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THE EMPIRICS OF MULTINATIONALITY AND PERFORMANCE

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ABSTRACT

The relationship between a firm's degree of multinationality and its performance is perhaps the most studied relationship in the field of international business. In this paper I address issues concerning the empirical estimation of this relationship. I argue for greater delineation of the underlying nature of firms' multinationality and I point to several statistical issues regarding estimation that appear to need resolution, but which appear to have been largely neglected in the international business literature. Among these are endogeneity of the multinationality construct in the performance relationship and the likelihood that the multinationality-performance relationship is heterogeneous across firms.

THE EMPIRICS OF MULTINATIONALITY AND PERFORMANCE

It was recently suggested that what determines the international success or failure of firms is the "one big question" that has, and should remain, at the core of international business research (Peng, 2004). True to this dictum, whether and how firm performance depends on a firm's degree of "multinationality" remains one of the most researched questions in the international business literature. As readers of this volume are likely aware, conflicting empirical results produced over the past 25 years have precluded reaching a consensus regarding the answer to this key question. However, recent research has made important inroads into the analysis of this key question as it attempts to reconcile prior results. A seemingly important direction has been to explore the functional nature of the multinationality-performance relationship; in particular, whether it is nonlinear and if so, what is the nature of this nonlinearity. The results of this strand of work appear to suggest that the relationship is indeed non-linear.

While recent efforts have sought to refine the nature of an empirical multinationality-performance, there are several issues that appear to have been largely neglected in the broad literature on this subject. In this chapter I reflect on these issues and offer thoughts for improvement and directions for further work. Some of the issues raised are statistical while others deal with conceptualizations of the multinationality-performance relationship, and ultimately how estimation of this relationship may allow us to better understand the "one big question." In this regard, I reconsider the underlying notions of multinationality and their associated costs and benefits to suggest that attention could usefully be directed toward the different forms in which multinationality manifests itself, what I call "modes of multinationality" (MoMs). This call for differentiating different aspects of multinationality parallels Rugman and Verbeke's (2004) observation that relatively few "global" companies appear to be truly global in scope; they instead appear to concentrate on exploiting their advantages in their closer regional markets.

From Theory to Empirics

For over 25 years considerable intellectual effort has been directed toward understanding the basis for the multinational firm. The predominant theory ascribes the existence of the multinational firm to ownership, location and internalization advantages (Dunning, 1981; Rugman, 1981), with more recent work stressing the multinational firm as an organic mechanism for the spatial transmission of tacit knowledge regarding the resources and capabilities that underlie a firm's competitive advantages (Kogut, 1997; Kogut and Zander, 1993). These theoretical frameworks serve to explain the governance structure represented by the multinational firm, and to suggest why such firms might be expected to outperform their equivalent but purely domestic rivals.

Based on these theoretical frameworks, a extensive empirical literature (for an exhaustive summary see Hitt, et al., 2006) has examined for a relationship between the extent or degree of multinationality and firm performance; the degree of multinationality is most often captured by either the firm's foreign sales ratio (share of a foreign sales in total firm sales) or by a measure of the geographic distribution of firm sales. The key elements for hypothesizing a relationship between a firm's degree of multinationality and its performance rests primarily on arguments about the behavior of the two components of a firm's profit (performance): revenue and cost, and their relationship to the extent of a firm's international presence. On the revenue side, gains from venturing into new markets arise from the exploiting market imperfections (Rugman, 1979) and firm specific advantages that are in turn linked to firm's intangible assets (Caves, 1996). Firms may also gain from opportunities to engage in price discrimination if markets can be spatially segmented. On the cost side, the spreading of the (quasi-fixed) costs of investments in creating intangible assets (e.g., R&D and advertising) over a larger customer base confers economics of scale, and the ability to deploy intangible assets having public good characteristics (i.e., knowledge capital,) into the different markets in which the firm operates can confer economics of scope. Increased geographic reach and an attendant increase in the size of the firm can also confer advantages, and hence cost savings, over suppliers, distributors, etc. Firms may also use their geographic reach to reconfigure value chain activities to arbitrage difference in factor input costs across markets.

However, these advantages come at a cost: international expansion into *new* markets will incur (fixed) costs associated with the "liability of foreignness" (Hymer, 1976). These entry costs depend on the nature of the firm's products, the extent to which they need adaptation to local conditions, and the firm's relative unfamiliarity with local business practices. All these factors suggest that a firm will enter and be present in a foreign market if it perceives that its inherent capabilities will overcome these initial costs associated of the liability of foreignness. As is discussed later below, that a firm initially incurs additional costs to enter a foreign market suggests that its performance would be expected to improve the longer the firm is present in a given market since the liability of foreignness and its attendant costs would be expected to decline as the firm learns about its host market(s).

The above summarizes the essential theoretical elements that have led researchers to hypothesize a positive relationship between a firm's degree of multinationality and its performance. In what follows I take the underlying theoretical rationale for a relationship between performance and multinationality as given and instead focus on various issues that arise when seeking to empirically detect the nature of the hypothesized relationship.

Measuring Multinationality

To a large extent, the choice of a measure of multinationality has been data bound, meaning that while scholars may have a wish list of variables to capture their idea of what is meant by a firm's degree of multinationality, data constraints have generally prohibited such wishes from becoming reality. The measures that have been used are generally of two types. The first captures the degree of a firm's international orientation or involvement in international markets. The most common measure of this type, and also the most commonly used measure in empirical studies, is the foreign sales ratio, defined as the share of a firm's total sales that derive from outside its home market. This measure therefore captures multinationality in terms of the importance of international transactions to the firm, and it can often include exports and well as sales by foreign affiliates. Other measures of this type would include foreign assets to total assets, foreign employment to total employment, and a count of the number of foreign affiliates.

The second class of measures instead attempts to capture the diversity of a firm's international involvement. The most common measure of this type is an entropy type diversity index based on a firm's sales shares across different geographic markets, although the Herfindahl type index has also been used.[1] Other share variables that can be used to construct such diversity indexes are affiliate asset shares and affiliate employment shares across different countries or regions. Another diversity measure is a count of the number of markets in which a firm is active. Generally, the first type of measure is thought to capture the depth of a firm's involvement in international markets while the second type of measure is thought to capture the breath of the firm's involvement in international activities.

Some researchers rightly see multinationality as a multidimensional construct that encompasses both of the above types of a firm's international involvement (and perhaps others) and that the measure of multinationality should therefore also have a multidimensional flavor (Sullivan, 1994). Researchers have therefore often constructed composite measures, such as the average of the foreign sales ratio and the ratio of affiliate employment to total employment. In this context, the UNCTAD routinely publishes as part of its *World Investment Report* a "Transnationality Index" defined for each firm as the average of three ratios: foreign assets to total assets, foreign sales to total sales and foreign employment to total employment. Others (e.g., Contractor, Kundu and Hsu, 2003) have used data reduction methods such as factor analysis or principle components to combine different multinationality measures into a single composite.

While the desire for a single measure that can capture all the seemingly diverse aspects of firms' international activity is perhaps understandable, collapsing different dimensions of multinationality would appear the wrong direction to take if one is to gain a better understanding of how multinationality impacts performance.

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[1] For a given share variable S_i, (.e.g., share of region i's sales in total firm sales) the Entropy measure is $E = -\sum_{i=1}^{N} S_i \, ln\left(S_i\right)$ while the Herfindahl measure is computed as $H = \sum_{i=1}^{N}\left(S_i^2\right)$. Higher values of E indicate more similarity in share values and E reaches it maximum value when all shares are equal. Higher values of H instead indicate less similarity across share values so the inverse of the H values is often used. In each case, greater similarity across the share values is taken to indicate greater diversity.

Instead, if we are to move closer to answering Peng's (2004) "one big question," it would seem desirable to have a greater understanding and identification of the individual sources of higher (lower) performance that may arise from multinationality. This argues for disaggregation rather than aggregation, for example, to distinguish the involvement of a firm in one geographic region versus another or the nature of its affiliate activity (e.g., production vs. distribution) in different locations. Rather than aggregate different dimensions of multinationality it would seem worthwhile to consider them separately, and to seek to obtain measures that better capture the underlying nature of a firm's involvement in international markets. As discussed in the next section, recent research on the multinational-performance relationship suggests that more clarity on the different bases or forms of multinationality is warranted.

The Nature of the Multinationality-Performance Relationship

Early studies of the multinationality-performance relationship were directed at uncovering the nature of the relationship with the null hypothesis being that the relationship is positive. The investigations were therefore directed more at uncovering an association as opposed to a causal relationship, and the usual linear specification was adopted. While several studies found evidence of a positive relationship, others found no relationship or a negative relationship (for reviews see Contractor, Kundu and Hsu (2003) and Hitt, et al., (2006)). These conflicting findings have generally prevented reaching a consensus about the nature of the relationship.

Some of the most recent efforts (e.g., Gomes and Ramaswamy, 1999; Contractor, Kundu and Hsu, 2003; Lu and Beamish, 2004) have sought to resolve the conflicting results of past studies by giving greater consideration to the underlying costs associated with international expansion (either in terms of depth or breath) and what this implies for the nature of the multinationality-performance relationship. The result of these efforts is to suggest that a potential explanation for the previously mixed results is that the multinationality-performance relationship is nonlinear. Initial results indicated that the relationship follows an inverted U-shape (Gomes and Ramaswamy, 1999; Geringer, Tallman, and Olsen, 2000). The most recent analyses propose that the relationship is more complex, and in particular, have posited that the relationship is S-shaped.

Researchers have interpreted the hypothesized S-shape to mean that firms pass though (three) stages of international expansion, with the performance implication of expanded multinationality being different at each stage (Contractor, Kundu and Hsu, 2003; Lu and Beamish, 2004). Below I offer some reflections on this evolving strand of the literature.

The rational for postulating a nonlinear relationship (quadratic, cubic, etc.) derives primarily from a deeper consideration of the behavior of costs as the importance of international activity to the firm rises. Since performance (profit) relates to the difference between revenue and cost, the behavior of revenues should also play a part in any explanation of the multinationality-performance relationship. However, the literature has thus far focused mainly on the behavior of costs and largely ignored the behavior of revenues; the latter are essentially assumed to rise at a decreasing rate as the degree of multinationality rises. I note in passing that the arguments commonly advanced in the literature equate a firm's degree of multinationality (either depth or breath) with the passage of time. While plausible, equating the passage of time to the importance of international activities to the firm could be questioned. Moreover, most studies derive their estimates in essentially a cross-sectional framework, which then raises the (difficult) question of the whether the cross-sectionally estimated "time path" between performance and multinationality is indicative of the time path applicable to a single firm. For now, I put aside this issue and instead proceed to consider the reasoning advanced for expecting a nonlinear relationship between multinationality and performance.

To fix ideas and as a framework for discussion, let the unit of observation be firm "*i*" at time "*t*" and assume that the relationship between this firm's performance (Π_{it}) and its (degree of) multinationality (M_{it}) at time "*t*" can be written as

$$(1) \qquad \Pi_{it} = \Phi_i\left(M_{it}, Z_{it}\right) R_i\left(P_{it}, Q_{it}\right) - \Gamma_i\left(M_{it}, Z_{it}\right) C_i\left(Q_{it}\right) = \Omega_i\left(P_{it}, Q_{it}, M_{it}, Z_{it}\right)$$

In this expression, revenue $R_i(.)$ depends on the price (P_{it}) and quantity (Q_{it}) of shipments (level of activity) while cost $C_i(.)$ depends only on the quantity of shipments. The functions $\Phi_i(.)$ and $\Gamma_i(.)$ "modify" a firm's revenue and cost. These functions depend on the firm's degree of multinationality (M_{it}) and a set of firm specific characteristics *(Z_{it})* at time *t*.[2] The function $\Omega_i(.)$ is therefore the firm's profit function which, by definition, depends on price, quantity, degree of multinationality and firm specific characteristics. The revenue, cost, and modifier functions, and hence the profit function, have an *"i"* subscript to indicate that they are firm specific, but they have no *"t"* subscript to indicate the assumption that the nature of these functions does not vary over time.[3] The revenue and cost functions can be thought to relate to a single product produced and sold in one market or to an "aggregate" relationship that combines several products and markets. Written in this way, the multinationality variable M_{it} takes the role of a choice variable that the firm can use to influence its revenue and cost, and hence its performance.[4] The multinationality variable appears in both $\Phi_i(.)$ and $\Gamma_i(.)$ to capture that multinationality is likely to have a separate influence on revenue versus cost.[5] Given this characterization, I now consider the basic arguments advanced for expecting that the firm's profit function $\Omega_i(.)$ will be a nonlinear function of its degree of multinationality.

The essential arguments advanced are these. First, in the early stages of internationalization the firm will incur costs associated with the liability of foreignness and is therefore likely to incur losses. As the firm's international presence grows (over time) the firm learns, adapts, and becomes more informed about selling/operating outside its domestic market. This learning or experience implies that the initial entry costs diminish in importance (over time) and at some point profits will turn positive. However, as the firm's degree of multinationality rises so also do costs associated with higher complexity and coordination.

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[2] Of course, a firm's activity level may also depend on these firm specific factors and hence they could also be included also as arguments in the revenue and cost functions. I separate these factors to capture notions of firm specific attributes such as brand name, firm specific knowledge, etc. However, where these factors appear in expression (1) is not germane to the basic issues I will discuss.

[3] It can be questioned whether the "modifier" functions should be considered to be firm specific.

[4] As will be discussed later in the paper, that the degree of multinationality is a choice variable for the firm implies this variable is endogenous in the multinational-performance relationship.

[5] One could also write (1) as $\Pi_{it} = \Theta_i(M_{it}, Z_{it})[R_i(P_{it}, Q_{it}) - C_i(Q_{it})]$ in which case the influence of multinationality and firm specific characteristics would have the same effect on revenue and on cost.

As the degree of multinationality rises these costs may begin to dominate and as a result the firm's profits decline and may even become negative. These arguments imply that the relationship between the *level* of a firm's profit and its degree of multinationality, holding fixed all other determinants of profit, would exhibit an inverted U-shape. In this explanation, the inverted U-shape relationship emerges because the firm bears a (fixed) cost of entering foreign markets, where the relevant fixed cost is associated with the liability of foreignness (Gomes and Ramaswamy, 1999). While this explanation deals primarily with the behavior of the *level* of profit as the degree of multinationality rises, it also has implications for the expected *incremental effect* of higher multinationality: the inverted U-shape implies that the incremental effect is at first positive but then becomes negative as the degree of multinationality passes the point at which the *level* of profit is maximized, and the firm's degree of multinationality enters the region of "excess multinationality."

Recent literature (Contract, Kundu and Hsu, 2003; Lu and Beamish, 2004) has gone beyond the inverted U-shape to argue that the relationship is instead S-shaped, which is algebraically represented by a cubic relationship. Figure 1 illustrates the nature of the relationship suggested. In Figure 1, the degree of multinationality has been divided into three stages: I, II and III, corresponding to negative profit, positive and rising profit, and positive but declining profit. As indicated in Figure 1, the key difference between asserting an S-shape rather than an inverted U-shape concerns the behavior of incremental profit in stage I (at a low level of multinationality). Along the dashed segment of the profit relationship the incremental effect of increased multinationality on performance is negative and declining until a point of minimum profit is reached, after which the incremental effect becomes positive, although the level of profit may still be negative.

Insert Figure 1 About Here

The behavior of costs that could produce this initial downward sloping segment of the profit curve is that the incremental cost (marginal cost) of international expansion first falls at a decreasing rate but then subsequently rises at an increasing rate. In Figure 1, the point where this switch in the rate of change in incremental cost occurs is where the dashed segment of the profit relationship ends and the solid segment begins.[6] As noted, the main theoretical rationale offered to explain the behavior of profits during Stage I is that firms incur fixed costs associated with the liability of foreignness in the initial phases of international expansion.

The profit relationship depicted in Figure 1 bears a noticeable resemblance to the standard Economics' textbook depiction of a firm's profit function, where the variable on the horizontal axis would be the firm's output per period (level of activity). In this context, Economics would offer two explanations for falling marginal costs at low levels of firm activity. The first arises in the context of the short-run, when some inputs the firm employees are considered fixed. In this case, marginal cost initially falls with rising firm activity due to an underutilization of fixed inputs as a low level of firm activity. As the firm's level of activity rises these fixed inputs eventually become "fully employed" after which further expansion by the firm entails diminishing (marginal) returns and hence marginal cost begins to rise. Moving to the long-run when all inputs are variable, falling marginal cost at low levels of a firm's activity instead arise from economies of scale (declining long-run average costs). The theoretical explanations advanced for the 3-stage hypothesis appear to mix, and in fact do not make clear, whether the contemplated behavior of costs relates to the short-run or long-run perspective. In treating the liability of foreignness as a fixed cost of entry the theoretical arguments take on a decidedly short-run flavor, whereas the implicit treatment of time in the analysis suggests instead the long-run view involving the effects of scale.

[6] More precisely, the dashed segment of profit relationship arises if the rate at which incremental cost falls is greater than the rate at which incremental revenue falls.

However, there is another conceptual issue to be considered. In Figure 1, the initial dotted segment of Stage 1 is associated with negative profit. If profit were instead always positive then it not possible to construct a (sensible) cost relationship that would give rise to a profit relationship in which the initial segment has a negative slope; to do so would require total costs to fall as the degree of multinationality rises.

This suggests one quick way to assess, in a given set of data, whether an S-shape relationship arising from the behavior of costs is likely to be a sensible specification: one need only look for a threshold value of multinationality below which firms earn negative profits.

Insert Table 1 About Here

As a quick check of this idea, Table 1 shows for each year between 1984 and 1999 the average rate of return on assets in a sample of firms at deciles of the foreign sales ratio.[7] For example, in 1984 the average rate of return was 13.8% for firms whose foreign sales ratio fell in the 10^{th} percentile while the average rate of return of firms in the next decile of the distribution was 12.9% Of note is that in any given year the average rates of return do not differ appreciably across deciles of the foreign sales ratio and, as indicated by the values in the last column of Table 1, the average rate of return across all firms declines over time. The last two rows in Table 1 show respectively the rate of return averaged over all years in each decile, and the average rate of return computed using the data pooled over all years. As seen, the average of the rate of return values in a given column do not differ appreciably from the average rate of return computed from the sample that is pooled over all years. In Table 1, the average rate of return is consistently positive in the lower deciles of the foreign sales ratio; the two negative average rate of return values are only in the last decile and only in the last two years. This casts doubt on an S-curve relationship arising from the assumed behavior of costs, at least in this set of data.

[7] The data where derived from COMPUSTAT as described in Bowen and Wiersema (2007).

For completeness, Figure 2 plots the average rate of return values shown in the second to last row of Table 1 against the average foreign sales ratio in each decile, and it shows fitted linear, quadratic, and cubic relationships along with a table of estimation results. The adjusted R-square values rise with the number of included regressors, with the cubic model evidencing a good overall fit as judged by the overall F-statistic.

However, while the estimates in the linear and quadratic specifications are significant at the 5% level, the coefficient estimates in the cubic specification are not significant.

For the cubic specification, the significant F-statistic but lack of significant coefficient estimates is one signal of a collinearity problem. Indeed, the correlation between the level, square, and cube of the foreign sales ratio variable are 0.961 and 0.899 while the correlation between the squared and cubed values is 0.984. Obviously, the relative low average rate of return in the 10^{th} decile has an important influence on the results, although this "outlier" can be explained by appeal to the hypothesis that "excessive multinationality" will be associated with low or negative performance. The bottom line of this admittedly simple inquiry is that there is no evidence that the average firm earns negative returns at low levels of multinationality (in data derived from COMPUSTAT, a widely used source), and that "outliers" may figure importantly in estimation.

Insert Figure 2 About Here

While the above suggests refining the basis for the presumed behavior of incremental costs, the more narrow economics perspective suggests one is describing the behavior of a firm's profit function as its level of foreign involvement rises. If so, then this raises some concerns about the usual measures of multinationality. As noted, one of the most commonly used measures is the foreign sales ratio. However, it is the firm's total profit function that is being depicted in Figure 1. This in turn depends on a firm's total sales, both domestic and foreign. If one thought to be depicting profits on foreign activity then the variable on the horizontal axis would be the level of foreign sales, and the relationship depicted would be drawn holding fixed the level of domestic sales.

This line of thinking suggests a relationship between profit on foreign activities and the level of foreign sales, with domestic sales included as a control variable. This view lends credence to Rugman and Verbeke's (2004) suggestion that one should focus on the rate of return on foreign assets in relationship to the foreign sales ratio. In this respect, preliminary work by Rugman (2006) in a sample of U.K. firms indicates support for an inverted U-shape relationship, but no support of an S-shape relationship, between the rate of return on foreign assets and the share of home region sales in total firm sales.

Returning to the characterization of the multinationality-performance relationship given in expression (1), it is clear that the relationship embeds a number of elements that could affect the nature of relationship. First, there are different channels through which multinationality influences firm performance, suggesting that "catch all" characterizations of multinationality only serve to confound the potentially different effects that multinationality may have on revenue versus cost. In particular, different "Modes of Multinationality" (MoMs) may be important for the nature of the multinationality-performance relationship. For example, if a firm's multinationality relates to off-shore production facilities intended to take advantage of location specific factors such as lower labor costs this might affect primarily the cost side, and one would expect a measure of this type of MoM to evidence a positive relationship with performance. Conversely, if a firm's MoM relates to having distribution/sales activities in foreign markets, but not production, then this MoM might be expected to affect both revenues and costs, with an uncertain net effect. More broadly, expression (1) suggests that the spatial dimension of a firm's revenue or cost is another element of the relationship, suggesting for example that foreign sales divided by the number of markets in which the firm operates could be appropriate measure. What all this suggests that different MoMs are likely to have different implications for the multinationality-performance relationship, and hence that efforts should be directed to separately identifying and analyzing different MoMs. [8]

[8] This suggests seeking a taxonomy of MoMs similar in spirit to the strategic management literature's search to understand the performance implication of product market diversification, a search that eventually produced consensus that a key distinction was between related versus unrelated diversification.

In my view, the recent search for higher order terms to characterize the multinationality-performance relationship is unlikely to significantly expand our understanding of the underlying basis for the relationship, that is, the aspects of multinationality that would give rise to superior performance. In terms of functional form, it seems both sufficient and parsimonious to adopt a quadratic specification since it captures the essential notion that in the early stages of internationalization firms incur higher costs associated with the liability of foreignness and that there exists some "optimal" degree of multinationality beyond which multinationality becomes "excessive." Although the existence of significance scale economies at low levels of internationalization would appear to be a better basis for expecting a cubic relationship, the risk of over-parameterizing the model with additional powers of the multinational construct (which also introduces variables with high inter-correlations) seems unwarranted.

As previously noted, the recent explorations of potential nonlinearity of the multinationality-performance relationship have mainly focused on the behavior of costs with only limited attention given to how the behavior of revenues might contribute. But an inverted U-shaped profit function can arise under several different specifications of the revenue and cost relationships. For example, an inverted U-shape can arise when there are constant costs of international expansion but the revenue function has an inverted U-shape (the case in which a firm has market power). An inverted U-shaped profit function can also arise when incremental revenue is constant (no market power) and costs are U-shaped. A third possibility is that the incremental cost of international expansion is constant or rising but the revenue relationship evidences a point of inflection (a different kind of S-shape), that is, in the early stages of international expansion revenues rise at an increasing rate but then subsequently rise at a decreasing rate as further international expansion encounters diminish returns (i.e., market saturation). Clearly, still more configurations are possible if the revenue and cost relationships have even higher order nonlinearities.[9]

[9] If the multinationality-performance relationship is viewed as describing the time path of a firm's revenue and cost in a given foreign market then an S-shaped profit relationship can arise if revenues evolve along an S-shaped path that converges to some upper limit while costs evolve along a downward sloping path that converges to some lower limit. This implies a S-shaped profit relationship that also approaches an upper bound.

All this is to suggest that a deeper understanding of the empirical behavior of both revenue and cost may be needed before a better understanding of the relationship between multinationality and performance can be reached. Stated differently, when examining the relationship between multinationality and performance (profit) the ability to untangle the ways in which multinationality affects revenue and cost is problematic. A separate focus on the behavior of revenue and cost may therefore be needed to identify the dimensions of multinationality that are most important.[10] Does multinationality (or specific types of multinationality) mainly affect a firm's ability to generate revenues or does it mainly affect costs, and if so how?

As a final remark on the current literature that investigates for nonlinearities in the multinationality-performance relationship, a close look at some of the recent literature suggests some cautionary remarks are in order regarding the interpretation of results. As an example, the first column in Table 2 reproduces results from a recent study that estimated a linear, quadratic and cubic multinationality-performance relationship. The multinationality measure was a composite measure that averaged the number of affiliates and number of geographic areas in which firms operated (as per my remarks above, I would have wished for these two elements to have been examined separately). The study concluded that its results strongly supported the hypothesis of the cubic relationship depicted in Figure 1.

Insert Table 2 About Here

However, using the study's results, the column in Table 2 labeled "Incremental Return" reveals that the estimated cubic relationship is far from that shown in Figure 1. For both the level and cubic models, the implied value of the multinationality variable (which ranged between 0 and 1) at which firm performance is maximized is zero, that is, when there is no multinationality.

[10] For example, if the driving force on the cost side it the ability of the multinational firm to create and benefit from economies of scope then an approach that focuses directly on the estimation of the cost function and that examines how this behaves in relation to say the extent of geographic dispersion of a firm's activities could allow for shaper conclusions about the underlying benefit of this type of multinationality.

This arises because, as indicated in Table 2, the slope of the estimated multinationality-performance relationship in each case is negative over the entire range of permissible values of the multinationality variable. Hence, despite statistically significant evidence of a cubic relationship, the estimated multinationality-performance relationship is in fact negatively sloped over the entire range of the multinationality variable. This negatively sloped relationship is further revealed in the estimates of the quadratic specification which imply a U-shaped and not an inverted-U shaped relationship; in this instance the estimated coefficients imply that firm performance is *minimized* when the multinationality variable takes a value of about 0.58. The study reported that the multinationality variable had a sample mean of 0.04 and standard deviation 0.07. This indicates that the value of the multinationality variable that minimizes firm performance in the quadratic model greatly exceeds 3 standard deviations above its mean, suggesting that for virtually all firms in the study's sample the multinationality-performance relationship is negative. The study's claim to present evidence in support of an S-curve hypothesis is true in the sense that the cubic model "fits the data," but the estimated relationship is opposite that hypothesized. These remarks are simply intended to caution analysts that when fitting nonlinear models considerable care must be taken to explore the nature of the estimated relationship.

Statistical Issues

Data and Estimation Strategies

The expression for firm performance given in (1) specifies the unit of analysis to be a single firm at a given point in time. In particular, the underlying revenue, cost and "modifier" functions are all firm specific. Given the firm specific nature of the relationship, it would seem that the proper method for estimating the effect of multinationality on firm performance would be to conduct a time-series analysis for a given firm. However, the traditional approach has been to estimate the relationship in a cross-section of firms, where the cross-section data are for a single year, or where the cross-section data has been "expanded" in the time dimension to form longitudinal data. The data sets frequently used in the literature contain many firms relative to the number of time periods and in this regard they are perhaps best considered to fall under the heading of panel data.

Panel data are increasingly being used given both the short-comings of single year cross-section analysis (Bowen and Wiersema, 1999) and the increasing availability of data on firms over several years. One virtue of panel data is that it can allow for modeling of "dynamic" elements, such as including lagged values of the dependent or independent variables in a model, although this has not been the focus of past work. But the primary virtue of panel data is that it allows one to take account of idiosyncratic differences among the cross-sectional units (firms); such differences are commonly referred to as (firm level) heterogeneity. That heterogeneity is likely to be an issue for the multinationality-performance relationship is immediately evident from expression (1) since it explicitly indicates that, at a minimum, the revenue and cost functions are likely to be firm specific. The potential importance of firm level heterogeneity is further suggested by the common use in the literature (Hitt, et al., 2006) of a firm level variable to serve as a moderator for the multinationality variable since, by definition, an interaction variable formed using a firm level characteristic is a recognition that the relationship between multinationality and performance differs across firms.[11]

However, this type of firm level heterogeneity is only one dimension of potential heterogeneity; heterogeneity can also exist at the industry and at the country level.[12] Several statistical methods exist to incorporate or control for such heterogeneity, and how this is done depends on what the researcher is willing to assume about the nature and source of heterogeneity. Below I note some of these estimation strategies in terms of the issues that might be expected to arise in an analysis of the multinationality-performance relationship. Is this regard, the discussion is meant to point to issues that appear to not have been adequately addressed in the literature, and that may serve to point to other reasons for the mixed results obtained in the literature.

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[11] In using an interaction variable, which variable is considered the moderator and which is the focus variable is somewhat problematic. For example, Lu and Beamish (2004) use firm level R&D to moderate the relationship between multinationality and performance. But one could take the opposite view: the effect of firm level R&D on performance is moderated by a firm's degree of multinationality. This ultimately raises questions of causality, which unfortunately cannot be answered by the use of interaction variables.

[12] Country level heterogeneity could potentially relate to both a firm's country of origin as well the foreign countries in which the firm operates.

Anticipating the conclusion of this discussion, what appears needed is a more systematic approach to, and investigation of, potential heterogeneity in the multinationality-performance relationship.

Omitted Firm Specific Characteristics

One underlying premise of the multinational-performance relationship is that the performance benefit arising from operating across international markets relates to the presence of firm specific intangible assets. Data permitting, the presence of such intangible assets has been captured by variables such as a firm's expenditure on R&D or advertising (both are usually measured per dollar of firm sales); such variables have generally been found to be significant control variables. However, it is likely that other firm specific characteristics (managerial effort, ability, management's embedded knowledge of foreign markets) have been omitted from consideration. Such omitted variables represent one source of heterogeneity in the level of performance across firms and their omission can lead to inconsistent estimates if these omitted variables are correlated with any of the included variables in a model. Given this, failure to take account of this source of heterogeneity may be one source of the mixed results obtained in the literature.

Panel data allow one to control for this source of heterogeneity using one of two techniques: fixed effects and random effects (Greene, 2003). The choice between the two approaches hinges on whether the omitted firm specific characteristics are assumed to be uncorrelated (random effects) or correlated (fixed effects) with the one or more of the variables included in the relationship.

Since some the omitted factors may themselves be antecedents of multinationality (Hitt, et al., 2006), the fixed effect specification would seem preferred. Moreover, even if the omitted factors are not correlated with any model variables the fixed effects specification is still appropriate. The main benefit of the random effects specification is that fewer ancillary parameters need to be estimated and hence it conserves on degrees of freedom. However, since most of the panel datasets employed in recent literature have well over 1,000 observations, conservation of degrees of freedom is a less convincing argument for the choice of the random effects specification.

In any event, test procedures are available to assess the appropriateness of the random effects assumption of no correlation between omitted and included variables (Greene, 2003).

A point worth noting is that both the fixed and random effects specifications assume that the excluded firm characteristics are constant over time. For this reason, these techniques prevents estimation of the effect of any variable included in a model that is constant over time, such effects are simply absorbed in estimating the firm specific effects. Since most specifications of multinational-performance relationship use time varying variables this would not seem to be a limiting factor. One instance where this could be important is for models that include industry specific dummy variables (e.g. Contractor, Kundu and Hsu, 2003) if the industry membership of firms does not change over time. Despite these concerns, the limitations faced by researchers in obtaining data on potentially important firm specific characteristics suggests that such omitted characteristics may be an important source of heterogeneity in the multinationality-performance relationship, and hence also a potential source of inconsistent estimates and hence invalid inferences. This strongly argues for panel data and the use of either the fixed or random effects specification as standard aspects of any estimation strategy regarding the multinationality-performance relationship.

Model Heterogeneity

Heterogeneity arising from the omission of firm specific but time invariant characteristics is a potential source of heterogeneity that may bias inference. However, this issue addresses heterogeneity only in terms of the level of performance across firms (i.e., the intercept), it does not address issues of potential heterogeneity in the relationship itself, that is, differences in (slope) coefficients across firms. Virtually all studies using panel data estimate a "fully-pooled model" which assumes that all model coefficients are the same across firms and constant over time. The assumption that slope coefficients are homogeneous across the cross-sectional units is a common assumption in applied work, and in the case of single year cross-section data is in fact necessary if estimation is to proceed. But while the assumption of coefficient homogeneity is common, one can question whether it is an appropriate assumption in the context of the multinationality-performance relationship.

If one takes expression (1) to be a reasonable characterization of a multinationality-performance relationship then the assumption of coefficient homogeneity is not likely to be appropriate. The empirical multinationality-performance literature itself provides evidence of heterogeneity via investigations that consider whether the coefficient on the multinationality variable varies with (is moderated by) some selectively chosen firm level variable (e.g., firm R&D intensity). While the use of an interaction variable goes some way toward addressing the issue of coefficient heterogeneity, such analysis takes too narrow a perspective on the more general issue of whether the coefficients in the multinationality-performance relationship can be assumed to be the same across the cross-section units (or over time).

In this regard, estimation methods exist that can admit the hypothesis of coefficient heterogeneity without committing, as does the use of an interaction variable, to any particular source of heterogeneity. Of course, the source of heterogeneity may ultimately be of interest to researchers. However, before beginning the search for potential sources of heterogeneity the first order of investigation should be to examine for the presence of heterogeneity. General approaches for detecting whether heterogeneity is an issue fall under the heading of random coefficient models (Greene, 2003), and their use to date appears absent from the multinationality-performance literature.

In its simplest form, a random coefficients model assumes that coefficient heterogeneity arises from stochastic (random) variation, that is, there is a underlying common coefficient so that differences in a given coefficient across firms arises from random variation. Like the "random effects" model described earlier in the context of omitted firm specific characteristics, the random coefficients model assumes that the stochastic variation underlying the heterogeneity is constant over time. However, these assumptions can be relaxed to admit, for example, heterogeneity that depends on firm level covariates.[13]

[13] This effectively reduces to using interaction variables. However, important is the one can use the random coefficients model as a basis to first explore the assumption of coefficient homogeneity, without committing to any particular source of the homogeneity.

Space limitations prevent a full discussion of random coefficients methods, but the nature of the multinationality-performance relationship and the firm level data often used to estimate this relationship suggests that variants of the random coefficient method may be particularly appropriate. In one sense, the issue of heterogeneity can be viewed not as an "if" question, but rather at what level does heterogeneity arise. For example, it may be reasonable to assume that the revenue and cost conditions of firms within the same industry are the same, suggesting that the effect of multinationality on performance is homogenous for firms within the same industry but that it may differ between industries. Virtually all studies of the multinationality-performance relationship use industry control variables to capture differences in performance levels across firms that arise from differences in industry membership, but no systematic effort has been directed to assessing whether there are significant differences in the multinationality coefficient across industries.[14] One hint that heterogeneity at the industry level is important comes from Contractor, Kundu and Hsu (2003) who found that the multinationality-performance relationship differed for capital-intensive service sectors (air transport, restaurants, hotels, etc) versus knowledge-intensive service sectors (advertising, market research, etc.).

If differences across industries are significant, this may go a long way to explaining the mixed results obtained in the literature since the results that have been obtained represent a kind of "average" effect of multinationality on performance across industries. Hence, if the effect for some industries is negative (due to excessive multinationality) but positive for other industries, the average effect may be of any sign, or may simply not be statistically significant. Returning to the notion of different MoMs (modes of multinationality), it seems reasonable that one MoM may be relevant (and a source of advantage) in one industry but that another MoM is relevant (and a source of advantage) in another industry. For example, the nature and advantages of multinationality to textile firms is likely to be completely different from those for pharmaceutical firms. It is even possible that controlling for heterogeneity may serve to obviate the question of whether the multinationality-performance relationship is nonlinear.

[14] This could easily be examined by interacting the multinationality variable with a set of industry dummy variables and testing for equality of the estimated coefficeints.

Endogenous Regressors

The characterization of the multinationality-performance relationship given in expression (1) assigns to multinationality the role of being a choice variable for the firm. In this respect, it seems reasonable to assume that a firm's degree of multinationality is indeed a choice under the control of the firm's managers. But acknowledging that a firm's degree of multinationality is a choice variable then raises an important concern: this choice is likely to be endogenous with respect to firm performance. This arises since manager's decisions regarding the depth or breath of the firm's international presence are linked to the expected performance outcome of such decisions. More generally, the concurrent nature of the relationship between managers' decisions and expected performance means that in any decision-performance relationship the decision variable and performance are jointly determined, that is, the decision variable is an endogenous variable in the performance relationship.[15] This raises problems for making valid statistical inferences since, in statistical terms, this source of endogeneity means that the error term in the multinationality-performance relationship will be correlated with the multinationality variable. Such correlation violates one of the basic assumptions of least squares estimation and hence estimation using OLS (or pooled OLS in the case of panel data) will yield inconsistent estimates. Recognizing and addressing the issue of endogeneity is therefore important for making valid inferences. Yet, on this issue, a review of recent studies of the multinationality-performance relationship (Bowen and Wiersema, 2007) indicated only one instance (Lu and Beamish, 2004) in which the issue of endogeneity was acknowledged. However, rather than adopt as their core model the one in which multinationality was treated as an endogenous regressor they chose only to remark that the results derived (but not reported) assuming endogeneity were qualitatively similar to the reported OLS estimates, that is, the endogeneity corrected estimates served only as a "robustness check." In addition, no details were provided on how the issue of endogeneity was addressed.

[15] Hamilton and Nickerson (2003) make the same point in discussing the empirical strategic management literature.

Several statistical methods exist to deal with this form of endogeneity and the attendant bias it induces. The most commonly used methods are based on the *method of instrumental variables*, which effectively uses a variable that is highly correlated with the endogenous right-hand-side variable but uncorrelated with the error term in the relationship. Computationally, the instrumental variable technique is relatively straight forward and is implemented in most statistical packages; the crucial problem is selecting an appropriate variable to serve as an instrument.

Perhaps the most widely known and used instrumental variables technique is Two-Stage Least Squares (2SLS). This technique uses predicted values of an endogenous right-hand-side variable as the instrumental variable. However, to implement this procedure one must specify a relationship between the endogenous variable and a set of variables, some of which differ from those already included in the performance equation.[16] For the performance-multinationality relationship this means specifying a relationship for the multinationality variable.[17] Developing such a relationship clearly requires that the researcher think more deeply about the underlying determinants of multinationality. In this regard, is a useful starting point is the Hitt, et al. (2006) summary of those studies that have investigated the antecedents of multinationality.

The issue of endogeneity arising from simultaneity between a decision variable and firm performance is a potentially serious and often neglected issue in most empirical management research. A central problem is that the underlying theoretical frameworks often offer limited assistance in specifying a set of systematic relationships that could be used as a foundation for specifying a model that could address the issue of causality. Structural Equations Modeling (SEM) and 2SLS are close cousins, and both seek to address issues of endogeneity. Few studies have approached the analysis of the multinationality-performance relationship with such methods, and hence the role that endogeneity bias may play in explaining the mixed findings of prior studies awaits more analysis.

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[16] This requirement is one method for resolving the "identification" problem that can arise in a multiple equation models (Greene, 2003).

[17] Bowen and Wiersema (2007) present a model to address the issue of endogeneity with respect to the multinationality-performance relationship in exactly this way.

Firm Scope: The Product Dimension

The international business literature (unlike the strategic management literature) has long recognized in its empirical investigations that firm scope comprises two key dimensions: the product markets in which a firm is active (product diversification) and the geographic reach of its activities (international diversification). In particular, all major studies of multinationality-performance relationship in the IB literature include some measure of product diversification as a control variable, and in some cases this variable has been used to investigate if a firm's product diversification moderates the multinationality-performance relationship (Hitt, et al., 2006). However, if one accepts that multinationality is a choice variable for the firm and that it is therefore endogenous in the performance relationship, then the same must be accepted for decisions regarding a firm's extent of product diversification. That is, both product diversification and international diversification are likely to be endogenous variables in the multinationality-performance relationship. Moreover, these two choice variables are unlikely to be independent. To my knowledge, no peer reviewed study has yet dealt simultaneously with both these issues.[18] That both the degree of multinationality and product diversification are likely to be endogenous in the performance relationship adds further concerns regarding the validity of the inferences drawn from past studies of the multinationality-performance relationship. In this regard, endogeneity bias can be added as another potential explanation for the mixed results obtained in prior research.

[18] Bowen and Wiersema (2007) develop a model in which both international and product diversification are endogenous in the performance relationship. Controlling for endogeneity as well as firm level heterogeneity arising from omitted firm specific characteristics, they find that international diversification (multinationality) and product diversification both evidence an inverted U-shape with firm performance, suggesting that the nonlinear specification is robust to the issues of endogeneity and firm heterogeneity. Their framework also allowed assessment of the nature of the direct relationship between international and product diversification. They concluded that these scope decisions represent substitute strategies within the firm.

Firm Scope: The Country Dimension

Few studies of the multinational-performance relationship have incorporated the country dimension (Hitt et. al., 2006). Most studies have used U.S. or Japanese data, the latter due to its richer availability of data on the geographic distribution of FDI by Japanese firms. However, home country characteristics are likely to be an important determinant of firms' international success, as are the characteristics of the countries that are the target of a firm's international expansion or the location of its foreign activities. One insight into the country of origin dimension comes from Ruigrok and Wanger (2003) who estimated a multinationality-performance relationship for German firms and found evidence of a U-shaped relationship. They suggested their finding reflected that international expansion by German firms is, by virtue of their location, initially into markets that are both smaller and less familiar (Switzerland and Austria) than are those available to, for example, U.S. firms (e.g., Canada) in the early stages of internationalization. As a result, they face initially higher costs associated with the liability of foreignness that would say U.S. firms.

More generally, the framework of Porter (1990) makes central that home market characteristics can have important implications for the success of a nation's firms in international markets. By restricting the sample to firms from only one country this important dimension is relegated to the constant term of the relationship (which is often estimated to be negative – a curious outcome). The potential importance of home country effects can be thought to be another layer of the issue of heterogeneity of the multinationality-performance relationship. While the use of data on firms from only a single country obviates this concern, future analysis should seek to incorporate the country dimension by expanding the country coverage of the data. Doing so would then permit one to examine for heterogeneity in the multinationality-performance relationship at three levels: the firm, the industry, and the country.

The issue of the country of destination of a firm's international activities may also be important and can in part be seen as delineating more carefully the nature of firm's international involvement, that is, in delineating alternative modes of multinationality. It can also be seen as an attempt to incorporate elements of "distance" into the relationship. In this respect, the spatial dimension of firms' international activities is for the most part conspicuously absent in most of the multinationality-performance literature.

The widespread use of total foreign sales in computing the ratio of foreign to total sales, or even the geographic distribution of a firm's sales, fails to take account of the spatial distance across markets. This “flat earth” perspective goes against many of the underlying premises for expecting international diversification to be associated with higher firm performance.

That the location of firm’s international involvement may be important is suggested by the work of Pantzalis (2001) who separated the geographic scope of MNC activity into two regions: developed and developing country markets. He found significantly higher performance for firms active in developing country markets but no significant performance difference for firms operating in developed country markets. This suggests that where firms operate may be a further, and important, piece of the puzzle.

In one respect, the attempts by researchers to explore the role of cultural differences in determining differential firm performance is one attempt to incorporate “distance” into the multinationality-performance model, but to date this has mainly been directed at assessing if such differences influence the mode of foreign market entry (Tihany, Griffith and Russell, 2005). However, the focus of the current volume on the regional activities of MNCs can be considered a step in the direction of delineating the importance of where (and perhaps how) firms operate for understanding the impact of multinationality on performance. In addition, narrowing the scope of where firms originate, and where they operate, in terms of their international activities to relatively homogenous geographic regions may serve to obviate the influence of potential heterogeneity in the multinationality-performance relationship that relates to differences in the international locations where firms operate.

Sample Selection Bias

A further issue potentially affecting the reliability of estimates of the multinationality-performance relationships is sample selection bias. If firms select to become multinational because they have superior performance (needed to overcome the liability of foreignness) then internationally diversified firms would be expected to evidence higher performance.

Effectively, the sample consists of higher performing firms who have, by definition, chosen to become multinational precisely because they possess advantages sufficient to offset the higher costs of operating in foreign markets. The statistical problem that arises is that the sample of firms can no longer be considered a random sample.

The sample selection issue is a concern in many branches of statistical inquiry, and has been the subject of a large literature dealing with the evaluation of treatment programs (Greene, 2003). A common approach for addressing this concern is to employ the sample selection model first developed by Heckman (Greene, 2003). In the present context, this model would involve two equations, one (the selection equation) models the decision of a firm to become multinational which, among other variables, is likely to include firm performance, and a second equation that specifies the relationship between geographic diversification and firm performance. The estimates derived from the selection equation are then used in the multinationality-performance equation to take account of an essentially omitted variable (Greene, 2003)

Cross-Sectional Variation and Time-Series Behavior

In theorizing the nature of the relationship between multinationality and performance the arguments advanced implicitly if not explicitly refer to the evolution of a firm's performance as its degree of multinationality changes over time. Consideration of expression (1) suggests that rising multinationality can logically be separated from the level of a firm's activity (production). In this sense, the degree of multinationality acts as a kind of "input" that imparts positive or negative effects on the firm's revenue and cost. However, the potentially firm specific nature of these effects raises the problematic question of whether estimation using cross-section or panel data on firms with different degrees of multinationality can be interpreted as indicative of the time path that would be followed by a given individual firm. This is a complicated question for which I have no ready answer.

However, one item of note in this regard is that the timing and scale of firms' entry into international markets could result in the findings from a cross-section analysis differing markedly from that obtained from a time-series analysis.

For example, some firms may have expanded rapidly into international markets while others have expanded more slowly (this may be a function of the industry of the firm, a reference to my earlier remarks regarding industry level heterogeneity). If multinationality is measured by the foreign sales ratio, it is likely that the "slower" firm will also have a lower foreign sales ratio, so the timing (and scale) of firms international involvement in a cross-section analysis would tend to correlate with the degree of international experience on the part of firms. However, a measure such as foreign assets to total assets, or number of affiliates, may assign a higher degree of multinationality to the newer entrant. In this case, the cross-sectional relationship between performance and degree of multinationality may be found to be negative, since the newer, but larger scale entrant, is more likely to be incurring a loss. What this calls for are measures of multinationality that can better capture not only the depth or breath of international involvement, but also the time span of such involvement.

Finally, another aspect related to the time dimension is that knowledge acquisition and learning are seen as important for the performance gains from operating internationally. And, as previously noted, a key aspect underlying the expectation of a nonlinear relationship is that the (fixed) costs associated with international expansion declines the longer the firm's presence in the market. All this is to suggest that the extent of firms' learning would be expected to figure prominently in the multinationality-performance relationship. At present, such learning is implicitly thought to be captured by the relative extent of a firm's involvement in foreign markets (e.g. via the foreign sales ratio). However, this may or may not accurately reflect accumulated knowledge. If not, then accumulated experience would be an important omitted variable, and may be another source of heterogeneity in the relationship. Since learning can be expected to evolve over time the fixed or random effects specifications are not suited to capturing the influence of sequential learning. Mimicking the learning curve literature, a variable that may better capture accumulated learning with respect to operating in foreign markets would be a firm's accumulated sales in overseas markets, where the accumulation sales variable could also be distinguished by country or region so as to capture the potentially different kinds of knowledge being learned.

CONCLUDING REMARKS

In this paper I have considered some issues that appear relevant to the empirical investigation of a hypothesized relationship between firm performance and a firm's degree of multinationality.[19] In this regard, I have considered certain "technical" details regarding the proposition that the relationship may be nonlinear, and I have suggested that a quadratic specification is both parsimonious and sufficient to capture the key aspects of this proposition.

I have also noted issues regarding specification and estimation of the relationship, with an eye toward resolving issues that if properly addressed may help explain the mixed findings heretofore presented in the literature. Among the issues raised, I consider two as central: first is the possibility of inconsistent estimates arising from the multinationality construct being endogenous in the performance relationship. The second is that the underlying relationship may be heterogeneous across firms (or industries or countries). Exploring these issues constitute important directions for further applied research. However, doing so will require researchers to commit to developing more specific models of multinationality, and to employing techniques that make use of the richness of longitudinal data.

I have also suggested that more clarity regarding the multinationality-performance relationship would be obtained by a better delineation of the different modes in which multinationality manifests itself, so that we can begin to untangle the different sources of performance that are encapsulated in the underlying theoretical explanations.[20] The theoretical arguments advanced for the relationship point to a number of contributing factors, but the analysis to date offers little understanding of the relative importance of the alternative factors. At one level, it is almost tautological that multinationality and performance are positively related, at least if we believe firms undertake international activities with the (expectation) of performance gains. However, decisions that appear appropriate *ex ante* may be bad *ex post*, and it is the *ex post* outcomes that are captured by the data.

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[19] One item omitted is discussion of the performance measure. While the choice of measure is often dictated by the data on hand, my preference is for market based measures since they in principle capture the expected long-term performance consequences of firms' current decisions.

[20] This echoes Osegowitsch and Zalan's (2005) concern that the multinationality-performance literature has "a persistent problem of under-specification."

Ultimately, the role of expectations may become an important component of analysis. However, for the moment there appears to be a sufficiently rich set of issues regarding both data and estimation that can occupy our attention.

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FIGURE 1

Relationship Between Performance (Profit) and Multinationality

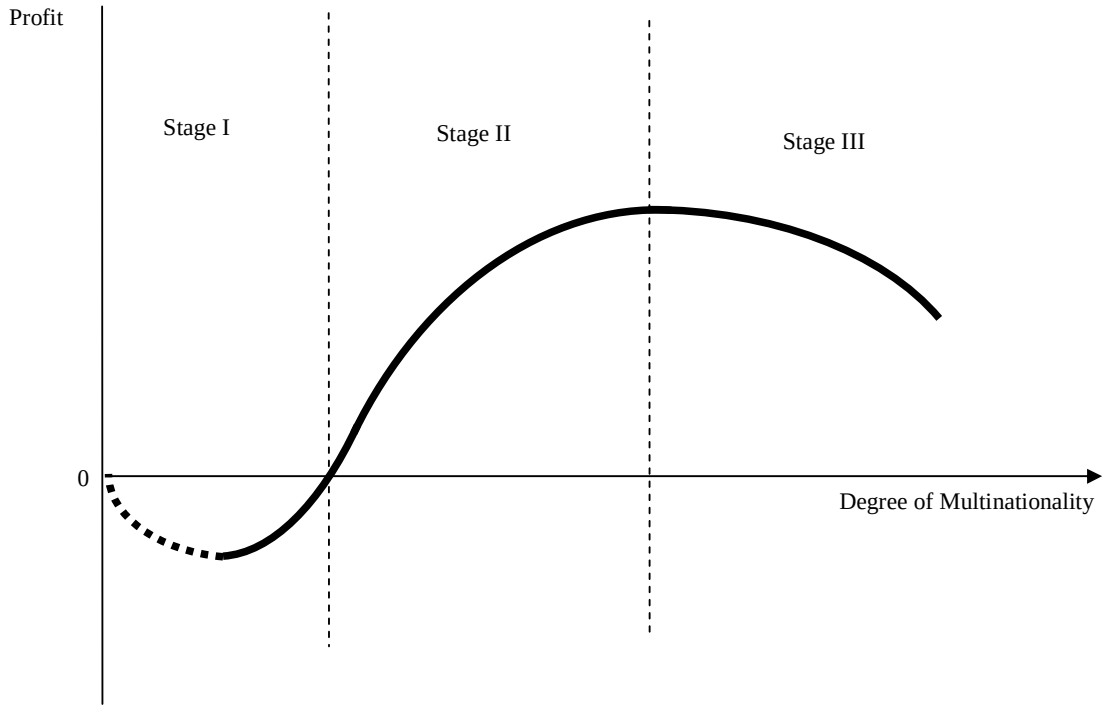

TABLE 1

Average Rate of Return (in %) at Deciles of the Foreign Sales Ratio [a]

Year	Deciles of the Foreign Sales Ratio (upper limit of decile in %) [b]										Mean (Row)
	1 (7.2)	2 (11.3)	3 (15.2)	4 (19.6)	5 (24.6)	6 (30.1)	7 (36.5)	8 (44.3)	9 (56.0)	10 (72.1)	
1984	13.8	12.2	13.9	14.2	13.1	13.3	13.0	12.1	14.0	7.3	12.69
1985	14.2	12.1	12.0	10.6	10.1	9.6	11.0	9.2	11.1	3.0	10.29
1986	11.1	9.5	11.8	13.1	7.8	8.2	9.0	8.4	8.8	3.8	9.15
1987	9.3	11.8	9.2	10.7	8.6	10.4	8.8	10.8	10.9	6.7	9.71
1988	6.5	12.3	10.9	11.5	7.7	9.7	9.4	11.8	11.8	6.0	9.77
1989	11.6	12.0	11.8	10.2	9.1	8.2	8.8	10.3	8.4	6.7	9.71
1990	10.2	9.9	7.4	10.1	10.0	7.7	8.2	8.0	8.8	4.6	8.48
1991	8.1	11.0	7.1	9.7	7.7	8.2	7.8	5.2	8.6	6.9	8.01
1992	7.6	10.6	9.4	8.6	9.5	9.7	7.3	10.3	5.1	3.9	8.19
1993	8.1	8.6	11.2	10.5	8.3	7.3	7.7	7.5	7.2	2.1	7.85
1994	10.7	10.9	10.8	11.3	9.8	11.7	7.6	9.9	9.0	4.0	9.58
1995	11.5	9.0	10.7	9.8	8.3	9.5	9.9	7.7	8.4	2.4	8.73
1996	9.4	7.6	10.3	9.9	5.2	9.7	10.2	9.9	10.1	2.1	8.43
1997	6.0	8.0	7.9	8.0	10.2	9.3	11.5	8.6	7.5	1.1	7.81
1998	5.2	6.4	8.2	8.2	9.7	10.1	8.1	6.6	1.2	-3.4	6.03
1999	4.4	5.8	6.1	8.2	4.0	9.0	8.2	4.4	5.7	-4.4	5.16
Mean (Column)	9.2	9.9	9.9	10.3	8.7	9.5	9.2	8.8	8.5	3.3	8.72
All Years	8.9	9.5	9.7	10.0	8.5	9.5	9.1	8.6	8.1	2.7	8.45

[a] Based on sample of 16,498 observations (approximately 1,000 firms in each year)
[b] Upper limit is for data pooled over all years; value for last decile is the mean value.

FIGURE 2

Relationship between Average Return on Assets and Multinationality (Foreign Sales Ratio)

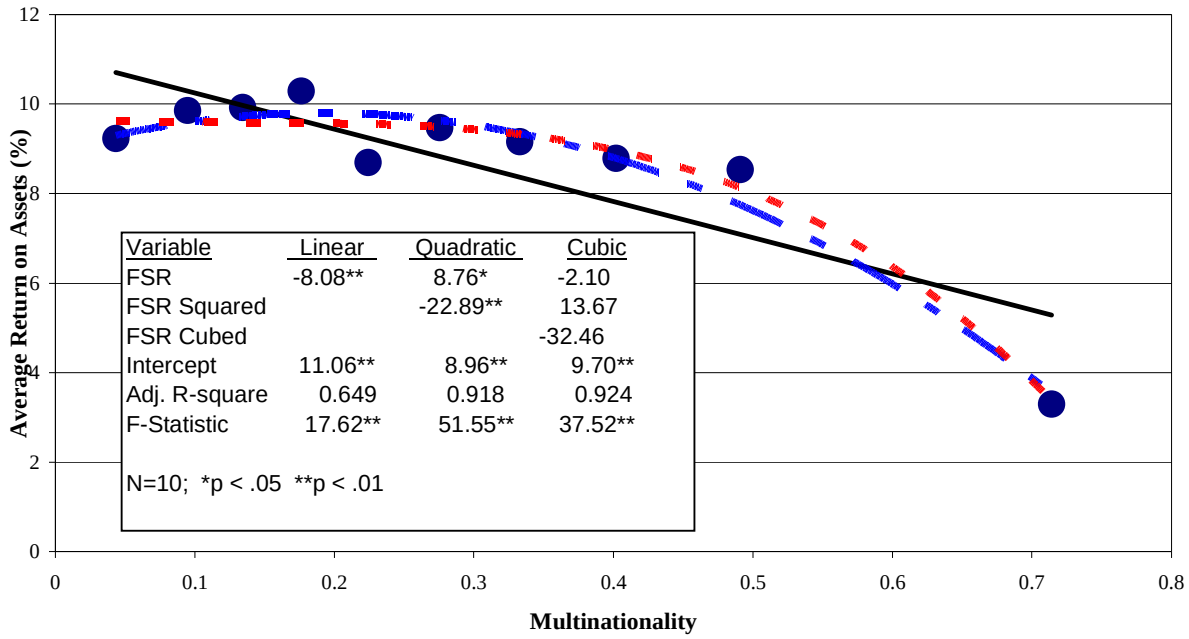

TABLE 2

Analysis of Estimates of a Multinationality-Performance Relationship

Form of the Model	**Coefficient Estimate** [a]			**Incremental Return (= slope of relationship)**	**Implied Value of Multinationality (M) That Maximizes Performance**
	Level (M)	Square (M^2)	Cube (M^3)		
Level	- 0.17			- 0.17	M = 0
Quadratic	- 0.30	0.26		- 0.30 + 0.52M	M = 0.577
Cubic	- 0.38	0.75	-0.50	- 0.38 + 1.5(M - M^2)	M = 0

[a] all estimates significant at the 0.01 level.