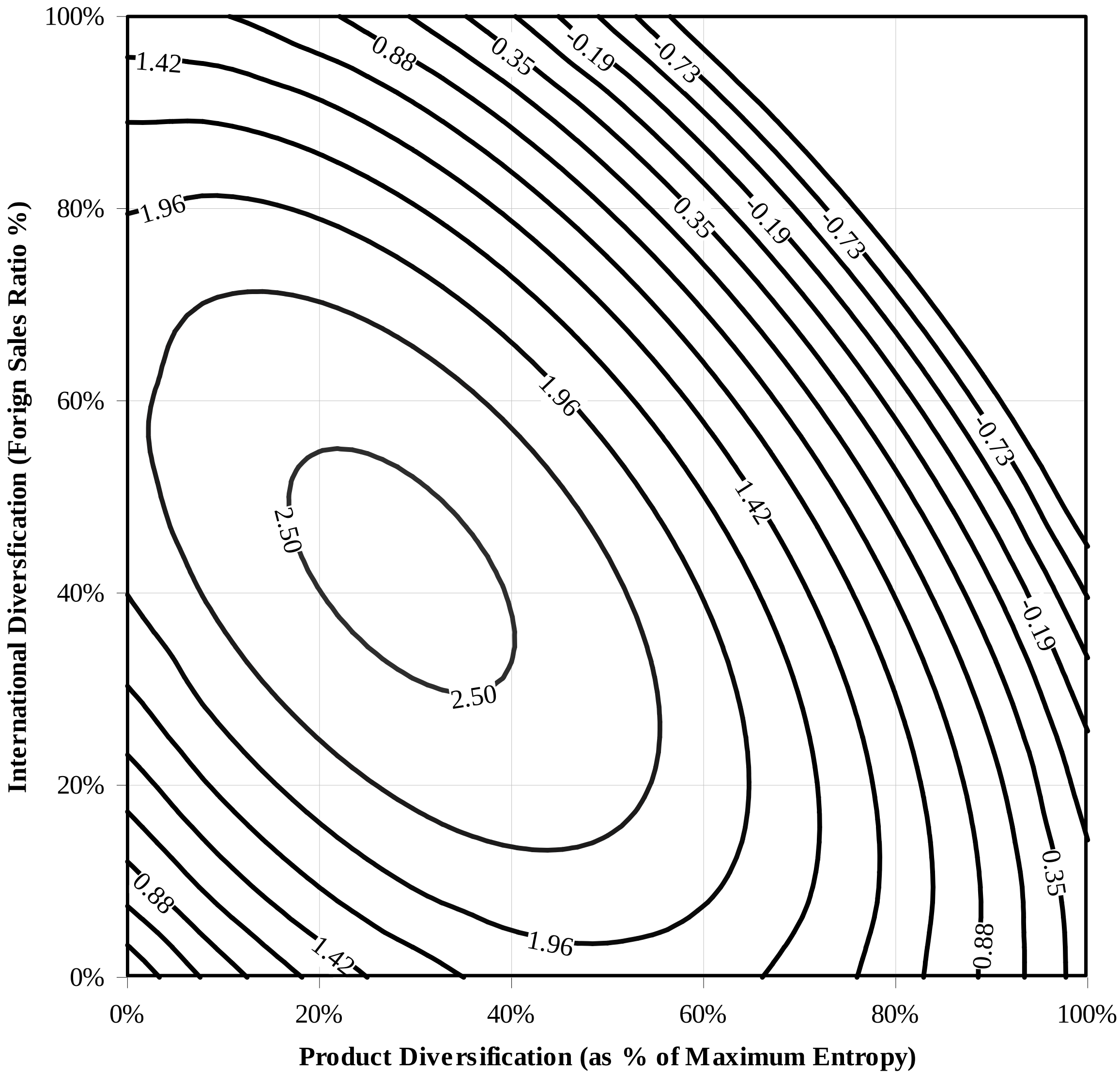


FIGURE 4.

Relationship Between International and Product Diversification for Constant Values of Firm Performance (Total Stock Return) [a]



[a] Figure based on estimated equation 1. Each ellipse represents a fixed value of firm performance, with ellipses closer to the center indicating higher performance and ellipses farther away from the center indicating lower performance. Movement along a given ellipse indicates the nature of the tradeoff between international and product diversification for the same level of firm performance.