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International Corporate Diversification, Market Valuation, and Size-Adjusted Evidence

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I. Introduction

Errunza and Senbet [ES, 7] analyze the effects of international operations on the market value of the firm both at theoretical and empirical levels. The theoretical model, which is largely heuristic, exploits the costly supply adjustment of multinational firms (MNCs) in providing international portfolio diversification services to investors who face differential cost barriers to direct holdings of assets across national boundaries. MNCs compete as financial intermediaries to undo the barriers so that, in equilibrium, profits are driven out; MNCs and pure domestic firms sell at an equivalent risk-adjusted return. However, costly financial intermediation and the associated relative efficiency leads to a positive valuation effect for MNCs relative to purely domestic firms. Further, the equilibrium analysis implies that demand-side (investor) barriers to international capital flows *alone* are inconsequential to the valuation of MNCs in their pure financial role, but that the interaction with the supply-side costs are necessary to produce a valuation effect at the corporate level. ES subject the theory to an empirical analysis in a value-based approach by employing a variant of Tobin's [17] q-ratio. The analysis, controlling for industrial market power, suggests that the relationship between the excess valuation and the degree of international involvement (DOI) has magnified over periods characterized by severe U.S. government controls vis-a-vis the more recent periods.

In this paper we formalize the theoretical argument by viewing indirect portfolio diversification by MNCs as a means of completing the international capital market. We employ a paradigm in the unanimity literature and formally characterize the equilibrium in which there is a rationale for MNC financial intermediation. We then perform an expanded empirical study by employing generalized least squares and maximum likelihood procedures. Since the positive relationship between excess valuation and DOI (as suggested in ES [7]) might be attributed to the so-called "small firm" or size and the P/E effects, the test methodology controls for such effects. Also, the traditional literature has relied upon foreign sales percentage as a proxy for DOI. In view of the well recognized limitations of this proxy, we employ four different measures of international

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involvement. Finally, the excess valuation approach might not correspond to the alternative return approach. We, therefore, include an alternative return based test. The results corroborate the earlier findings of ES [7]. The specifics of these results are summarized in the concluding section.

II. International Consumer-Investor Equilibrium

This section characterizes a simple two-period exchange model for the portfolio behavior of investors diversifying across two national boundaries.

A. *The Framework and Technology*

Consider a world economy with two countries (e.g., the U.S. and rest of the world), represented by two firms; the U.S. firm is domestic (D) and the other firm is foreign (F). The security of the foreign firm is traded abroad. Domestic-based investors have *costly* access to the security of the foreign firm. The domestic-based firm operates in both national regimes, but it also faces costly access in its direct foreign investment. Direct foreign investment takes either a form of partial ownership of the foreign firm or a real activity through a foreign branch. In either case the share of the assets represented by its degree of international involvement is the same. Finally, assume all-equity financing so as to abstract from leverage-related complications.

Thus, costly access is imposed *both* on the supply and demand side, in contrast to the tradition, such as Stultz's [16] and Black's [5] notion of the tax imposed on individual holdings only. However, like Black, the cost is proportional, and it is a fractional share of the end-of-period cash flows or values. The cost is broadly defined to include such factors as (a) controls on export/import of capital, (b) possibility of expropriation, (c) information gaps, and (d) unfamiliarity or search costs, (e) nondivisibility of assets, (f) exchange controls, (g) short-sale restrictions, (h) border taxes, etc., characterizing barriers to international capital flows.

The profit functions can be posited as:

The Binational Firm:

$$\tilde{\pi}_{df} = \tilde{\theta}_d \bar{x}_d + \gamma_f \tilde{\theta}_f \bar{x}_f (1 - q^*) \tag{1}$$

The Domestic Firm: (The Theoretical Benchmark.)

$$\tilde{\pi}_d = \tilde{\theta}_d \bar{x}_d \tag{2}$$

The Foreign Firm:

$$\tilde{\pi}_f = \tilde{\theta}_f \bar{x}_f \tag{2a}$$

where

$\tilde{\theta}$ = a random operator whose distributional beliefs are commonly held by all investors; $E(\tilde{\theta}) = 1$; $\bar{x}$ = expected gross cash flows, inclusive of salvage value of productive assets: γ_f = the degree of international involvement; q^* = the proportional cost of direct capital flow through the binational firm; for simplicity assume it is independent of the degree of international involvement, i.e., $q^{*\prime}(\gamma_f) = 0$; the effect of relaxing this assumption is discussed in the following section.

Note that γ_f is *fixed* in the initial equilibrium, and it is defined in somewhat different form from the measures of the degree of international involvement that we employ in the empirical section.

B. *Portfolio Equilibrium*

We analyze equilibrium, consisting of market values, V_{df} and V_f, and portfolio holdings, α^i_{df}, α^i_f, and B^i, such that markets clear and each i^{th} investor's expected utility is maximized[1]

V_{df} = the value of the binational firm at $t = 0$; V_f = the value of the foreign firm at $t = 0$; B^i = borrowing/lending commitment ($B^i > 0$, lending).

The investor chooses his holdings so as to maximize the expected utility of current and future consumption.

$$\underset{\{\alpha^i_{df},\ \alpha^i_f,\ B^i\}}{\text{Max}}\ E(\tilde{U}^i) = \int U^i[C^i_0,\ C^i_1(\tilde{\theta}_d,\ \tilde{\theta}_f)]\ dF(\tilde{\theta}_d,\ \tilde{\theta}_f) \tag{3}$$

where $F(\tilde{\theta}_d, \tilde{\theta}_f)$ = the joint cumulative distribution of $\tilde{\theta}$; subject to current and future consumption functions, C^i_0 and C^i_1, respectively:

$$C^i_0 = K^i - B^i - \alpha^i_{df}V_{df} - \alpha^i_f V_f + \bar{\alpha}^i_{df}(V_{df} - I_{df}) + \bar{\alpha}^i_f(V_f - I_f) \tag{4}$$

$$\tilde{C}^i_1 = B^iR + \alpha^i_{df}[\tilde{\theta}_d\bar{x}_d + \gamma_f\tilde{\theta}_f\bar{x}_f(1 - q^*)] + \alpha^i_f\tilde{\theta}_f\bar{x}_f(1 - q^i) \tag{5}$$

where

R = one plus the riskless rate of interest; K^i = non-financial investment source endowments; α^i_f = the i^{th} investor's foreign securityholding; $\bar{\alpha}$ = initial shareholdings; I = real or productive investment commitment; q^i = the i^{th} investor's cost of access to the foreign security. Again, for simplicity, this is independent of the investor's foreign holdings, i.e., $q^{i\prime}$, $(\alpha^i_f) = 0$.

It is worthwhile again to contrast our approach to Black's methodology which subsidizes shortsellers. Indeed, the subsidy implies that *all* foreign involvement would be in very high short positions if the cost of the tax penalty is sufficiently high. (See also Stultz [16] for a similar point). Consequently, Black's model allows unrestricted foreign securityholdings. By contrast, shortsellers incur costs in our framework, but in this case their future consumption would be a function of $\tilde{\theta}_f\bar{x}_f(1 + q^i)$. There is one other unattractive feature with shortselling subsidy in that countries with acute capital flow barriers restrict or prohibit shortselling opportunities. In this case it is more appropriate to assume an outright ban of shortselling rather than subsidizing shortsellers. To emphasize this point, the *first order conditions* below are characterized by inequalities, although for convenience we treat the conditions with equality later for our analysis.

[1] If the U. S. capital market is taken as segmented from the rest of the world, domestic investors behave so as to have no appreciable influence on V_f. Otherwise, both V_{df} and V_f can be determined endogeneously. However, the equilibrium framework developed in this paper is generalizable to any well-functioning capital market base, and hence rationalize *multidirectional* capital movements.

The first order conditions are:

$$\frac{dE(\tilde{U}^i)}{d\alpha^i_{df}} = -V_{df}\int \frac{\partial U^i}{\partial C^i_0}\,dF + \int \frac{\partial U^i}{\partial C^i_1}\,[\tilde{\theta}_d\bar{x}_d + \gamma_f\tilde{\theta}_f\bar{x}_f(1-q^*)]\,dF \le 0 \quad (6)$$

$$\frac{dE(\tilde{U}^i)}{d\alpha^i_f} = \int \frac{\partial U^i}{\partial C^i_1}\,\tilde{\theta}_f\bar{x}_f(1-q^i)\,dF - V_f\int \frac{\partial U^i}{\partial C^i_0}\,dF \le 0 \quad (7)$$

$$\frac{dE(\tilde{U}^i)}{dB^i} = R\int \frac{\partial U^i}{\partial C^i_1}\,dF - \int \frac{\partial U^i}{\partial C^i_0}\,dF = 0 \quad (8)$$

Denoting

$$E(U^i_0) = \int \frac{\partial U^i}{\partial C^i_0}\,dF \text{ and } E(U^i_1) = \int \frac{\partial U^i}{\partial C^i_1}\,dF,$$

we see that the marginal rate of substitution, MRS, is uniform[2] across all domestic-based investors with $E(U^i_0)/E(U^i_1) = R$.

Domestic-based individuals adjust their endowment portfolios to include foreign securities by trading off the benefits in terms of increased expected future return (or consumption), or reduction of the risk of consumption, against foregoing consumption from incurring cost of international capital barriers. On the supply-side, the binational firm faces a parallel value-maximizing decision for direct foreign investment. We shall examine the supply adjustment issue in the following section.

The first order conditions would be equated to zero for those individuals who take positions in the relevant securities, namely, riskfree asset and the securities of the binational firm and the foreign firm. We can characterize the values of the firms from (6) and (7), respectively.

$$V_{df} = \frac{1}{E(U^i_0)}\int \frac{\partial U^i}{\partial C^i_1}\,[\tilde{\theta}_d\bar{x}_d + \gamma_f\tilde{\theta}_f\bar{x}_f(1-q^*)]\,dF \quad (9)$$

$$V_f = \frac{1}{E(U^i_0)}\,\bar{x}_f(1-q^i)\int \frac{\partial U^i}{\partial C^i_1}\,\tilde{\theta}_f\,dF \quad (10)$$

III. Equilibrium for the Degree of International Involvement and the Valuation Effect

An equilibrium in the preceding section is *partial*, since it does not allow for the supply-side adjustment in the firm's degree of international involvement. We now investigate into the optimal level of the firm's involvement by examining the investor marginal preference function. This calls for possible revision of γ_f so as to maximize the expected utility of a representative investor. The paradigm we employ here is in the same vein of the unanimity literature (e.g., Baron [4],

[2] We abstract from exchange rate uncertainty so as to focus on the role of the multinational firm in completing the international capital market.

Senbet and Taggart [14]). The first step is to differentiate (3) for a representative investor with respect to γ_f. A more detailed derivation is given in the *Appendix.*

$$\frac{d\int U^i}{d\gamma_f}\,dF = \bar{x}_f(1-q^*)\alpha^i_{df}\int \frac{\partial U^i}{\partial C^i_1}\,\tilde{\theta}_f\,dF - E(U^i_0)\bar{\alpha}^i_{df}(V_f) + E(U^i_0)(\bar{\alpha}^i_{df}-\alpha^i_{df})\frac{dV_{df}}{d\gamma_f} \quad (11)$$

The function in (11) reflects the marginal preference of a domestic-based agent in his role both as a consumer and investor. The first term depends on final shareholdings (α^i_{df}) and hence represents a "consumption effect" reflecting the impact of foreign investment on future consumption. The last two terms represent the effect of revision in investment on the capital gains and losses on shareholdings realized at the beginning of the current period.[3]

To evaluate (11) one needs to forecast the change in the value of the binational firm, $dV_{df}/d\gamma_f$. An individual knows that for any investment allocation across the two national regimes, a securities market equilibrium will be established and hence the value of the firm will satisfy (9). Consequently, the perceived value change is:

$$dV_{df}/d\gamma_f = \int \frac{dZ}{d\gamma_f}\,dF + \frac{1}{E(U^i_0)}\int \frac{\partial U^i}{\partial C^i_1}\,\tilde{\theta}_f\bar{x}_f(1-q^*)\,dF \quad (12)$$

where

$$\frac{dZ}{d\gamma_f} = \frac{d\left[\dfrac{\partial U^i}{\partial C^i_1}\Big/E(U^i_0)\right]}{d\gamma_f}\{\tilde{\theta}_d\bar{x}_d + \gamma_f\tilde{\theta}_f\bar{x}_f(1-q^*)\}$$

The first term in (12) reflects value change associated with changes in implicit prices or the marginal rate of substitution. However, it must collapse to zero once we recognize a price-taking behavior of the binational firm. The second term gives the marginal valuation of output at the end of the period, and it will be utilized in the evaluation of (11). Thus, taking account of this in (11) and simplifying, we obtain

$$\frac{d\int U^i}{d\gamma_f}\,dF = \left[\int \frac{\partial U^i}{\partial C^i_1}\,\tilde{\theta}_f\bar{x}_f(1-q^*)\,dF - E(U^i_0)V_f\right]\bar{\alpha}^i_{df} \quad (12')$$

[3] We can also decompose the function as follows:

$\bar{\alpha}^i_{df}\left(\dfrac{dV_{df}}{d\gamma_f} - V_f\right)$ = *net* marginal value of endowment effect

$-\alpha^i_{df}\dfrac{dV_{df}}{d\gamma_f}$ = the change in the cost of purchasing the *optimal* portfolio

Also, Post V_{df} = Pre $V_{df} + dV_{df}$; where, $dV_{df} = d(\gamma_f V_f)$ + capital gain/loss.

Using (10) for V_f, we have

$$\frac{d\int U^i}{d\gamma_f}\,dF = \bar{\alpha}^i_{df}\bar{x}_f(q^i - q^*)\int \frac{\partial U^i}{\partial C^i_1}\,\tilde{\theta}_f\,dF$$

$$= \bar{\alpha}^i_{df}\bar{x}_f(q^i - q^*)[E(\tilde{U}^i_1) + \mathrm{Cov}(\tilde{U}^i_1, \tilde{\theta}_f)] \quad (13)$$

where[4]

$$\int \frac{\partial U^i}{\partial C^i_1}\,\tilde{\theta}_f\,dF = E(\tilde{U}^i_1\tilde{\theta}_f);\ E(\tilde{\theta}_f) = 1$$

If the initial shareholder were a net foreign investor and $q^i > q^*$, he would prefer that the firm increase its degree of international involvement. Thus, the firm's role in completing the international capital market is of value to investors and priced as such.

At this point we can draw further implications for international corporate intermediation. Although the result is based on a single binational firm, it should be noted that in the more general case many MNCs compete to provide the necessary international financial intermediation services through direct foreign investment. If q^* is *zero* across firms, for instance, the profit would be driven out by competition so that, in equilibrium, there would be no value differential between the purely domestic firm and the MNC. On the other hand, if q^* is firm-specific and dependent on the level of the degree of direct foreign investment there will be an optimal proliferation of the degree of international involvement across MNCs of varying cost efficiency. In this sense the theory that emerges parallels capital structure equilibrium under incomplete market conditions (e.g., Senbet and Taggart [14]). Indeed, the multinational corporate sector alone may not satisfy all the supply adjustments required for optimal international portfolio diversification calling for a separate financial intermediary sector. However, certain regions of the world, particularly developing economies with mostly nontraded assets, can only be spanned through direct foreign investment. Pure financial intermediation cannot provide a diversification opportunity for a non-traded segment.

The relative valuation notion derived in this paper is based on the portfolio concept. Obviously MNCs which go to a corner solution in terms of specializing in a single geographic area are at variance with optimal indirect diversification.

[4] Note that $E(\tilde{U}_1) + \mathrm{Cov}(\tilde{U}_1, \tilde{\theta}_f)$ is positive. To see this, imagine a single firm economy where investors maximize their expected utility over current and future consumption. It can be shown that the first order condition for a portfolio optimum, using our notation results in,

$$\bar{X}E(\tilde{U}_1\tilde{\theta}) - VE(\tilde{U}_0) = 0$$

implying the value of the firm:

$$V = \left[\frac{E(\tilde{U}_1)}{E(\tilde{U}_0)} + \frac{\mathrm{Cov}(\tilde{U}_1, \tilde{\theta})}{E(\tilde{U}_0)}\right]\bar{X}$$

The term in the parenthesis is a discount factor, and it is positive.

At the empirical level, we try to use several measures of the degree of international involvement to capture the concept. We also assume rationality in the observed behavior of MNCs in optimizing their direct foreign investment so as to achieve an optimal degree of international involvement consistent with value maximization.

IV. A Return Interpretation: A Bridge Between the Generalized Theory and a Return-Based Empiricism.

Our formal analysis can be linked with the ES [7] graphic analysis and interpreted in that context. The demand curve for MNC stocks depends on q^i and the associated portfolio behavior, and it is upward sloping in a return-quantity space, such as in Figure 1 of ES [7] to entice investors who are in regressively lower costs of barriers to international capital flows. Each point along the demand curve represents the aggregate demand for optimal holdings of MNC stocks. There exists a nominal certainty-equivalent yield (NCY) differential between MNC and domestic stocks below which no MNC stocks are demanded. As this NCY differential diminishes, the induced penalty on MNC stocks that provide financial intermediation services is reduced, and hence the aggregate demand for MNC stocks by all investors will increase. This translates itself into the upward-sloping aggregate demand schedule. (Note that on the demand-side the NCY is unadjusted for the benefits of corporate financial intermediation services.)

The supply curve is horizontal through a zero NCY differential when diversification services provided through MNCs are costless. The intersection point between the supply curve and the upward sloping demand curve determines the equilibrium in which all the rents to financial intermediation services evaporate. If this were the case there will be no relationship between excess valuation and the degree of international involvement at the individual firm level, although there is an economy-wide determinate level of international involvement. The picture changes when MNCs compete at a cost and possess *relative* cost efficiencies in their supply adjustments. What emerges then is a downward sloping supply curve resulting in an optimal degree of international involvement (DOI). The new intersection point associated with $-\lambda_2$ determines the new equilibrium characterized by dual implications; 1) a positive relationship between excess valuation and the DOI and 2) a negative relationship between NCY (return) and DOI.

We can be more precise about the second interpretation. It has been argued in the literature (e.g., Levy [9], Mayshar [11]) that a cross-sectional return relationship among assets depends not only on relative systematic risk but also on unsystematic risk under costly portfolio diversification. In simple terms, the following consumer equilibrium captures the spirit of such a relationship:

$$E(\tilde{R}_k) = R_f + \left(\frac{E(\tilde{R}_i) - R_f}{\sigma_i^2}\right)\text{cov}(\tilde{R}_k, \tilde{R}_i) \tag{14}$$

where

$E(\tilde{R}_k)$ = the expected rate of return on the k^{th}asset; R_f = the risk free rate of

interest; $E(\tilde{R}_i)$ = the expected rate of return for the i^{th} investor's portfolio under constrained optimization.

The unconstrained optimum leads to holding of the international market portfolio. However, the constraint associated with costly access to the international capital market limits the amount of foreign holdings. In the parlance of the previous analysis, α_f is limited. Consequently, we can rewrite (14) as

$$E(\tilde{R}_k) = R_f + \theta[E(\tilde{R}_i) - R_f]\beta_k + \left[\left(\frac{E(\tilde{R}_i) - R_f}{\sigma_i^2}(w_{ki} - w_{km})\text{cov}(\tilde{R}_k, R_i' - \tilde{R}_m')\right)\right]\sigma_k^2 \quad (15)$$

where

$\beta_k = \text{cov}(\tilde{R}_k, \tilde{R}_m)/\sigma_m^2$, $\theta = \sigma_m^2 \mid \sigma_i^2$, R_m = the market rate of return (R_m' is exclusive of asset k) and w_{ki}, w_{km} = the fractional weight of asset k in the constrained portfolio i and the market portfolio, respectively. Note that the contribution of σ_k^2 is zero when $w_{ki} = w_{km}$.

Although (15) applies when consumers are at their personal equilibrium, the main feature of this relationship carries through market equilibrium. The role of MNC diversification service is to reduce or eliminate the unsystematic risk element and restore a perfect-market type relationship for an international asset pricing. For instance, the segmentation effect in international asset pricing models, such as in Errunza-Losq [6] evaporate through corporate direct foreign investment. As we have demonstrated earlier in Equation (13), this role of MNCs improves investor welfare when $q^* < q^i$, and hence an equilibrium return relationship implicitly prices relative financial intermediation services embodied in varying degrees of international involvement. In the following section we have subjected both the excess value and return implications of our theoretical analysis to an empirical investigation.

V. Empirical Investigation

A. *Methodology*

The empirical test is based on the formal market-value theoretic framework developed in the theoretical sections. The objective is to establish the existence of monopoly rents associated with financial imperfections and incompleteness in the international capital market. The significance of the degree of international involvement (DOI) is confirmed after accounting for the size or P/E (price-earnings ratio) effect. The testable hypotheses relate to the excess market valuation attributable to the degree of international involvement. Following Errunza and Senbet [7], the relationship is tested in a linearized version. Specifically,

$$ev_k = a_1 + b_1\beta_k + C_1[(S_k - S_m)/S_m] + d_1[(F_k - F_m)/F_m] \quad (16)$$

where

ev_k = excess valuation normalized by sales for security k; a_1 = expected rate of

return on a zero-beta portfolio; b_1 = expected market risk premium; β_k = systematic risk of security k; C_1 = contribution of the size or P/E effect to excess valuation; S_k = size or P/E of security k; S_m = average size or P/E for the market; d_1 = contribution of DOI to excess valuation; F_k = DOI of security k; F_m = average DOI for the market.

Alternatively, the significance of the DOI can also be examined along the lines of Banz [3] by employing a return-based asset pricing suggested in the last section. Specifically,

$$E(\tilde{R}_k) = a_2 + b_2\beta_k + C_2[(S_k - S_m)/S_m] + d_2[F_k - F_m)/F_m] \tag{17}$$

where $E(\tilde{R}_k)$ = expected excess return on security k, and all other variables are as defined earlier. Since expectations are unobservable, we assume rational expectations and use historical returns ($\tilde{R}_k$) to proxy $E(\tilde{R}_k)$. Under intertemporal parameter stationarity, the expression (16) and (17) can be rewritten as,

$$ev_{kt} = \alpha_1 + \gamma_1\beta_{kt} + \delta_1[(S_{kt} - S_{mt})/S_{mt}] + \theta_1[(F_{kt} - F_{mt})/F_{mt}] + \tilde{\epsilon}_{kt};\ k = 1, 2, \ldots, N;\ t = 1, 2, \ldots, T \tag{18}$$

$$\tilde{R}_{kt} = \alpha_2 + \gamma_2\beta_{kt} + \delta_2[(S_{kt} - S_{mt})/S_{mt}] + \theta_2[(F_{kt} - F_{mt})/F_{mt}] + \mu_{kt};\ k = 1, 2, \ldots, N;\ t = 1, 2, \ldots, T \tag{19}$$

The coefficients α, γ, δ and θ correspond to a, b, c and d.

It is widely recognized that the residual variances are not generally proportional to the identity matrix resulting in inefficient Ordinary Least Squares (OLS) estimators. The existing research has coped with this concern by computing Generalized Least Squares (GSL) estimators.[5]

Since the independent variable β cannot be observed, it is usually estimated from past data by means of the time series regression of the market model. To deal with the problem of errors-in-variables resulting from this procedure, most researchers have grouped stocks into portfolios on the basis of, for example past security beta, estimating portfolio parameters (e.g., beta) in the following period and then performing cross-sectional OLS regression (see Fama and MacBeth [8]). Grouping reduces the errors-in-variables problem as well as efficiency. Litzenberger and Ramaswamy [10] (henceforth LR) use Maximum Likelihood Estimators (MLE) to resolve the issue.

An additional problem exists, because the optimum grouping procedure is generally unknown (Stehle [15]) for models characterized by two or more independent variables. In view of this grouping problem and the relatively small

[5] For further discussion, see Litzenberger and Ramaswamy [10]. We follow the lead of Litzenberger and Ramaswamy and assume the diagonal model to be the correct description of the return generating process in order to specify the residual variance-covariance matrix. Specifically, the inverse of the residual standard deviations from single index market model are used to construct the variance-covariance matrix Ω_t for each period t. Notationally,

Market model: $\tilde{R}_{kt} = \alpha_{kt} + \beta_{kt}\tilde{R}_{mt} + \tilde{e}_{kt}$, $k = 1, 2, \ldots, N$; $\tilde{R}_{kt}$ and $\tilde{R}_{mt}$ are realized excess returns on security k and the market index in period t.

The (j, k) element of $\Omega_t = 0$, $j \neq k$

$j, k = 1, 2, \ldots, N$

$= S_{kk}$, $j = k$

number of firms in our sample (restricted by the number of multinational firms and data availability as discussed below), we follow LR and use their MLE procedure to approach the errors-in-variables problem. As Banz [3] points out, this method is also theoretically superior to grouping. Thus, we will use OLS, GLS and MLE procedures to obtain monthly time series estimates for α, γ, δ and θ. Pooled estimators (arithmetic) means will then be used for significance tests.[6]

B. *Measuring the Degree of International Involvement*

The degree of international involvement is a complex attribute. Depending on one's disposition, it has been variously linked with (a) Accounting ratios, such as foreign sales, percentages in earnings, or assets[7], (b) Organizational characteristics, such as the number of foreign countries where a manufacturing subsidiary is located[8], (c) Ownership and management patterns with multinational ownership and board of directors implying a truly multinational firm, (d) Geographical distribution of the firm's operations, and (e) The absolute size of international involvement.[9]

Despite the well-recognized need to appropriately measure DOI, the literature to date has primarily relied upon one accounting number, namely foreign sales percentage. Even though this measure seems to be the least biased at the firm level, the primary motivation has been the easy availability of historical data. In a preliminary attempt to address this limitation, the present study uses four different measures of DOI, namely[10], (a) Foreign sales percentage (FSP), (b) Number of foreign i.e., non-U.S. subsidiaries (NOS), (c) Entropy measure of firm's geographical diversification (ENT)[11], and (d) Absolute ($) foreign sales (FSA).

C. *Measuring Risk, Size and P/E*

Beta for each security would be measured in the traditional way by using 60 historical observations on security and market excess returns with monthly

[6] LR also suggest *ue* of weighted means.

[7] Proportion of the firm's net earnings or net assets from foreign sources were found by Errunza and Senbet [7] to be poor proxies of DOI.

[8] In the absence of data on firms asset holdings by country, Miller and Pras [16] find subsidiary diversification to be a good proxy for asset diversification. They report an R^2 of 0.954 for correlation between the number of U.S. corporations' foreign affiliates and their total assets among 49 countries in 1966.

[9] For example, see Wolf [18].

[10] One could develop multiple attribute criteria using for example, cluster analysis to group firms according to a composite measure of DOI. Such a measure, however, may be non-stationary or sample bound.

[11] Following Miller and Pras [12], the entropy measure of each firms' relative regional holdings is defined as:
Entropy $= -\sum_{k=1}^{n} S_k \log S_k$ where, S_k is the ratio of firms number of subsidiaries in region k to the total number of its foreign subsidiaries. We define 7 regions namely, European Economic Community (EEC), European Free Trade Area, COMECON, EEC Associates plus Spain, developed-industrialized, less developed countries, and Canada-Mexico.

updating.[12] Specifically, $\tilde{R}_{kt} = \alpha_{kt} + \beta_{kt}R_{mt} + \tilde{e}_{kt}$, $t = t - 60, \ldots, t - 1$. The size and P/E variables are calculated at the end of December (fiscal end) in the same manner as Banz [3] and Reinganum [13]. They are updated on an annual basis.[13]

D. *Data and Sample*

First, the data on foreign sales percentage from 1970 to 1978 was obtained from the "Outlook" and "Foreign Sales Reports" published by Standard and Poor. A total of 402 December fiscal year end firms had data on FSP variable for at least one year. For these firms, data on total number of foreign subsidiaries and their geographic distribution from 1971 to 1978 was compiled from various issues of "Who Owns Whom" published by Dunn and Bradstreet. The month-end prices and return data as well as fiscal year-end earnings, number of shares outstanding and total sales data were obtained from COMPUSTAT tapes. The equally weighted NYSE index is from CRSP files.

The sample size is constrained by the availability of the above information. It is further reduced by the end to include firms with only the December-end fiscal year.[14] The number of securities increase from 138 in 1970 to 245 in 1978 for FSP and FSA samples, and from 262 in 1971 to 295 in 1978 for NOS and ENT samples.

Finally, one important characteristic of the sample should be noted in order to avoid misinterpretation of results. The average firm size in our sample is considerably larger than either the Banz [3] or the Reinganum [13] sample. Specifically, if we had used a grouping procedure, the first (small) size portfolio would have been of average market value comparable to MV3 of Reinganum [13]. This data characteristic is not troublesome, because our intent is to establish the DOI effect after accounting for potential size or P/E effect and not the small firm effect *per se*. One could, however, argue for a mild size and/or P/E effect on the basis of monotonically increasing nature of these effects observed in the past studies.

E. *Results*

1. *DOI Proxies*

Table 1 reports Spearman rank correlations among the four measures of DOI over the period 1971–1978.

Although the correlations are statistically very significant, they are not too

[12] In the international context, the traditional beta may be an inappropriate and/or an incomplete measure of risk as suggested by Errunza and Senbet [7]. However, there are theoretical and empirical problems related to the concept and measurement of international riskless rate and the world market index. Since the primary purpose of our test is to establish the DOI effect, we use 30 day commercial paper returns as a proxy for R_f and the equally weighted NYSE index as a proxy for $\tilde{R}_m$. These proxies, while they are consistent with our empirical focus on US-based MNCs, will facilitate comparison with available research on size and/or P/E effect.

[13] Banz uses monthly observations for size. Since data on DOI proxies and P/E ratio are available only on an annual basis, size variable is also updated on an annual basis.

[14] December end fiscal year constraint is imposed in keeping with the arguments of Errunza and Senbet [7] and Reinganum [13]. We assume no information content on announcement.

Table 1

Spearman Rank Correlation Coefficients: 1971–1978

	Pairwise Correlations					
Year	NOS-ENT	NOS-FSP	NOS-FSA	ENT-FSP	ENT-FSA	FSP-FSA
1971	0.75	0.21	0.76	0.17*	0.41	0.39
1972	0.71	0.41	0.79	0.35	0.51	0.57
1973	0.69	0.47	0.83	0.39	0.52	0.60
1974	0.69	0.47	0.80	0.38	0.46	0.60
1975	0.67	0.41	0.72	0.29	0.45	0.61
1976	0.71	0.34	0.66	0.29	0.39	0.58
1977	0.67	0.35	0.65	0.28	0.43	0.60
1978	0.66	0.41	0.71	0.33	0.42	0.61

* Not significant–All others significant at 1% level.
NOTE: Correlations are based on all available data.

large suggesting that each measure might represent a somewhat different facet of international involvement. Hence, we will use all the above measures in tests which follow.

2. *Excess Valuation and DOI*[15]

In the following regressions the market power is not included as an independent variable in view of the difficulty of classifying well-diversified MNCs into one industry code, appropriately defining industry and concentration ratios in the international context and unavailability of relevant global data.[16] In order to separate monopoly rents in the product and factor markets from financial market imperfections, we divide the data into two subperiods that characterize the presence and absence of U.S. capital controls. We would expect relatively stronger relationship between *ev* and DOI during the initial period vis-a-vis the final period.

The cross-sectional regressions represented by equation (3) provide a time series of estimates α_t, γ_t, δ_t, θ_t; $t = 1, \ldots, T$. As described in the previous section, we use OLS, GLS and MLE procedures to obtain three sequences each. Following LR, we use arithmetic means of the above time series to obtain estimators of α, γ, δ and θ for each of the three procedures. The results are similar across OLS, GLS and MLE procedures. To conserve space, we report OLS and MLE estimates in Tables 2 and 3 for the value-based test and OLS estimates in Table 4 for a return-based test.

The following observations are warranted on the basis of Tables 2 and 3; 1) Almost all the coefficients are highly significant for the entire period and the

[15] Excess valuation is defined as the difference between market value of common equity and net worth normalized by annual sales. Average DOI, size and P/E values for the sample are used as proxies for the respective market-wide measures. In view of the observed month-by-month non-stationarity of β, the procedure used here is preferred over the one reported in Errunza and Senbet [7] insofar as we have to be consistent with the excess return methodology.

[16] Results that include market power variable proxied by only U.S. data are in Errunza and Senbet [7].

Table 2

Relation Among Excess Valuation, DOI, Size and P/E: OLS Procedure

Independent Variables	$\hat{\alpha}$	$\hat{\gamma}$	$\hat{\delta}$	$\hat{\theta}$
β, ENT	2.22	−2.4	—	0.41
	1.05 2.91	−1.06 −3.21		0.25 0.50
β, NOS	2.40	−2.6	—	−0.07
	1.18 3.07	−1.2 −3.38		−0.10 −0.04
β, FSP	2.43	−2.4	—	1.60
	1.48 3.19	−1.33 −3.26		1.18 1.94
β, $\emptyset$, ENT	1.68	−1.83	0.25	0.20
	0.77 2.23	−0.78 −2.46	0.18 0.30	0.10 0.26
β, $\emptyset$, NOS	1.85	−2.04	0.28	−0.26
	0.90 2.42	−0.93 −2.70	0.20 0.33	−0.23 −0.28
β, $\emptyset$, FSP	1.89	−1.9	0.21	1.35
	1.11 2.51	−1.03 −2.58	0.15 0.26	1.03 1.61
β, E, ENT	1.57	−1.7	1.35	0.29
	0.55 2.18	−0.55 −2.39	0.94 1.59	0.15 0.37
β, E, NOS	1.66	−1.8	1.35	−0.03*
	0.63 2.27	−0.64 −2.49	0.95 1.59	−0.08 0.00**
β, E, FSP	2.36	−1.66	2.2	1.25
	1.24 3.26	−0.88 −2.28	1.44 2.81	0.80 1.61

* Significant at 5%, **Not Significant, All others significant at 1%.

KEY: Total Period Total Period: 1970–1978 for FSP, 1971–1978 for ENT & NOS
Period 1 Period 2 Period 1: 1970–1973 for FSP, 1971–1973 for ENT & NOS
Period 2: 1974–1978

NOTE: All available data are used for each regression.
$\emptyset$ = Size Measure
E = P/E Measure

two subperiods for each of the three procedures; 2) In most cases, the relationship between *ev* and the various DOI proxies is relatively stronger (higher *significance level*) during the first period vis-a-vis the second period. In view of the normalization of excess value by annual sales, the absolute foreign sales were not used as a DOI proxy. The negative relationship between NOS and *ev* is troublesome but can be attributed to high correlation between NOS and FSA; 3) Despite data limitation mentioned earlier, the P/E effect is very strong. However, the reported significance of the size effect should be interpreted with care in view of the definition of *ev*. It is not possible to differentiate between the true size effect and the spurious relationship that might be induced by variable definition; 4) The international effect as proxied by our variables is not subsumed by the widely reported size or P/E effect. Whether the international effect would subsume the size or P/E effect is an open question.

Table 3

Relation Among Excess Valuation, DOI, Size and P/E: MLE Procedure

Independent Variables	$\hat{\alpha}$	$\hat{\gamma}$	$\hat{\delta}$	$\hat{\theta}$
β, ENT	2.99	−3.83	—	0.21
	1.85 3.67	−2.30 −4.75	—	0.23 0.19
β, NOS	3.26	−4.11	—	−0.13
	2.12 3.94	−2.57 −5.0	—	−0.12 −0.13
β, FSP	3.64	−4.45	—	0.94
	2.24 4.75	−2.61 −5.92	—	0.85 1.03
β, $\emptyset$, ENT	2.17	−2.95	0.17	0.05*
	1.48 2.6	−1.91 −3.58	0.09 0.23	0.16 −0.008**
β, $\emptyset$, NOS	2.47	−3.26	0.19	−0.23
	1.73 2.91	−2.15 −3.92	0.10 0.24	−0.16 −0.26
β, $\emptyset$, FSP	2.94	−3.73	0.14	0.77
	1.76 3.89	−2.14 −5.01	0.09 0.19	0.86 0.71
β, E, ENT	1.97	−2.55	1.44	0.08
	1.13 2.47	−1.4 −3.24	1.00 1.70	0.13 0.05**
β, E, NOS	2.16	−2.76	1.43	−0.10
	1.34 2.66	−1.6 −3.45	1.0 1.69	−0.10 −0.10
β, E, FSP	3.0	−2.85	2.34	0.70
	1.78 3.98	−1.81 −3.68	1.48 3.03	0.54 0.83

* Significant at 5%, **Not Significant, All others significant at 1%.

KEY: Total Period Total Period: 1970–1978 for FSP, 1971–1978 for ENT & NOS
Period 1 Period 2 Period 1: 1970–1973 for FSP, 1971–1973 for ENT & NOS
Period 2: 1974–1978

NOTE: All available data are used for each regression.
$\emptyset$ = Size Measure
E = P/E Measure

3. *Excess Return and DOI*

As discussed in the previous section, the arithmetic means of the time series estimates for α, γ, δ and θ were computed based on cross-sectional regressions represented by equation (19) using the OLS, GLS and MLE procedures. The results are similar across the three procedures. Table 4 summarizes the results of the OLS procedure. In contrast to the results based on excess valuation, the size and P/E effects are not statistically significant. This is not very surprising when viewed in the context of data limitation as discussed earlier and weak results for recent periods of Banz [3, Table 1] based on a portfolio approach. The portfolio approach has traditionally yielded stronger explanatory power vis-a-vis regressions based on individual securities.

With respect to the DOI proxies, the signs of the coefficients are in most cases consistent with those predicted by the theoretical model, and two of the four DOI

Table 4

Relation Among Excess Returns, DOI, Size and P/E: OLS Procedure

Independent Variables	$\hat{\alpha}$	$\hat{\gamma}$	$\hat{\delta}$	$\hat{\theta}$
β, ENT	0.007 (1.3)	0.003 (0.6)	—	−0.002 (−0.7)
β, NOS	0.008 (1.4)	0.002 (0.4)	—	−0.002 (−2.1)*
β, FSP	0.008 (1.3)	0.002 (0.3)	—	0.004 (1.4)
β, FSA	0.010 (1.5)	−0.0005 (−0.09)	—	−0.0007 (−1.98)*
β, ϕ, ENT	0.007 (1.2)	0.004 (0.67)	0.0003 (1.05)	−0.002 (−0.8)
β, ϕ, NOS	0.008 (1.3)	0.003 (0.56)	0.0004 (1.75)	−0.002 (−2.5)*
β, ϕ, FSP	0.008 (1.3)	0.001 (0.24)	0.0 (−0.3)	0.004 (1.5)
β, ϕ, FSA	0.009 (1.4)	0.0009 (0.01)	0.0005 (1.6)	−0.001 (−2.4)*
β, E, ENT	0.005 (0.99)	0.006 (1.2)	0.0004 (0.25)	−0.002 (−0.7)
β, E, NOS	0.006 (1.1)	0.005 (1.05)	0.0005 (0.27)	−0.001 (−1.7)
β, E, FSP	0.005 (0.8)	0.003 (0.5)	−0.002 (−0.7)	0.003 (1.4)
β, E, FSA	0.006 (1.03)	0.0007 (0.1)	−0.002 (−0.7)	−0.0007 (−1.96)*

* Significant at 5%

NOTE: All available data were used for each regression. Thus, the sample size varies over time as well as across DOI proxies. (t-statistics are in parentheses)

proxies, namely the number of subsidiaries and the $ foreign sales, are statistically significant. The nonsignificance of the entropy and FS % measures is difficult to interpret.

VI. Conclusion

This paper has formalized a theory of pure financial role for corporate international diversification by employing an incomplete market paradigm, and it has provided an expanded empirical investigation of the issue. It is shown that costless international corporate intermediation through direct foreign investment restores perfect market-type results by undoing barriers to international capital flows faced by individual investors. However, the more realistic case of relative cost efficiency on the supply-side leads to a positive valuation effect associated with the degree of international involvement. The empirical study, which employs generalized least squares and maximum likelihood procedures, controls for the size and P/E effects, and obtains results consistent with the theoretical valuation effect. On the other hand, the weaker relationship based on a return-based test may be due to non-correspondence between excess valuation and excess returns which require a specification of the pricing of risk in the international capital market.

The valuation effect of international corporate diversification has magnified over the subperiods characterized by severe government controls, and it is not subsumed by the so-called "small firm" or "P/E" effects. Although our data base does not permit us to investigate the extent to which the "small firm" effect is

subsumed by the international effect, this is a line of potentially fruitful research in the event that improved data are gathered on MNCs. Finally, the results of the study confirm the concern for an appropriate measurement of DOI as recognized by earlier studies. Multiple attributes, which measure the various aspects of geographic diversification as well as the shear size of international involvement, can augment the traditional reliance on only the foreign sales percentage.

Appendix

The Marginal Preference Function for the Degree of International Involvement

$$\frac{d\int U^i}{d\gamma_f}\,dF = -E(U_0^i)\left\{\frac{dB^i}{d\gamma_f} + V_{df}\frac{d\alpha_{df}^i}{d\gamma_f} + V_f\frac{d\alpha_f^i}{d\gamma_f} + \alpha_{df}^i\frac{dV_{df}}{d\gamma_f} + \alpha_f^i\frac{dV_f}{d\gamma_f} - \bar{\alpha}_{df}^i\left(\frac{dV_{df}}{d\gamma_f} - \frac{dV_{df}^N}{d\gamma_f}\right) - \bar{\alpha}_f^i\frac{dV_f}{d\gamma_f}\right\} + \int\frac{\partial U^i}{\partial C_1^i}\left[R\frac{dB^i}{d\gamma_f} + \{\tilde{\theta}_d\bar{x}_d + \gamma_f\tilde{\theta}_f\bar{x}_f(1-q^*)\}\frac{d\alpha_{df}^i}{d\gamma_f} + \alpha_{df}^i\tilde{\theta}_f\bar{x}_f(1-q^*) + \tilde{\theta}_f\bar{x}_f(1-q^i)\frac{d\alpha_f^i}{d\gamma_f}\right]dF \tag{A.1}$$

Substituting the results from (8), (9), and (10) into (A.1) and simplifying:

$$\frac{d\int U^i}{d\gamma_f}\,dF = -E(U_0^i)\alpha_{df}^i\frac{dV_{df}}{d\gamma_f} + E(U_0^i)\bar{\alpha}_{df}^i\left(\frac{dV_{df}}{d\gamma_f} - \frac{dV_{df}^N}{d\gamma_f}\right) + \int\frac{\partial U^i}{\partial C_1^i}(\alpha_{df}^i\tilde{\theta}_f\bar{x}_f)(1-q^*)\,dF \tag{A.2}$$

Rearranging (A.2) yields (11) in the text.

Clarification

The question addressed is: Is it worth undertaking foreign investment from the standpoint of the current owners of the firm? Yes, if it improves the welfare of the owners, and (A.1) is intended to investigate the issue.

Define

$d(\gamma_f, V_f)$ = the change in the purchase cost of foreign assets; the firm is a price-taker with respect to V_f and hence $\frac{d\gamma_f V_f}{d\gamma_f} = V_f$

dV_{df} = the change in the value of the firm

$dV_{df}^N = dI_{df}$ = the value of additional shares issued to finance new investment

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DISCUSSION

JAMES L. BICKSLER*: The Errunza-Senbet (hereafter E-S) paper on excess valuation and degree of international involvement (hereafter DOI) is both interesting and rigorous and there are a variety of laudatory comments that could be detailed regarding its analytics and empirics. I do, however, have some reservations and technical points about their paper.

The starting point analytics utilized by E-S is that of a Miller debt and tax framework (i.e., an upward sloping demand curve and a horizontal supply curve determining an equilibrium price having the characteristic of a zero excess value

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[Footnotes]

[7] **The Effects of International Operations on the Market Value of the Firm: Theory and Evidence**

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