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What matters about internationalization: a market-based assessment

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Abstract

This study examines the relationship between a firm's degree of internationalization (DOI) and market value. Our objectives are to provide future researchers with more confidence and empirical validation when selecting DOI constructs and to provide practitioners with more evidence of the value of internationalization. The results of the study indicate that the foreign assets percentage in both a linear and a quadratic valuation model is significantly correlated with the information set that investors utilize when determining market valuations.
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1. Introduction

Given the ever-increasing global orientation of firms, many researchers have examined the impact of internationalization on firm performance and value. This strong research interest has generated a growing body of empirical studies among international business researchers in strategy, finance, marketing, and other disciplines. Within these studies, a number of variables and approaches have been used to measure a firm's degree of internationalization (DOI) (Sullivan, 1994). These various measurement choices have naturally led to another topic of special interest among researchers: how to best measure the specific dimensions of a firm's DOI (Sullivan, 1994; Ramaswamy et al., 1996). This issue is clearly important given the continued research interest on the impact of internationalization on firm performance and value, and has been under-researched relative to the substantial number of empirical studies.

The purpose of this paper is to examine which aspects of a firm's DOI are important to investors when determining U.S. multinational corporation (MNC) market valuations. Specifically, we investigate whether Sullivan's (1994) aggregate multi-item metric (and its underlying components) significantly measures the dimensions of internationalization that lead to cross-sectional differences in an MNC market value. Our objectives are to provide future researchers with more confidence and empirical validation when selecting DOI constructs, and to provide practitioners with more evidence on the value of internationalization. To disclose the results somewhat, we find that foreign assets percentage is a significant DOI information item for market valuation, whereas the often cited aggregate multi-item measure proposed by Sullivan is not.

2. Research background

2.1. Relationship between a firm's DOI and performance and value

The relationship between a firm's DOI and its performance and value has drawn considerable research attention. From a theoretical perspective, researchers have offered varied benefits of internationalization including the following: (i) internalization (e.g., Buckley and Casson, 1976; Rugman, 1980), (ii) location advantages (e.g., Dunning, 1980; Kogut, 1985), (iii) organizational learning (e.g., Kogut and Zander, 1993), (iv) geographic diversification (e.g., Rugman, 1976, 1980), and (v) scale and scope economies (e.g., Kobrin, 1991). In contrast, others have offered varied disadvantages of internationalization including the following: (i) liability of foreignness (e.g., Hymer, 1976), (ii) increased coordination and control costs (e.g., Bartlett and Ghoshal, 1988; Jones and Hill,

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1988), and (iii) increased risks (e.g., Delios and Henisz, 2000; Rugman, 1980).

In testing these differing theoretical perspectives, the empirical evidence on the relationship between internationalization and firm performance and value has been somewhat mixed (Hitt et al., 1997; Sullivan, 1994). For large, established MNCs, a number of studies have found a positive relationship (e.g., Kim et al., 1993; Tallman and Li, 1996; Vernon, 1966), while other studies have found a negative or insignificant relationship (e.g., Horst, 1973; Kumar, 1984; Siddharthan and Lall, 1982) between internationalization and firm performance. For new venture startups or small and medium-sized enterprises (SMEs), most of the studies have found a positive relationship between internationalization and firm performance (e.g., Autio et al., 2000; Bloodgood et al., 1996; McDougall and Oviatt, 1996; Zahra et al., 2000). Interestingly, a number of more recent studies have found a curvilinear relationship, suggesting that firm performance can both increase and decrease at different levels of internationalization (Daniels and Braker, 1989; Geringer et al., 1989; Gomes and Ramaswamy, 1999; Hitt et al., 1997; Lu and Beamish, 2001).

Similarly, other researchers have examined the impact of internationalization on firm value or market valuation (e.g., Hughes et al., 1975; Michel and Shaked, 1986). In particular, a number of studies have empirically examined whether international operations are valued differently than domestic operations. This empirical evidence has also been mixed. Focusing on the decade of the 1970s, several studies have found that investors value international operations more highly than domestic operations (Errunza and Senbet, 1984; Morck and Yeung, 1991). Focusing on more recent decades, other studies have found a contrary relationship that international operations do not enhance firm value more than domestic operations (Boatsman et al., 1993; Christophe, 1997; Dennis et al., 2002).

2.2. A multi-item measure of DOI

While researchers have shown great empirical interest in examining the relationship between a firm's DOI and its performance and value, how to best measure DOI has been relatively under-researched. Sullivan's (1994) study offers some recent empirical evidence on measuring a firm's internationalization and argues for a multi-item measure of DOI to more appropriately capture the multidimensionality of MNC internationalization. Based on the DOI constructs used by prior researchers, Sullivan identifies nine potentially important internationalization variables, and performs an item–total analysis to arrive at a final aggregate index measure (DOI_{INTS}). His multi-item DOI_{INTS} measure consists of five "good" variables: one performance attribute consisting of 3-year average of foreign sales as a percentage of total sales (FSTS); two structural attributes consisting of (i) 3-year average of foreign assets as a percentage of total assets (FATA) and (ii) overseas subsidiaries as a percentage of total subsidiaries (OSTS); and two attitudinal attributes consisting of (i) top managers' international experience (TMIE) and (ii) psychic dispersion of international operations (PDIO). These five variables were factor analyzed and found to load on a single factor. Thus, Sullivan argues that the following model, $DOI_{INTS} = FSTS + FATA + OSTS + TMIE + PDIO$, is an improved model for measuring a firm's DOI, and that it can assist international business researchers in improving the reliability and validity of their DOI analyses.

Sullivan's (1994) study is prominently cited by many researchers in numerous journals across many disciplines (e.g., *Journal of Financial Quantitative Analysis*, *Journal of International Business Studies*, *Journal of International Marketing*, and *Strategic Management Journal*). To illustrate, a search on *Social Science Citation Index* for Sullivan's study brings up over 30 articles (as of May 2002). (A complete list of articles and DOI measures used are available upon request from the authors.) Interestingly, where the researchers use a DOI measure, they all cite Sullivan's study as a basis for measuring a firm's DOI, but none actually use his complete aggregate multi-item measure. This suggests that there still exists uncertainty among researchers about how to best measure a firm's DOI. Therefore, it is worthwhile to further examine Sullivan's metric empirically to ensure its usefulness—especially given the recent debate over whether Sullivan's multi-item measure is really superior to a single-item measure for explaining performance variance due to internationalization (Ramaswamy et al., 1996). Thus, we perform a market-based test to shed additional light on which DOI constructs are indeed relevant and useful measures for market valuation.

We recognize that many prior studies have looked at the value of internationalization from an accounting performance perspective, such as the impact of internationalization on return on sales and return on assets (Hitt et al., 1997; Lu and Beamish, 2001; Sullivan, 1994). We choose to use a market valuation perspective (described below) rather than an accounting performance perspective because market valuation is what investors care about, and it is a major underlying objective of accounting disclosures. As noted in the Financial Accounting Standards Board (FASB) Statement of Financial Accounting Concepts, No. 1, 1978: "Financial reporting should provide information that is useful to present and potential investors and creditors and other users in assessing the amounts, timing, and uncertainty of prospective cash receipts." Therefore, it seems appropriate to consider the usefulness of DOI constructs from a market, rather than accounting, valuation perspective.

3. A market-based test of DOI metrics

3.1. Linear specifications

The empirical specifications used in this study are grounded in prior studies by Morck and Yeung (1991),

Tobin and Brainard (1977), and others. The specification is designed to allow an investigation of the relationship between a firm's market value and its DOI. In addition, in an attempt to control for potential specification error, several other factors commonly acknowledged to have an impact on firm value are included. Therefore, we propose the following functional relationship:

$$M_{FIRM} = f(f,\ rd,\ ad,\ debt,\ \theta) \tag{1}$$

where M_{FIRM} = market value of the firm's securities; f = measure of internationalization; rd = research and develop expenditures; ad = advertising expenditure; debt = - capital structure variable measuring financial leverage; and θ = other residual factors that affect firm market value.

The measure of internationalization, variable (f), is included in Eq. (1) to examine the relationship between firm value and internationalization. Several aspects of (f) will be considered, including DOI_{INTS}, to determine which aspects of internationalization are significantly correlated with firm value.

Research and development expenditures (rd) and advertising expenditures (ad) are included in Eq. (1) because they have been previously found to be associated with firm-specific advantage, which may result in increased firm value (Branch, 1974; Grabowski and Mueller, 1978). A variable for capital structure, (debt), is included to control for the potential impact of leverage on firm value (McConnell and Servaes, 1990).

Taking the functional relationship described in Eq. (1), putting it into standard equation form, and dividing both sides by the replacement cost of the firm's assets leads to a Tobin's q relationship:

$$\tilde{q} = \beta_0 + \beta_1 F + \beta_2 \mathrm{AD} + \beta_3 \mathrm{RD} + \beta_4 \mathrm{DEBT} + \tilde{\varepsilon} \tag{2}$$

In this specification, q represents the Tobin's q for the firm. AD, RD, and DEBT represent the firm's annual advertising expenditures, annual research and development expenditures, and year-end long-term debt after each has been normalized by the replacement cost of the firm's assets. F, the metric for the firm's internationalization, will be measured in several different ways (described below in detail).

In addition, to control for industry-related valuation effects, Eq. (2) is modified to include two-digit SIC code dummies. This approach follows the specification used by Morck and Yeung (1991). Note that since the dummy variables will add to a vector of ones, the dummy for the first SIC industry in the sample is suppressed, and its impact is reflected in the estimate for the intercept term.

Finally, to control for potential q-related affects associated with firm size, the natural log of the firm's assets (LOGSIZE) is also included. Banz (1981) finds that smaller firms earn higher risk-adjusted rates of return than larger firms. Therefore, the base model is specified as the following:

$$\tilde{q} = \beta_0 + \beta_1 F + \beta_2 \mathrm{AD} + \beta_3 \mathrm{RD} + \beta_4 \mathrm{LOGSIZE} + \beta_5 \mathrm{DEBT} + \gamma \sum_{j=2}^{N} \mathrm{SIC}j + \tilde{\varepsilon} \tag{3}$$

The empirical approach proceeds in several stages. First, we consider the relevance of DOI_{INTS} as a measure of internationalization by substituting DOI_{INTS} for (F) in Eq. (4) and conducting a cross-sectional regression. More formally, the first specification that we estimate is specified as the following:

$$\tilde{q} = \beta_0 + \beta_1 \mathrm{DOI}_{\mathrm{INTS}} + \beta_2 \mathrm{AD} + \beta_3 \mathrm{RD} + \beta_4 \mathrm{LOGSIZE} + \beta_5 \mathrm{DEBT} + \gamma \sum_{j=2}^{N} \mathrm{SIC}j + \tilde{\varepsilon} \tag{4}$$

If, in this estimation, β_1 is statistically significant, then DOI_{INTS} is a useful metric for explaining the market valuation of internationalization. Next, we compare the results from the estimation of Eq. (4) to the results from an estimation where we decompose the Sullivan measure (DOI_{INTS}) into its component parts. More specifically:

$$\tilde{q} = \beta_0 + \beta_1 \mathrm{FATA} + \beta_2 \mathrm{FSTS} + \beta_3 \mathrm{OSTS} + \beta_4 \mathrm{PDIO} + \beta_5 \mathrm{TMIE} + \beta_6 \mathrm{AD} + \beta_7 \mathrm{RD} + \beta_8 \mathrm{LOGSIZE} + \beta_9 \mathrm{DEBT} + \gamma \sum_{j=2}^{N} \mathrm{SIC}j + \tilde{\varepsilon} \tag{5}$$

where FATA = 3-year average of foreign assets as a percentage of total assets (1997–1999); FSTS = 3-year average of foreign sales as a percentage of total sales (1997–1999); OSTS = overseas subsidiaries as a percentage of total subsidiaries; PDIO = psychic dispersion of international operations; TMIE = top managers' international experience; and all other variables as defined above.

The estimation of Eq. (5) will indicate which components, if any, of DOI_{INTS} are useful for explaining market valuation. The sample of firms used in the estimations of Eqs. (4) and (5) is drawn from the Compustat PC Plus dataset. In Sullivan's (1994) study, the final sample included 74 manufacturing firms selected from *Forbes*' annual ranking of "The 100 Largest U.S. Multinationals" from 1979 to 1990. Consistent with the procedure used by *Forbes* when compiling this list, we initially ranked the companies in the Compustat PC Plus database on the basis

of their 1999 dollar amount of foreign sales. From this ranking, we then selected the 100 U.S. multinational firms with the largest dollar amount of foreign sales that had the following: (i) December fiscal year ends; (ii) sufficient data available on Compustat to estimate the required dependent and independent variables; and (iii) a primary SIC code in a manufacturing industry. The December fiscal year-end criterion was used to examine the cross-sectional value of international operations within a common time window. Following Collins et al. (1998), the sample is restricted to manufacturing firms (SIC 2000–3999) in order to avoid firms with valuations tied to an underlying commodity such as agriculture firms, and quasi-regulated firms such as utilities and financial institutions. (In addition, one firm was excluded from the sample because its ratio of foreign sales to total sales in 1999 exceeded unity.) A full listing of sample firms and their associated statistics are available on request from the authors.

Tobin's q estimates are obtained using a modification of a measure developed by Chung and Pruitt (1994). Although alternative proxies for this measure are available (e.g., Perfect and Wiles, 1994, and Thomadakis, 1977), we use the Chung and Pruitt method because Christophe (1997) finds that parameter estimates are similar when any of these three approaches are used. Recently, Lewellen and Badrinath (1997) and Lee and Tompkins (1999) have proposed new methods for estimating q. Although the Chung and Pruitt approach results in lower mean and median q estimates for firms, it is still highly correlated with q estimates generated by these new approaches. In addition, since we are not using our q measure to partition our sample, but are instead examining the q of firms relative to other firms, we argue that the Chung and Pruitt method can be appropriately used and can be used for estimation inferences. The Chung and Pruitt statistic is the following:

$$\tilde{q} = \frac{\mathrm{MVE} + \mathrm{PS} + \mathrm{DEBT}}{\mathrm{TA}}$$

where MVE = market value of the firm's equity; PS = liquidating value of the firm's preferred stock; DEBT = book value of the firm's long-term debt plus short-term liabilities minus short-term assets; and TA = book value of the firm's total assets.

Since U.S. multinational firms do not typically reveal foreign operating results in earnings press releases, but instead first disclose the information when filing their annual report during the first quarter following the fiscal year end, we utilize a modified version of the Chung and Pruitt (1994) q statistic by estimating it for each firm as of March 31, 2000. This approach ensures that the information contained in the annual report is publicly available to be impounded in the firm's market valuation. Because this modified approach uses the first quarterly data disclosed after the fiscal year end, and such data do not typically include the liquidating value of the firm's preferred stock, our q measure is obtained by using the book value of preferred stock. Data for the $\mathrm{DOI_{INTS}}$ multi-item measure are obtained from several sources. OSTS and PDIO are obtained from *Dun's Directory of American Corporate Families and International Affiliates (2000)*. TMIE is obtained from *Dun's Reference Book of Corporate Managements (2000)*. FATA and FSTS are obtained from Compustat and represent the MNC's average for these two statistics over the 1997, 1998, and 1999 period. The data sources used are consistent with those used by Sullivan (1994).

Table 1 contains summary statistics for the sample of firms included in the study. The mean Tobin's q for the sample is 2.183, and the average $\mathrm{DOI_{INTS}}$ measure is 1.993. Table 2 contains the correlation coefficients for the independent variables included in the study. Not surprisingly, all five of the components linearly combined to estimate the $\mathrm{DOI_{INTS}}$ measure are significantly correlated with $\mathrm{DOI_{INTS}}$.

Results obtained from the OLS estimations of Eqs. (4) and (5) are presented in Table 3. The diagnostic test of variance inflation factors (VIFs) indicated no multicollinearity problems. To conserve space, the parameter esti-

Table 1
Summary statistics for the sample of firms ($N = 100$)

Variables	Mean	S.D.	Minimum	Maximum
Tobin's q (TOBQ)	2.183	1.976	.667	9.408
Sullivan's multi-item measure ($\mathrm{DOI_{INTS}}$)	1.993	.526	.690	3.576
Average foreign assets as a percentage of total assets 1997–1999 (FATA)	.300	.138	.023	.748
Average foreign sales as a percentage of total sales 1997–1999 (FSTS)	.393	.143	.057	.865
Proportion of overseas subsidiaries to total subsidiaries (OSTP)	.585	.193	.087	.920
Psychic dispersion of international operations (PDIO)	.679	.200	.100	1.000
Top management team's international experience (TMIE)	.036	.114	.000	.872
Advertising expenditures as a percentage of total assets (AD)	.017	.035	.000	.185
R&D expenditures as a percentage of total assets (RD)	.037	.039	.000	.165
Natural log of total assets (SIZE)	8.816	1.184	6.765	12.912
Debt as a percentage of total assets (DEBT)	.219	.126	.000	.656

Table 2
Correlation coefficients

Panel a: Variables	1	2	3	4	5	6	7	8	9	10	11
1. TOBQ	1.000	.071	−.127	.092	.087	.066	.105	.279	.652	.011	−.441
		(.483)	(.208)	(.364)	(.392)	(.515)	(.298)	(.005)	(.000)	(.912)	(.000)
2. DOI_{INTS}		1.000	.648	.700	.730	.770	.366	.293	.086	.249	−.139
			(.000)	(.000)	(.000)	(.000)	(.000)	(.003)	(.393)	(.012)	(.167)
3. FATA			1.000	.574	.236	.285	.159	.193	−.030	.006	−.108
				(.000)	(.018)	(.004)	(.115)	(.055)	(.771)	(.952)	(.284)
4. FSTS				1.000	.352	.309	.144	.093	.055	.115	.115
					(.000)	(.002)	(.154)	(.358)	(.585)	(.256)	(.256)
5. OSTS					1.000	.532	.014	.114	.112	−.021	−.019
						(.000)	(.889)	(.258)	(.268)	(.835)	(.852)
6. PDIO						1.000	.170	.211	.124	.443	−.224
							(.091)	(.035)	(.218)	(.000)	(.025)
7. TMIE							1.000	.439	−.043	.261	−.012
								(.000)	(.672)	(.009)	(.905)
8. AD								1.000	.102	−.013	−.238
									(.313)	(.900)	(.017)
9. RD									1.000	−.043	−.460
										(.670)	(.000)
10. SIZE										1.000	−.059
											(.557)
11. DEBT											1.000

Probability coefficient = 0 in parentheses.

mates associated with the two-digit SIC dummy variables are not reported (but are available upon request from the authors). The first column of Table 4 shows the results from the estimation of Eq. (4) where (F) is measured by Sullivan's DOI_{INTS}. The results indicate that there is little information in Sullivan's DOI_{INTS} that is correlated with the information set utilized by investors for determining MNC market valuations. The parameter estimate on the DOI_{INTS} measure is −.46, and with a corresponding t statistic of −1.43, it is not statistically significant at traditional levels of significance.

The second column of Table 4 shows the results from the estimation of Eq. (5), where (F) is measured by decomposing the Sullivan DOI_{INTS} measure into its component parts. The results indicate that there is a statistically significant relationship between foreign assets as a percentage of total assets, FATA, and Tobin's q. The parameter estimate on the FATA measure is −4.63, and with a corresponding t statistic of −3.45, it is statistically significant at a .1% level. None of the other components of DOI_{INTS}, however, are statistically significant. It is interesting to note the negative relationship, which implies that internationalization, based on foreign assets percentage, is not valued as highly as domestic operations.

We also repeated the estimations of Eqs. (4) and (5) using both return on sales and return on assets as the dependent variable. Results are consistent with those reported in Table 3. That is, for the Eq. (4) estimation, the Sullivan measure does not explain firm valuation (the P value for its parameter estimate is .57 in the ROS model and .67 in the ROA model). Instead, firm value of internationalization is best explained by percentage foreign assets (the P values in the Eq. (5) estimations are .08 and .02 for the ROS and ROA model estimations, respectively, with none of the other Sullivan component parts significantly different from zero at 10% or better).

3.2. Nonlinear specifications

As discussed above, some recent studies report a curvilinear relationship between firm performance and international operations. To examine the potential importance of this issue, we next modify Eqs. (4) and (5) to include terms designed to control for nonlinearities in the market value/internationalization relationship. More specifically, we next estimate the following empirical specifications:

$$\tilde{q} = \beta_0 + \beta_1 \mathrm{DOI}_{\mathrm{INTS}} + \beta_2 \mathrm{DOI}^2_{\mathrm{INTS}} + \beta_3 \mathrm{AD} + \beta_4 \mathrm{RD} + \beta_5 \mathrm{LOGSIZE} + \beta_6 \mathrm{DEBT} + \gamma \sum_{j=2}^{N} \mathrm{SIC}j + \tilde{\varepsilon} \quad (6)$$

$$\tilde{q} = \beta_0 + \beta_1 \mathrm{FATA} + \beta_{11} \mathrm{FATA}^2 + \beta_2 \mathrm{FSTS} + \beta_{22} \mathrm{FSTS}^2 + \beta_3 \mathrm{OSTS} + \beta_{33} \mathrm{OSTS}^2 + \beta_4 \mathrm{PDIO} + \beta_{44} \mathrm{PDIO}^2 + \beta_5 \mathrm{TMIE} + \beta_{55} \mathrm{TMIE}^2 + \beta_6 \mathrm{AD} + \beta_7 \mathrm{RD} + \beta_8 \mathrm{LOGSIZE} + \beta_9 \mathrm{DEBT} + \gamma \sum_{j=2}^{N} \mathrm{SIC}_j + \tilde{\varepsilon} \quad (7)$$

where ${DOI_{INTS}}^2$, $OSTS^2$, $PDIO^2$, $TMIE^2$, $FATA^2$, $FSTS^2$ are the corresponding independent variables squared, and all other variables are as above.

Results obtained from the estimations of Eqs. (6) and (7) are presented in Table 4. To reduce multicollinearity due to multiplicative variables, we mean-centered and standardized the DOI variables in both quadratic equations (Jaccard et al., 1991). The first column of Table 4 shows the results from the estimation of Eq. (6) where (F) is measured by DOI_{INTS} and $DOI_{INTS}{}^2$. As above in the linear model, there is no statistically significant evidence that the information contained in either DOI_{INTS} or $DOI_{INTS}{}^2$ is correlated with the information set utilized by investors for determining MNC market valuations.

The second column of Table 4 shows the results from the estimation of Eq. (7). Similar to the above linear model, FATA continues to exhibit a statistically significant (and negative) coefficient. The parameter estimate for FATA is −.88; with a corresponding t statistic of −3.82, it is statistically different from zero at a .1% level of confidence. There is some evidence of a curvilinear relationship between internationalization and firm value. The parameter estimate for $FATA^2$ is .20, and with a corresponding t statistic of 1.67, it is statistically significant at 10%. This result implies that international operations (foreign assets) are worth less than domestic—although as international operations increase in size (foreign assets, squared), the valuation discount becomes smaller. No other components of DOI_{INTS} are statistically significant in explaining firm value as measured by Tobin's q.

Table 3
OLS regression results

Eq. (4):

$$\tilde{q} = \beta_0 + \beta_1 DOI_{INTS} + \beta_2 AD + \beta_3 RD + \beta_4 SIZE + \beta_5 DEBT + \gamma \sum_{j=1}^{N} SICj + \tilde{\varepsilon}$$

Eq. (5):

$$\tilde{q} = \beta_0 + \beta_1 FATA + \beta_2 FSTS + \beta_3 OSTS + \beta_4 PDIO + \beta_5 TMIE + \beta_6 AD + \beta_7 RD + \beta_8 SIZE + \beta_9 DEBT + \gamma \sum_{j=1}^{N} SICj + \tilde{\varepsilon}$$

Variables	Eq. (4)	Eq. (5)
Intercept	1.28 (.83)	2.01 (1.20)
DOI_{INTS}	−.46 (−1.43)	
FATA		−4.63
		(−3.45)***
FSTS		1.36 (1.04)
OSTS		1.14 (1.14)
PDIO		−.82 (−.75)
TMIE		1.38 (.91)
AD	17.65	18.51
	(3.43)***	(3.42)***
RD	30.59	29.53
	(6.53)***	(6.61)***
SIZE	.07 (.51)	.00 (.99)
DEBT	−1.18 (−.85)	−1.90 (−1.41)
Adj. R^2	.51	.56

N = 100 and t statistics reported in parentheses.
*** P < .001, two-tailed t tests.

Table 4
Quadratic regression results

Eq. (6):

$$\tilde{q} = \beta_0 + \beta_1 DOI_{INTS} + \beta_2 DOI_{INTS}^2 + \beta_3 AD + \beta_4 RD + \beta_5 SIZE + \beta_6 DEBT + \gamma \sum_{j=1}^{N} SICj + \tilde{\varepsilon}$$

Eq. (7):

$$\tilde{q} = \beta_0 + \beta_1 FATA + \beta_{11} FATA^2 + \beta_2 FSTS + \beta_{22} FSTS^2 + \beta_3 OSTS + \beta_{33} OSTS^2 + \beta_4 PDIO + \beta_{44} PDIO^2 + \beta_5 TMIE + \beta_{55} TMIE^2 + \beta_6 AD + \beta_7 RD + \beta_8 SIZE + \beta_9 DEBT + \gamma \sum_{j=1}^{N} SIC_j + \tilde{\varepsilon}$$

Variables	Eq. (6)	Eq. (7)
Intercept	.26 (.16)	1.59 (.84)
DOI_{INTS}	−.26 (−1.51)	
$DOI_{INTS}{}^2$	−.05 (−.56)	
FATA		−0.88
		(−3.82)***
$FATA^2$		.20 (1.67)$^+$
FSTS		.33 (1.48)
$FSTS^2$		−.09 (−.72)
OSTS		.16 (.77)
$OSTS^2$		−.06 (−.44)
PDIO		−.11 (−.42)
$PDIO^2$		.02 (.15)
TMIE		.56 (1.49)
$TMIE^2$		−.07 (−1.17)
AD	18.33 (3.45)***	19.09 (3.42)***
RD	30.38 (6.44)***	30.49 (6.66)***
SIZE	.08 (.57)	−.04 (−.26)
DEBT	−1.18 (−.85)	−1.55 (−1.11)
Adj. R^2	.51	.56

N = 100 and t values reported in parentheses.
*** P < .01, two-tailed t tests.
$^+$ P < .10, two-tailed t tests.

4. Summary

We perform a market-based test on a set of well-established DOI constructs to examine the extent of their usefulness in valuing MNCs and to provide more confidence and empirical validation in these measures for future researchers. Our results suggest that from a market valuation perspective, foreign assets percentage provides significant information about a firm's DOI. In contrast, the aggregate multi-item measure of DOI and four of its five underlying components (FSTS, OSTS, PDIO, and TMIE) are not found to be significantly correlated with the information set used by investors when determining company market values. Because there is significant

computational burden associated with estimating the DOI_{INTS} multidimensional measure, the evidence presented herein implies that this computational burden is not worth the cost, at least in valuing MNCs.

As to our specific findings, the negative relationship in the linear model between internationalization (foreign assets) and firm value are consistent with some of the prior research, which found that international operations are not valued as highly as domestic operations (Boatsman et al., 1993; Christophe, 1997; Dennis et al., 2002). The curvilinear relationship in the quadratic model, although marginally significant, also suggests that the markets discount the international operations of MNCs relative to domestic operations, but the discount is tempered at greater levels of internationalization. It appears as U.S. MNCs build up their international operations (foreign assets), the costs from liability of foreignness and weak market knowledge and capabilities (Hymer, 1976; Lu and Beamish, 2001) and from increasing complexity of coordination and control (Bartlett and Ghoshal, 1988; Geringer et al., 1989; Jones and Hill, 1988), for example, outweigh the benefits. However, the market discount associated with increasing international operations does not persist as firm value begins to improve slightly. It appears at a certain level the benefits from economies of scale, scope, and experience (Kobrin, 1991; Kogut, 1985), for example, are fully realized and somewhat offset the costs. In principle, the quadratic model implies a U-shaped relationship between foreign assets (FATA) and Tobin's q. However, the upward trend in Tobin's q (given the parameter estimates for FATA and $FATA^2$ in Eq. (7)) associated with the maximum value for FATA (3.24, which is obtained after mean centering and standardizing the sample) is only slight. Consequently, at greater levels of internationalization, there is an improvement in firm value, but it is best characterized as a tempered improvement.

We offer this finding while also recognizing the limitations of our sample and empirical approach. Our sample is relatively homogeneous because it is restricted to include only U.S.-based firms with the greatest dollar amount of foreign operations, and because it is restricted to a single year. We do not anticipate, however, that expanding the sample to include additional years would lead to substantially different results given the variables that comprise DOI_{INTS}. For example, two of the components of DOI_{INTS} (FSTS and FATA) represent averages measured over a 3-year time window. Consequently, intertemporally, the values for these two variables are likely to change only gradually. Similarly, OSTS, PDIO, and TMIE are also likely to change only gradually.

Nevertheless, our key contribution is the emphasis on examining a firm's DOI from a market-based test, finding no statistically significant explanatory power associated with the multi-item measure of DOI, but finding statistically significant explanatory power associated with foreign assets percentage. These findings should be of some use for future research studies that consider the impact of a firm's internationalization.

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