RESEARCH SEMINAR IN INTERNATIONAL ECONOMICS

School of Public Policy
University of Michigan
Ann Arbor, Michigan 48109-1220

Discussion Paper No. 411

WHY INVESTORS SOMETIMES VALUE SIZE AND DIVERSIFICATION: THE INTERNALIZATION THEORY OF SYNERGY

Randall Morck
University of Alberta

Bernard Yeung
University of Michigan

September 5, 1997

Recent RSIE Discussion Papers are available on the World Wide Web at: http://www.spp.umich.edu/rsie/workingpapers/wp.html

First Draft: May 16, 1997
This Draft: September 5, 1997

WHY INVESTORS SOMETIMES VALUE SIZE AND DIVERSIFICATION:

THE INTERNALIZATION THEORY OF SYNERGY

Randall Morck
Faculty of Business
University of Alberta
Edmonton Canada T6G 2R6
phone: 403 492 5683
fax:403 492-3325
e-mailrandall.morck@ualberta.ca

Bernard Yeung
School of Business Administration
University of Michigan
Ann Arbor, Michigan, USA 48109-1234
phone: 313 763 6391
fax:313 936 8715
e-mailbyeung@umich.edu

---

[*]*The authors are at the University of Alberta and the University of Michigan, respectively.*
We thank Judith A. Chevalier, Vikas Mehrotra, and Joanne Oxley for helpful comments.

WHY INVESTORS SOMETIMES VALUE SIZE AND DIVERSIFICATION: THE INTERNALIZATION THEORY OF SYNERGY

Randall Morck and Bernard Yeung

Abstract

For most firms, size and diversification are correlated with lower value. However, for firms possessing substantial information-based asset, geographical diversification, line of business diversification, and growth in general, add value. This is consistent with information-based assets being a critical prerequisite for synergy, as postulated in internalization theories of synergy.

Introduction

Baumol (1952), Jensen (1986), and others argue that value decreasing corporate growth in scale and scope is commonplace. Yet, large, diversified multinational conglomerates are the preferred targets of consultants prescribing downsizing, increased focus, restructuring, re-engineering and other slimming remedies.

To some extent, these practices are justified by the empirical finance literature. Especially when corporate growth takes the form of cross-industry diversification, it has been found to destroy value (Morck, Shleifer and Vishny, 1990; Lang and Stulz, 1994; Berger and Ofek, 1995, 1996; John and Ofek, 1995; and others). [1] Bagwell and Zechner (1993) and Stein (1997) argue that highly diversified companies have more coordination problems and are subject to more influence costs. Morck, Shleifer and Vishny (1990), Denis *et al.* (1997), Rajan, Servaes and Zingales (1997), Shin and Stulz (1997), and Scharfstein (1997) present evidence that corporate diversification may be a type of *agency problem* - managers value the risk reduction diversification brings even though shareholders do not.

These results are interesting because, until recently, financial theorists and practicing managers found numerous reasons for expecting the opposite. Perhaps most importantly,

diversification was thought to create synergies - value enhancing economies of scale.

According to the *internalization theory of synergy*, proposed by, e.g., Buckley and Casson (1976), Helpman (1984), Caves (1985) and others, information-based assets are the key prerequisite for the existence of synergy. This is because information-based assets have increasing returns to scale (Romer, 1996), and because trading in such assets is stymied by numerous market failure problems.[2] The solution is to *internalize* the markets for information-based assets by bringing the buyers and sellers together within the same firm. This implies that size, and perhaps diversification too, should add value when firms have substantial information-based assets. The importance of the internalization theory of synergy has been empirically verified in the context of international diversification by multinationals with intangible assets (Morck and Yeung; 1991, 1992). With some modifications, its logic should also apply to firms operating within a large country such as the United States.

We find that firms with substantial information-based assets add shareholder value through diversification, both across industries and countries, and through sheer size. Similar strategies by other firms destroy shareholder value. We also find that firms which can benefit from diversification and size, but have remained focused or small, are subsequently more likely to become friendly takeover targets, and to have significantly higher target returns. Firms that have become large or diversified, but possess few intangibles, are subsequently more likely to become hostile takeover targets.

Our results are consistent with the following.

i). Corporate size and diversification are ways to internalize economies of scale and scope due to intangible assets; and thus to capture the values of these synergies for shareholders.

ii). Still, size and diversification often characterize firms with few such assets. In these firms, size and diversification are associated with reduced shareholder value, and may thus reflect agency problems. This is especially evident in domestic cross-industry diversification, and less apparent in international diversification. We speculate that currency risk, political risk, local firms' 'home turf' advantage, etc. may make international diversification less attractive to self-interested, risk-averse managers.

iii). The market for corporate control provides value increasing corrections. Excessively large or over-diversified firms tend to become hostile takeover targets during the early to mid 1980s, while firms with untapped synergistic value tend to become friendly takeover targets. The latter firms may be maximizing shareholder returns by allowing the acquirers to absorb winner's curse costs and the like.

The Internalization Theory of Synergy

Romer (1986) proposes the accumulation of information as the primary source of growth in market economies. This is because new information, unlike most other assets, has increasing returns to scale. To see this, suppose a firm spends $10 on R&D and develops a new process, which returns $1 per year in perpetuity. At a 10% discount rate, this yields a zero *NPV*. If the firm applies the same new process in a second market, the return becomes $2 per year, but since the R&D cost remains $10, the *NPV* becomes +$10. Adding a third market raises the *NPV* to +$20. The reason for this increasing returns to scale on the $10 investment is that information based assets behave like public goods; they can be used simultaneously by many people in many different locations. In contrast, ordinary capital

investments, like drill presses, lack this public good property, and can be used in only one place at a time.

This same public goods property also makes property rights over information-based assets difficult to enforce, and consequently makes trading such goods difficult. Corporations with information-based assets therefore want to keep these assets within the firm. This need to use information-based assets on the largest scale possible, but still keep it within the firm, means firms with substantial information-based assets should expand, thereby *internalizing* the markets for these assets. The values of scale and scope should plausibly also be higher for these firms than for other firms.

Doukos and Travlos (1988), Morck and Yeung (1992), Kang (1993), and others find that bidder returns in foreign acquisitions tend to be positive, in contrast to the negative or zero returns that Asquith, Brunner and Mullins (1983) and others find for bidders in domestic acquisitions. Consistent with this being due to internalization, Harris and Ravenscraft (1991) and others find that cross-border takeovers are more concentrated in R&D-intensive industries than are domestic acquisitions. Consistent with this reflecting internalization, Morck and Yeung (1991, 1992) find that international geographic diversification adds value when the diversifying firm has substantial intangible, information-based assets, but destroys value otherwise. They argue that achieving the high returns to scale associated with information-based assets more than compensates for the difficulty of doing business globally, but that in the absence of such assets, multinationals compete poorly against local firms on their home turf.[3]

Geographic diversification differs from firm size, and especially from diversification across lines of business. Harris and Ravenscraft (1991) find that the buyer and seller in

cross-border takeovers are usually in related industries. Information about a new Japanese ceramics production process may be of value in the U.S. ceramics industry, but of little use in the electronics industry. However, electronics firms are quite interested in "high temperature superconductors", which are in fact ceramics. Such seemingly improbable cross-industry fertilizations are actually quite important in the history of science[4] The importance of the internalization theory of synergy in prescribing optimal firm size or cross-industry diversification is therefore an empirical matter.

Empirical studies have found that growth and diversification often destroy value, and this appears to be largely due to agency problems. Our objective is to see if firms with potentially large internalization synergies, or "edges", are more likely than other firms to add value when they grow and diversify.

Methodology

In the cross section analysis, our methodology is to regress various measures of firms' **Tobin's q ratios** on control variables and on measures of **firm size** and the **extent of diversification**. Our objective is to see whether variables proxying for intangible assets affect the size and significance of the coefficients of diversification variables.

We are basically assuming that financial markets value firms efficiently. Thus, a firm's market value, the net present value of the cash flows its investors anticipate, V is

$$V = PV(c_1, c_2, c_3, ...) \quad (1)$$

The value of the assets the firm is using to generate these cash flows is A. Tobin's q, as

commonly measured, is the firm's market value divided by the replacement value of its assets. Thus,

$$q = \frac{V}{A} \tag{2}$$

Financial economists define a capital investment's net present value or *NPV* as the difference between the expected present value of its future cash flows and its cost. Thus, "cost" for capital budgeting purposes and "replacement cost" are similar,

$$NPV = PV(c_1, c_2, c_3, \ldots) - A \tag{3}$$

Tobin's q can also, therefore, be defined as

$$q = \frac{V}{A} = 1 + \frac{NPV}{A} \tag{4}$$

Where *NPV* is the combined net present values of all the firm's activities, its "intangible edge", so to speak. Our regressions are of the form

$$q = \beta_0 + \beta_1 i_1 + \beta_2 i_2 + \beta_3 i_3 + \ldots + \beta_n i_n + \epsilon \tag{5}$$

where each i_j is a proxy for a given type of positive or negative *NPV* per dollar of tangible assets. (Since the assets that make up A are usually tangible assets, the i_j can be viewed as proxies for intangible assets of various types that are developed using the firm's tangible assets, for example "future growth prospects", "consumer loyalty" or "technical know-how". These are specific sources for positive net present values.) Abstracting from tax considerations and other market imperfections, we anticipate that β_0 should be one and that the other coefficients should be either positive or negative depending whether the ith variable

proxies for an intangible asset or intangible liability. In particular, we are interested in the coefficients of variables that measure different dimensions of firms scope and scale: extent of international diversification, extent of cross industry diversification, and simple firm size.

Multicollinearity between such measures of scale and scope is a problem. We therefore follow Spanos (1986) and orthogonalize these scale and scope measures. Each scale or scope variable is replaced with the residual from a regression of that variable on the others. For example, our international diversification variable is the residual from a regression of international diversification on cross-industry diversification and firm size. As we discuss further in the 'robustness' section below, this procedure does not qualitatively affect our results, except to eliminate obvious artifacts of multicollinearity.

We follow our cross section to see if the firms we think should grow and diversify subsequently do so. To do this, we do an event study of subsequent M&A transactions by our firms. We compare the abnormal returns of firms that should and should not expand, and that have and have not expanded at the time of our initial cross section.

Data

Cross Section Variables

For the cross section, we choose 1978 as first a year prior to the most recent merger wave, and second a year for which data on geographical diversification are readily available. Our data on the geographic locations of U.S. firms' subsidiaries is from the *National Register* (1980/81). Data on lines of business is from S*tandard and Poor's Register of Corporations, Directors and Executive,* Vol. 3 in 1979. Our accounting data is from the *NBER Financial Master File* (Hall, 1988) and from Standard and Poor's *COMPUSTAT*. Stock return data is

from the University of Chicago's CRISP database. To smooth fluctuations in financial and accounting variables, we use three year average for 1976, 1977, and 1978. The intersection of available data from these sources yields a cross-section of 1,277 U.S. firms.

Tobin's q

The construction of Tobin's q is based on Linderberg and Ross (1981) and on Lang and Stulz (1994). Tobin's q is an average for 1976 through 1978. Our *q*'s are adjusted to reflect market value estimates for debt, inventories, plant and equipment, and other factors according to Hall (1988).

Empirical studies using Tobin's *q* ratios commonly measure a firm's *q* relative to a primary industry benchmark. In our context, choosing a proper benchmark q is complicated because we are asking whether venturing beyond a firm's core business ever adds value. We therefore consider three alternative *q*s.

The first (q-μ_q) is the **firm's q ratio minus the average q ratio of all firms in its core industry**, as defined by S*tandard and Poor's Register of Corporations*. This is the measure used by Morck, Shleifer and Vishny (1990) and Morck and Yeung (1991).

A problem with this approach is that different levels of intangibles are "normal" in different industries. For example, the intangible asset of "consumer loyalty" may be less important to brick making firms than to automakers. This means different industries have different mean *q* ratios. Comparing a one industry firm and a conglomerate based in the same core industry to the same benchmark *q* may be inappropriate. Two solutions present themselves in our context.

One is to argue that absolute amounts of intangibles, not amounts relative to industry

benchmarks, are important to the internalization theory. If automakers firms typically have more intangibles than brick makers, automakers have more assets to which the internalization theory applies. Consequently, automakers *should* be larger and more diversified than brick makers. Our second alternative q measure is therefore the **firm's unadjusted q ratio** (q). This is the approach originally used by Tobin and Brainard (1977).

The third alternative is the "chop shop" approach, pioneered by LeBaron and Speidell (1987), of using each firm's **q ratio minus a weighted average of industry average q ratios based on undiversified firms**. We follow Lang and Stulz (1994) in constructing this variable, but use two variants. The first ($q - q_{pps}$) uses industry segment sales to weight pure play qs, while the second ($q - q_{ppa}$) uses industry segment assets. The weights are constructed using *Compustat* Industry Sement data. Asset weights make more theoretical sense, but *Compustat* industry segment assets seldom add up to total assets, leaving an overhead to allocate arbitrarily (we divide it proportionally by assets). Segment sales generally add up to total sales, so sales weights avoid this problem.

Unfortunately, an operational "chop shop" approach relies on reported industry segment information, and firms have considerable accounting discretion in defining segments. Pacter (1993), Harris (1995) and Hayes and Lundholm (1996) argue that firms strategically increase the number of segments they report. In particular, when overall firm performance is poor top managers add segments so as to isolate poor performance in divisions not run directly by the head office. Furthermore, in constructing such "chop shop" qs, we find that a considerable number of industries contain no pure-play firms. Omitting firms in these industries might risk omitting instances of the most natural synergies. Fortunately, Lang and Stulz (1994) demonstrate that the "chop shop" methodology and an

approach similar to our first alternative yield similar results.

None of our approaches is wholly satisfactory. We present cross sectional empirical results using all three *q* measures and argue that the consistency of our findings across these different definitions of firm value makes a spurious result unlikely.

Intangibles

We consider intangibles related to R&D and marketing, as these are most frequently connected with economies of scale (Helpman, 1984; Caves, 1985). Following Morck and Yeung (1991), we use **research and development spending per dollar of tangible assets** (*rd/a*) to proxy for production related intangibles and **advertising spending per dollars of tangible assets** (*adv/a*) to proxy for marketing related intangibles. These variables are again averages for 1976, 1977, and 1978. If a firm for which all other accounting data is available does not report R&D or advertising spending, or reports either to be "nil", the variable in question is set to zero.

We deliberately omit proxies for "growth" or "past success". It makes sense to include such variables when it is necessary to control for the present value of future growth opportunities in general. Since the purpose of our study is to explore the detailed nature of these growth opportunities, including such broad brush variables is inappropriate and would amount to "double counting".

Geographic Diversification

To measure geographic diversification, we follow Morck and Yeung (1991) in using the **number of foreign nations** in which it has a subsidiary (*nats*). As a robustness check, we

repeat our analysis using the **number of foreign subsidiaries** the firm has, and an analogous variable relative to the primary industry mean.

Industry Diversification

To measure cross industry diversification, we use the **number of three digit SIC codes** in which the firm operates (*n3*) and also the **number of four digit SIC codes** (*n4*). These numbers are from S*tandard and Poor's Register of Corporations*, which lists a primary 4 digit industry and up to twelve secondary 4 digit industries for each firm. A final measure we use is the **number of reported business segments** in each firm's accounting data that Compustat assigns to different three digit industries (*s3*). We also use a four digit version of the last as a robustness check.

Firm Size

To measure firm size, we use **total sales**, (*sales*). Since this variable in its raw form would introduce substantial heteroskedasticity into regression errors, we normalize it as follows. An inverse standard normal distribution function is applied to the percentile rank of each firm's total sales, a number between 0 and 100%, to form a new size variable (*s*). As a robustness check, we also use a similar transformation of **total tangible assets**, the inflation adjusted value of the firm's assets. This variable is calculated by estimating the average ages of property, plant and equipment and of inventories, and then applying an appropriate inflation factor. Regressions using net capital are similar to those using sales, and so are not shown.

Control variables

We control for industry effects, with either three digit or four digit **primary industry dummies**, as assigned by S*tandard and Poor's Register of Corporations, Directors and Executives*. We also include a capital structure variable, **long term debts per dollar of tangible assets** (*d/a*). This is also an average for 1976, 1977, & 1978. We include this variable because intangible assets make poor collateral, so firms whose assets are more tangible may have a tax advantage from higher leverage.

Follow Up Study Variables

We follow our 1978 cross section of firms until 1986 and record 242 **domestic acquisitions** of publicly traded targets and 110 **foreign acquisitions** they make, and how these acquisitions affect their values.[5] We stop in 1986 because takeover rules changed in the late 1980s due to state anti-takeover laws.

Abnormal Returns

Our event date is the date the bidder's first bid is listed in the *Wall Street Journal Index*. We follow the bidder's stock return from two trading days before the event date to one trading day following it.[6] We then subtract the *Center for Research In Securities Prices* daily value weighted market return for the same period to estimate the **bidder's abnormal stock return** (r_b).

Other Variables

Asquith, Brunner and Mullins (1983) show that bidders whose takeover bid announcements

include plans to use new equity financing have lower event day returns than other bidders. We therefore use a **stock financing** dummy variable. Bradley, Desai and Kim (1988) find that bidders' event date returns are lower if there are rival bidders driving up the target's price. We therefore also use a **multiple bidder** dummy variable. These variables are constructed using the *Wall Street Journal Index*. We also use the bidder's **leverage** from our 1978 cross section to proxy for free cash flow. Large firms' stock are less moved by acquisitions than are small firms' stocks, and large targets are more likely to move a bidder's price than are small targets. Therefore, we control for the **ratio of the target's acquisition price to the bidder's equity value** prior to the takeover bid. This information is from the *C.R.S.P.* tapes. Finally, we track corporate growth from 1978 to 1986 for our cross section using an annualized percentage **change in asset value**. Asset values are inflation adjusted, as per Hall (1988), and are further adjusted for general inflation.

Cross Section Results

Univariate and Bivariate Statistics

Table 1 reports univariate statistics and cross-section correlations for the variables introduced above. Panel A shows the mean *q* to exceed the median, implying that some very high q firms pull the mean up. The same is true for our diversification variables (*n3*, *n4* for product lines, and *nats* for geographic diversification) and for our intangibles proxies (*rd/a* and *adv/a*).

Panel B shows our various *q* measures to be almost perfectly correlated with each other. All are also positively correlated with international diversification, negatively correlated with industry diversification, uncorrelated with size, positively correlated with

intangibles, and negatively correlated with debt. International diversification, cross industry diversification, and size are all positively correlated with one another.

Conspicuously, *q* and intangibles are negatively correlated with cross-industry diversification, consistent with Lang and Stulz (1994); but positively correlated with international diversification, consistent with Morck and Yeung (1991). Doukos and Travlos (1988), Morck and Yeung (1992), Kang (1993), Harris and Ravenscraft (1991) and others find positive bidder returns in foreign acquisitions; whereas, Asquith, Brunner and Mullins (1983) and others consistently report negative or zero event day returns for bidders in domestic acquisitions. Although Morck and Yeung (1992) find evidence of agency problems in some international expansions, these may be less important relative to synergies than in domestic cross-industry mergers. Firstly, cross border mergers are more risky because they expose the acquirer to foreign currency risk, political risk, and the general disadvantage of competing with local firms on their "home turf". These deterrents make cross-border mergers less attractive than domestic mergers to risk-averse, self-interested mangers. Second, economies of scope and scale from intangibles may be harder to achieve in cross-industry diversification. Thus, synergy might be relatively more prevalent in international diversification, while agency problems might be relatively more common in cross-industry diversification, consistent with the observed correlation coefficients.

Debt has correlations opposite in sign to those of q and intangible measures, consistent with high leverage being associated with tangible assets but not, at least in simple bivariate correlations, with higher shareholder value.

Multivariate Analysis

Our basic framework is regressions of the form of (5), *viz.*

$$q = \sum_{s=1}^{S} \upsilon_s + \beta_1 \frac{d}{a} + \beta_2 \frac{rd}{a} + \beta_3 \frac{adv}{a} i_2 + \beta_4 [\,{}^{geographic}_{diversification}\,] + \beta_5 [\,{}^{industry}_{diversification}\,] + \beta_6 size + \epsilon \qquad (6)$$

where υ_s is a dummy equal to one if the firm's primary industry is industry *s* and equal to zero otherwise. We then modify this specification to allow the diversification and size coefficients, β_4 through β_6, to depend on the firm's intangible "edge",

$$\beta_4 = \gamma_0 + \gamma_1 \frac{rd}{a} + \gamma_2 \frac{adv}{a} \qquad (7)$$

$$\beta_5 = \text{'}_0 + \text{'}_1 \frac{rd}{a} + \text{'}_2 \frac{adv}{a} \qquad (8)$$

$$\beta_6 = \eta_0 + \eta_1 \frac{rd}{a} + \eta_2 \frac{adv}{a} \qquad (9)$$

We thus run regressions:

$$\begin{aligned} q = {} & \sum_{s=1}^{S} \upsilon_s + \beta_1 \frac{d}{a} + \beta_2 \frac{rd}{a} + \beta_3 \frac{adv}{a} i_2 \\ & + \gamma_0 [\,{}^{geographic}_{diversification}\,] + \gamma_1 \frac{rd}{a} [\,{}^{geographic}_{diversification}\,] + \gamma_2 \frac{adv}{a} [\,{}^{geographic}_{diversification}\,] \\ & + \text{'}_0 [\,{}^{industry}_{diversification}\,] + \text{'}_1 \frac{rd}{a} [\,{}^{industry}_{diversification}\,] + \text{'}_2 \frac{adv}{a} [\,{}^{industry}_{diversification}\,] \\ & + \eta_0 size + \eta_1 \frac{rd}{a} size + \eta_2 \frac{adv}{a} size + \epsilon \end{aligned} \qquad (10)$$

In a similar specification, but considering geographic diversification only, Morck and Yeung (1991) find that γ_0 is negative while γ_1 and γ_2 are positive, and conclude from this that geographic diversification adds value only if the firm possesses information-based intangibles (assets thought to have very large economies of scale). In subsequent tables, we search for a similar effects in size and cross-industry diversification.

Consistent with Morck and Yeung (1991), Table 2 shows geographic diversification

adding no value in the absence of intangibles (though the point estimates of γ_0 are negative), but adding statistically significant value when R&D spending is high.

Cross industry diversification appears to destroy significant value when intangibles are absent, as Table 2 consistently shows negative and significant estimates for $'_0$. The coefficients of about -.03 imply that *q* falls by over 3% of the dollar value of tangible assets per additional 3-digit sic segment, and by over two percent per additional 4-digit sic segment. These numbers roughly confirm Lang and Stulz (1994). These declines are roughly 10 times larger than the comparable (statistically insignificant) declines for diversification into an additional country. This may reflect a greater incidence of cross industry diversification due to agency problems. It might also reflect more valuable tax avoidance opportunities associated with international diversification and transfer pricing.[7]

Notably, however, we find that cross industry diversification appears to add to firm value in the presence of intangibles. We find consistently positive and significant values for $'_1$ and positive, though seldom significant, values for $'_2$! This is irrespective of whether we use number of 3 digit or 4 digit industries to measure diversification, and irrespective of how we define *q*.

Sheer firm size also appears to destroy value in the absence of intangibles, but adds to value in their presence. Like geographic and industry diversification, firm size is negative and significant but its cross-terms with intangibles are positive and significant. Note that advertising appears to add value more through firm size than through industry or, especially, geographical diversification.

The other variables behave as expected: leverage is negative and significant, R&D spending is positive and significant, and advertising is insignificant.

A Comparison with the Literature on Cross Industry Diversification

We find that cross industry diversification does not always destroy value. Jensen (1989) argues that diversification became bad only in the 1980s. Our analysis suggests that this view can be refined. In 1978, we find that diversification adds value when the firm has intangibles, but otherwise destroys value. This supports Livermore (1935), who found a similar relationship between intangible assets, like R&D or advertising, and superior post-takeover firm performance in the U.S. "turn of the century" merger wave.

Nonetheless, the analyses of Morck, Shleifer and Vishny (1990), Lang and Stulz, (1994), Berger and Ofek (1995, 1996), John and Ofek (1995), Servaes (1997), Stein (1997), Denis *et al.* (1997), Rajan *et al.* (1997), Shin and Stulz (1997), Scharfstein (1997) and others are roughly correct - industry diversification does destroy value in most cases. To illustrate, recall that the overall effect of industry diversification on q is

$$\beta_5 = \gamma_0 + \gamma_1 \frac{rd}{a} + \gamma_2 \frac{adv}{a} \qquad (11)$$

For this to be positive, it must be the case that

$$\gamma_1 \frac{rd}{a} + \gamma_2 \frac{adv}{a} > -\gamma_0 \qquad (12)$$

For a firm with no advertising spending to profit from diversification, its R&D spending must satisfy

$$\frac{rd}{a} > -\frac{\gamma_0}{\gamma_1} \qquad (13)$$

The values of γ_0/γ_1 in regressions 2.1 through 2.6 are 6.06%, 5.57%, 6.44%, 5.35%, 5.90%,

and 5.88% respectively: an average of just under six percent. From Table 1A, the mean of *rd/a* is $\mu = 2.39\%$ and its standard deviation is $\sigma = 3.95\%$. Thus, the calculated values of $'_0/'_1$ are roughly equal to one standard error above the mean, $\mu + \sigma = 6.34\%$. In other words, expansion into a new 3 or 4 digit SIC code is likely to add value only if a firm's R&D spending per dollar of tangible assets exceeds the overall mean by one standard error. (A similar calculation using *adv/a* leads to a similar qualitative prediction.)

For a given firm, cross-industry diversification adds or subtracts value as β_5 in equation 11 is positive or negative. Based on the average values of $'_0/'_1$ in regressions 2.1, 2.3, 2.5 and 2.6 (all of which measure diversification by three digit industries), only 151 or 12% of our 1,277 firms could benefit shareholders through cross-industry diversification. The remaining 1,126 firms, 88% of the sample, should be focused on a core industry. In fact, 1,011 firms operate in more than one three digit line of business! Of the 151 firms that could benefit shareholders by diversifying across industries, 104 have done so. Of the 1,126 that should not be diversified, only 219 firms, or 19%, resisted the temptation. Instances of value destroying cross-industry diversification (907 firms) outnumber instances of value creating diversification (104 firms) nine to one.

Robustness

The results in Table 2 are highly robust. Using number of foreign subsidiaries instead of number of nations in which such subsidiaries are located gives similar results. Using four digit industries to define "chop shop" *q*s also gives similar results, though the sample shrinks further because "pure play" firms are lacking in more industries. Using assets rather than sales to measure firm size also makes no qualitative difference. Using logarithms of sales

or assets instead of the normalized rank transformation in Table 2 also makes no material difference. Raw sales or assets is insignificant, but induces substantial heteroskedasticity.

Using raw scale and scope variables, rather than variables orthogonalized according to Spanos (1986), allows for substantial multicollinearity, and makes regressions containing more than one scale or scope variable difficult to interpret. When we use raw variables and include only multinational diversification and its cross terms, only cross industry diversification and its cross terms, or only firm size and its cross terms, we get results qualitatively similar to those in Table 2.

We can also reject the possibility that our results are an artifact of "averaging". If the U.S. has a comparative disadvantage in low technology industries, these industries should generally be contracting while high tech industries are generally expanding. Focused firms in the contracting industry have lower *q*s than have focused firms in the expanding industry. A low tech firm expanding into a high tech industry incurs more R&D and also has a higher *q* than its counterparts that remain focused in the low tech industry. Similarly, firms expanding into the low tech industry incur less R&D and have lower *q*s than their peers that remain focused in the high tech industry. In such a world, a regression of *q* on the cross term between diversification and intangibles will give a spurious positive coefficient for the cross term.

In principle, the “chop shop” approach should eliminate this problem. However, if low *q* firms are more likely to report many segments, as Pacter (1993), Harris (1995) and Hayes and Lundholm (1996) argue, the number of reported segments is itself a function of *q*. The ensuing bias in cross-terms is difficult to predict.

Fortunately, we can also reject this "averaging" story because it makes symmetrical

predictions for expansion from high to low tech industries and from low to high tech industries. That is, if we cut the sample into high and low tech home industries, this story predicts identical cross terms in both sub-samples. When we partition the sample in this way, we find that the cross term result is strong in the high tech industry sub-sample, but absent in the low tech industry sample. This is consistent with internalization based synergy: firms whose home industry is low tech should not have much to internalize while the opposite is true for firms whose home industry is high tech.

Follow Up Study Results

The previous results suggest that some firms can add value by growing and diversifying, while others cannot. In this section, we follow our firms to see which ones do expand and diversify, and whether this in fact adds value.

We again partition our initial cross section according to whether or not the firm should grow or diversify according to equations 7, 8 and 9. That is, we use the estimated coefficients in Table 2 to gauge whether or not the positive effect of growth or diversification due to each firm's intangibles overrides the negative intrinsic effect of these policies. We repeat this procedure for each relevant regression in Table 2 and then assign each firm to the subsample implied by the majority of regressions.

We argued above that information-based assets might have increasing returns to scale and scope for many firms. However, given sufficient existing scale and scope, diminishing returns might eventually set in. We therefore construct a second partition based on whether or not each firm has, in fact, diversified. This allows us to compare firms that should expand but have not, and thus should have unambiguously increasing returns to scale

in intangibles, to other firms. Table 3 presents these comparisons.

Subsequent International Diversification

The first panel in Table 3 examines international diversification. Firms that should be multinationals according to Table 2 are indeed more likely to have overseas subsidiaries (t = 5.99) than are other firms.[8] Of our 1,277 firms, 269 should not be diversified internationally, and only 72 of these have so diversified. In contrast, of the 1,008 that should diversify internationally, 536 have. Thus, the ratio of instances of value destroying to value enhancing international diversification is roughly one in seven. Recall that for cross-industry diversification, the comparable ratio is nine instances of value destroying diversification to one instance of value creating diversification. Furthermore, firms that should expand internationally are significantly more likely to make subsequent foreign acquisitions (t = 3.36).

The event studies of foreign acquisitions by firms in each subsample are also consistent with internalization. Firms that should diversify internationally, but have not, show the least negative stock price reactions to foreign acquisitions announcements. In contrast, firms that should not expand internationally, but have done so, have the most negative stock price reactions to further foreign acquisitions. These differences in returns are not statistically significant, and remain insignificant when effects related to equity financing, bidder size, etc. are controlled.

Takeover bids of firms with intangibles by companies with extant or potential multinational structures are obvious alternative ways for the economy to realize potential synergies. Indeed, this route may be preferable for the shareholders of the target firms, as

winner's curse costs and the like are absorbed by the bidder shareholders. Firms that should expand internationally, but have not, are significantly more likely (t = 2.33) than other firms to become the targets of friendly merger bids. Their odds of being the target of a hostile bid, in contrast, are not significantly different from those of other firms. Firms that should not have expanded internationally, but did, have incidences of both hostile and friendly takeovers not significantly different from those of other firms.

Subsequent Cross Industry Diversification

The second panel in Table 3 considers cross-industry diversification. In contrast to the first panel, firms that should not diversify across industries are significantly (t = 3.30) *more* likely to have done so! Firms that should not diversify across industries are also significantly *more* likely (t = 1.97) to launch a subsequent cross-industry takeover bid. Indeed, firms that should diversify across industries, but have not, actually launch *no bids at all* from 1978 to 1986.

This makes it impossible to test whether cross-industry bids by firms that should diversify, but have not, add to shareholder value. Diversifying bids by firms that should diversify, and already are, have more negative stock price reactions than other bids, however these differences are not statistically significant. Controlling for equity financing, target size relative to bidder size, the presence of multiple bidders, and the bidder's leverage fail to alter this result.

Clearly, many firms that would benefit by diversifying across industries fail to launch takeovers that should add to shareholder value. This does not necessarily mean the full value of their intangibles remains unrealized. The last three lines of the middle panel contain

statistics about takeover bids launched against firms in each subsample. Firms that should be diversified, but are not, are significantly more likely to become targets of friendly merger bids (t=1.76) than are other firms. Indeed, more than one third of the firms that should diversify, but have not, end up as friendly merger targets. This is consistent with the managers of firms with potential diversification synergies adopting passive strategies, and letting other firms organize the mergers.

Note also that hostile bids are not more likely against these firms than against other firms. In contrast, hostile takeovers are significantly more likely (t = 2.65) against firms that should not have diversified, but did, than against other firms. This is consistent with hostile bids having a disciplinary role, aimed at undoing past mistakes in corporate strategy, consistent with Morck, Shleifer and Vishny (1989), Martin and McConnell (1991) and others.

Subsequent General Expansion

The third panel of Table 3 considers overall firm growth from 1978 to 1986. Firms that are small, but should be large due to their intangibles, do grow at a significantly higher (t=2.28) 3.45% annual growth rate in fixed assets compared to all other firms. However, they are significantly less likely (t= 2.51) to launch domestic takeover bids, diversifying or not, than other firms are.

Small firms that should grow also show the most positive stock price reactions to announcing takeovers, about one percent. The differences in simple mean returns are insignificant, but become highly statistically significant when we control for the presence of multiple bidders, contemporaneous stock issues, the bidder's leverage, and the ratio of the

target's size to the bidders' size in a multiple regression setting, *viz*

$$r_b = \underset{(.57)}{.00602} + \underset{(.01)}{.0253} \times \chi_{\substack{\text{should expand} \\ \text{but has not}}} - \underset{(.02)}{.0269} \times \chi_{\substack{\text{multiple} \\ \text{bidders}}} - \underset{(.05)}{.0182} \times \chi_{\substack{\text{equity} \\ \text{issue}}} - \underset{(.25)}{.0366} \times \frac{debt}{assets} + \underset{(.73)}{.00368} \times \frac{target\ size}{bidder\ size} \qquad (14)$$

with the numbers in parenthesis being probability levels. Firms that should expand, but have not, post significantly higher stock price gains upon announcing domestic acquisitions once we control for other variables known to affect bidder returns.[9]

Again, firms that should expand, but have not, are significantly more likely (t = 4.25) to become targets of friendly takeover bids. Note also that firms that should not diversify, but have, are significantly more likely (t = 4.04) to become targets of hostile bids. This is, once more, consistent with hostile takeovers being a mechanism for busting up firms that have grown too large.

Conclusions

For most firms, international diversification, cross industry diversification, and sheer size are correlated with reduced shareholder value. For firms owning substantial information-based assets related to R&D or advertising, international diversification, cross industry diversification and size add value. These findings support the internalization theory of synergy: Information-based assets have increasing returns to scale and scope, but cannot be traded easily; they therefore justify firm extension in scale and scope.

Many firms with substantial intangible assets are relatively unextended in scale and scope. Moreover, these firms launch few subsequent takeovers. They are, however, significantly more likely than other firms to becoming targets of friendly mergers. This

suggests that synergies are a legitimate reason for mergers, and that the market for corporate control plays an important role in allowing firms to realize synergies from international diversification, cross industry diversification, and sheer size.

Many other firms diversify and expand without possessing valuable intangibles. In these firms, increased scope and scale destroy value. We find that such firms are unusually likely to become hostile takeover targets. This is consistent with the market for corporate control correcting non-value-maximizing corporate strategies *via* hostile takeovers.

The above results illuminate the economic function of firm size and diversification, and also resolve empirical tension on these subjects. Firm size and diversification are ways to internalize economies of scale and scope arising from intangibles, and to capture these synergistic values for shareholders. Firm size and diversification can also betray managers pursuing their self-interest at the shareholders' expense.

We find that international diversification is more likely to be value enhancing, whereas cross-industry domestic diversification is more likely to be value destroying. This is consistent with cross-country diversification being less attractive to risk-averse, self-interested mangers because of factors like currency risk, political risk, and competitors' 'home turf' advantage. It is also consistent with there being less inherent synergy in domestic cross-industry diversification.

Given human nature, it is unsurprising that diversification often reflects agency problems rather than internalization. But the lesson here is that agency behavior is ubiquitous, not that diversification is bad. Indeed, our results suggest that the market for corporate control made appropriate corrections. Corporate strategies that extend scale or scope only when this adds value are clearly better for shareholders than a Quixotic tilt to

downsize and focus. A discerning market for corporate control acts to make such strategies better for managers too.

References

Asquith, Paul R., R. F. Brunner and David W. Mullins 1983. "The gains to bidding firms from merger" *Journal of Financial Economics*, 11 pp. 121-140.

Bagwell, Laurie Simon and Zechner, Josef. 1993. "Influence costs and capital structure." *Journal of Finance* July, v48n3, p. 975-1008

Baumol, William. 1959. *Business Behavior: Value and Growth*. MacMillian, New York.

Berger, Philip G. Eli Ofek. 1996. Bustup takeover of value-destroying diversified firms. *Journal of Finance* Sep, v51n4, p. 1175-1200

Berger, Philip G. and Eli Ofek, 1995, "Diversification's effect on firm value" *Journal of Financial Economics*, Jan 1995, pp. 39-65.

Bradley, Michael. Desai, Anand. and Kim, E. Han. 1988. Synergistic gains from corporate acquisitions and their division between the stockholders of target and acquiring firms. *Journal of Financial Economics* May, v21n1, pp. 3-40.

Buckley Peter J. and Mark Casson. 1976. *The Economic Theory of the Multinational Enterprise*. Macmillan. London.

Burke, James, *Connections* London, Macmillian, 1978.

Caves, Richard, 1986, *Multinational Enterprise and Economic Activity*, Cambridge University Press.

Coase, Ronald H., 1937. "The nature of the Firm," *Economica* Vol. 4, Nov. pp. 386-405.

Denis, David J. Denis, Diane K. Sarin, Atulya. 1997 Agency problems, equity ownership, and corporate diversification. *Journal of Finance* Mar, v52n1, p. 135-160

Hall, Bronwyn H. 1988, "The Manufacturing Sector Master File" Palo Alto N.B.E.R. technical paper, Stanford.

Hall, Bronwyn H., 1993, "The Stock Market 's Valuation of R&D Investment During the 1980 's," *American Economic Review*, Vol. 83, No. 2, May, pp. 259-264.

Harris, David, Randall Morck, Joel Slemrod and Bernard Yeung. 1993. "Income Shifting in US Multinational Corporations" in Alberto Giovannini, Glen Hubbard and Joel Slemrod, eds. *Studies in International Taxation*. University of Chicago Press.

Harris, Mary Stanford, "Economic Factors Affecting Managers' Business Segment Reporting Choices," unpublished manuscript Pennsylvania State University, 1995.

Harris, Robert S. Zechner, Josef. 1991. The Role of Acquisitions in Foreign Direct Investment: Evidence from the U.S. Stock Market. *Journal of Finance* July, v46n3, p. 825-844

Hayes, Rachel M. and Russell Lundholm, "Segment Reporting to the Capital Market in the Presence of a Competitor", *Journal of Accounting Research*, 1997 34 pp. 261-279.

Helpman, Elhanan 1984, "A Simple Theory of International Trade with Multinational Corporations" *Journal of Political Economy*, 92, June, pp. 451-471.

Jacob, John. 1996. " Taxes and transfer pricing : Income shifting and the volume of intrafirm transfers" *Journal of Accounting Research* Autumn, v34n2, p. 301-312

John, Kose and Eli Ofek, 1995, "Asset sales and increase in focus" *Journal of Financial Economics,* Jan 1995, v37n1, p. 105-126.

Kang, Jun-Koo. 1993. The international market for corporate control : Mergers and acquisitions of U.S. firms by Japanese firms. *Journal of Financial Economics* Dec, v34n3, p. 345-371.

Lang, Larry H. P., and Rene M. Stulz, 1994, "Tobin 's q, Corporate Diversification, and Firm Performance," *Journal of Political Economy*, Vol. 102, No. 6, pp. 1248-1280.

LeBaron, Dean, and Lawrence S. Speidell, 1987, "Why Are the Parts Worth More than the Sum? 'Chop Shop,' a Corporate Valuation Model," in *The Merger Boom*, edited by Lynn E. Browne and Eric S. Rosengren. Conference Series, no. 31. Boston: Fed. Reserve Bank.

Linderberg, Eric B., and Stephen Ross, 1981, "Tobin 's q Ratio and Industrial Organization," *Journal of Business*, Vol. 54 Jan. pp. 1-32.

Livermore, Shaw. 1935 "The Success of Industrial Mergers" *Quarterly Journal of Economics*, May, pp. 68-96.

Manzon, Gil B Jr. Sharp, David J. Travlos, Nickolaos G. 1994. An empirical study of the consequences of U.S. tax rules for international acquisitions by U.S. firms. *Journal of Finance* Dec, v49n5, p. 1893-1904.

Martin, Kenneth J. McConnell, John J. 1991. Corporate Performance, Corporate Takeovers, and Management Turnover. *Journal of Finance* June, v46n2, p. 671-687

Matsusaka, John G. 1996. "Did tough antitrust enforcement cause the diversification of American corporations?" *Journal of Financial & Quantitative Analysis* Jun, v31n2, pp. 283-294.

Matsusaka, John G. 1993a. "Takeover motives during the conglomerate merger wave." *Rand Journal of Economics* Autumn, v24n3, p. 357-379.

Matsusaka, John G. 1993b. "Target profits and managerial discipline during the conglomerate merger wave." *Journal of Industrial Economics* Jun, v41n2, pp. 179-189

Morck, Randall, and Bernard Yeung, 1991, "Why Investors Value Multinationality," *Journal*

of Business, Vol. 64, no. 2, pp. 165-187.

Morck, Randall, and Bernard Yeung, 1992, "Internalization: an event study test," *Journal of International Economics*, vol. 33, pp. 41-56.

Morck, Randall, Andrei Shleifer and Robert Vishny, 1990 "Do Managerial Objectives Drive bad Acquisitions" *Journal of Finance*, 45(1), March, pp. 31-48.

Pacter, Paul, "Reporting Disaggregated Information" *Financial Accounting Standards Board 123-A*, FASB 1993.

Rajan, Raghu, Henri Servaes, and Luigi Zingales. 1997. "Conglomerate Discount and Inefficient Investment." University of Chicago working paper.

Romer, Paul M., 1996, "Increasing Returns and Long Run Growth," *Journal of Political Economy*, Oct., pp. 1002-1037.

Servaes, Henri. 1996. "The Value of Diversification During the Conglomerate Merger Wave." University of North Carolina working paper. *Journal of Finance*, Sept, 51(4), p. 1201-1225.

Scharfstein, David. 1997. "The Dark Side of Internal Capital Markets II." MIT working paper.

Shih, Michael S H. Corporate tax incentives for conglomerate mergers: Model development and empirical evidence. *Contemporary Accounting Research* Spring 1994, v10n2, p. 453-481.

Shin Hyun-Han and René M. Stulz. 1997. "Are Internal Capital Markets Efficient?" Ohio State University working paper.

Spanos, Aris (1986), *Statistical Foundations of Econometric Modeling*, Cambridge University Press.

Stein, Jeremy C. "Internal capital markets and the competition for corporate resources." *Journal of Finance* Mar 1997, v52n1, p. 111-133.

Tobin, James. and William Brainard, 1977. "Asset markets and the Cost of Capital" in *Economic Progress, Private Values and Public Policy: Essays in Honor of William Fellner*. ed. R. Nelson and B. Balassa. Amsterdam, North Holland.

Table 1 A: Univariate Statistics

Variable	*mean*	*standard deviation*	*median*	*minimum*	*maximum*
Tobin s q (***q***)	.839	.545	.680	.109	3.93
Tobin s q -prim. ind. av. (***q-μq***)	0	.471	-.0616	-1.27	2.73
Tobin's q - sales weighted average of pure play q's (***q - q_{pps}***)	-.0536	.487	-.111	-1.57	2.73
Tobin's q - asset weighted average of pure play q's (***q - q_{ppa}***)	-.0534	.487	-.110	-1.21	2.62
number of foreign nations with a subsidiary (***nats***)	2.79	6.11	0	0	58
number of nations with a subsid. – prim. ind. av. (***nats-μnats***)	0	5.64	-1.03	-25	52.3
number of 3-digit SIC segments (***n3***)	3.83	2.59	3	1	12
no. of 3-digit SIC segments –prim. ind. av. (***n3-μn3***)	0	2.36	-.545	-5.33	8.88
number of 4-digit SIC segments (***n4***)	4.70	3.37	4	1	12
no. of 4-digit SIC segments –prim. ind. av. (***n4-μn4***)	0	3.09	-.778	-6.25	8.97
number of reported 3-digit SIC segments (***s3***)	1.46	1.06	1	1	9
sales (***sales***)	887	3,469	146	.0770	63,221
sales - industry average sales (***s - μsales***)	0	3,237	-145	-14,120	59,234
R&D spending per $ of tangible assets (***rd/a***)	.0239	.0395	.0086	0	.359
Advertising spending per $ of tangible assets (***adv/a***)	.0226	.0561	.0007	0	.772
Leverage per $ of tangible assets (***d/a***)	.247	.155	.231	0	.899
bidder's abnormal return in subsequent domestic takeovers (***r_b***)	-.00292	.0613	-.00660	-.139	.289
bidder's abnormal return in subsequent foreign takeovers (***r_b***)	-.000137	.0309	-.000166	-.0698	.101
subsequent growth in tangible assets	.0254	.0818	.0217	-.255	.375

Sample size: 1,277 firms for all variables except for: q - q_{pps} and q - q_{ppa}, for which only 1,205 firms are available; bidder abnormal return, available for 242 bids; bidder return in foreign takeovers which exists for 110 bids; and capital expenditure growth, available for 773 firms.

Table 1 B: Bivariate Correlation Coefficients.

	measures of firm value				measures of international diversification		measures of cross industry diversification					measures of size	measures of intangibles			debt
	$q-\mu_q$	q	$q - q_{pps}$	$q - q_{ppa}$	$nats-\mu_{nats}$	nats	$n3-\mu_{n3}$	$n4-\mu_{n4}$	n3	n4	s3	$sales-\mu_{sales}$	sales	rd/a	adv/a	d/a
$q-\mu_q$	1.00	.864	.956	.955	.0750	.0929	-.0874	-.0764	-.0798	-.0701	-.106	.0102	.0095	.129	.0175	-.109
	(.00)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.72)	(.73)	(.01)	(.53)	(.01)
q		1.00	.837	.837	.0869	.145	-.0755	-.0660	-.108	-.106	-.119	.0088	-.0070	.313	.108	-.0900
		(.00)	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)	(.01)	(.01)	(.01)	(.75)	(.80)	(.01)	(.01)	(.01)
$q - q_{pps}$			1.00	1.00	.0983	.0981	-.0781	-.0670	-.0733	-.0612	-.115	.0124	.0187	.0878	-.0011	-.115
			(.00)	(.01)	(.01)	.(.01)	(.01)	(.02)	(.01)	(.03)	(.01)	(.67)	(.52)	(.01)	(.97)	(.01)
$q - q_{ppa}$				1.00	.0986	.0983	-.0764	-.0649	-.0726	-.0600	-.114	.0121	.0180	.0872	-.0006	-.114
				(.00)	(.01)	(.01)	(.01)	(.02)	(.01)	(.04)	(.01)	(.68)	(.53)	(.01)	(.98)	(.01)
$nats-\mu_{nats}$					1.00	.923	.161	.184	.121	.142	.0053	.330	.308	.0512	.0101	-.0421
					(.00)	(.01)	(.01)	(.01)	(.01)	(.01)	(.85)	(.01)	(.01)	(.07)	(.72)	(.13)
nats						1.00	.122	.142	.158	.177	.0051	.304	.340	.106	.0320	-.0542
						(.00)	(.01)	(.01)	(.01)	(.01)	(.86)	(.01)	(.01)	(.01)	(.24)	(.05)
$n3-\mu_{n3}$							1.00	.943	.913	.865	.206	.0830	.0774	-.0675	-.0522	.0681
							(.00)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)	(.06)	(.02)
$n4-\mu_{n4}$								1.00	.861	.917	.204	.115	.108	-.0555	-.0476	.0508
								(.00)	(.01)	(.01)	(.01)	(.01)	(.01)	(.05)	(.09)	(.07)
n3									1.00	.939	.225	.0758	.114	-.0918	-.0823	.0497
									(.00)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.08)

n4	1.00	.212	.106	.135	-.0968	-.0692	.0323
	(.00)	(.01)	(.01)	(.01)	(.01)	(.01)	(.25)
s3		1.00	-.0343	-.0104	-.0881	.0016	.0476
		(.00)	(.22)	(.71)	(.01)	(.96)	(.09)
sales-μ_{sales}			1.00	.933	.0424	-.0039	-.0974
			(.00)	(.01)	(.13)	(.89)	(.01)
sales				1.00	.0090	-.0195	-.0950
				(.00)	(.75)	(.48)	(.01)
rd/a					1.00	.0938	.0454
					(.00)	(.01)	(.11)
adv/a						1.00	-.0584
						(.00)	(.04)

Sample is 1277 firms. Numbers in parentheses are significance levels.

Table 2: OLS regression of Tobin s q on geographic diversification, industry diversification and size as well as cross-terms between these three variables and intangibles (R&D and advertising spending per dollar of tangible assets) controlling for primary industry, leverage per $ of tangible assets, intangibles. Regressions 2.1 and 2.2 measure q, geographic diversification, industry diversification, and size as deviations from primary 3 digit industry means. Regressions 2.3 and 2.4 use absolute values of these variables. Regressions 2.5 and 2.6 use q relative to sales and asset weighted averages respectively of the average qs of undiversified firms in the industries in which the firm operates.

	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)
dependent variable: q ratio relative primary industry mean ($q - \mu_q$), q ratio (q), or q ratio relative to pure play portfolio q ($q - q_{ppp}$).	$q - \mu_q$	$q - \mu_q$	q	q	$q - q_{pps}$ (sales weighted)	$q - q_{ppa}$ (asset weighted)
industry dummies	3 digit	4 digit	3 digit	4 digit	3 digit	3 digit
leverage per $ of tangible assets (d/a)	-.368 (.01)	-.392 (.01)	-.328 (.01)	-.352 (.01)	-.336 (.01)	-.332 (.01)
R&D spending per $ of tangible asset (rd/a)	2.94 (.01)	2.95 (.01)	3.17 (.01)	3.24 (.01)	2.70 (.01)	2.70 (.01)
Advertising spending per $ of tangible assets (adv/a)	.232 (.51)	-.212 (.60)	.125 (.73)	-.354 (.39)	-.0776 (.84)	-.0743 (.85)
geographic diversification variable: no. of nations the firm operates in (nats), or no. relative to av. for firms in the same prim. ind. ($nats - \mu_{nats}$)	$nats - \mu_{nats}$	$nats - \mu_{nats}$	nats	nats	nats	nats
geographic diversification	-.00245 (.54)	-.00489 (.30)	-.00232 (.58)	-.00412 (.40)	-.00284 (.53)	-.00276 (.54)
interaction of geographic diversification and R&D spending: geographic diversification × rd/a	.238 (.01)	.302 (.01)	.247 (.01)	.275 (.01)	.227 (.01)	.227 (.01)
interaction of geographic diversification and advertising: geographic diversification × adv/a	.0996 (.04)	.0704 (.20)	.0571 (.27)	.310 (.60)	.0662 (.21)	.0654 (.22)
industry diversification variable: # 3 digit lines (n3 or s3)[a] or # 4 digit lines (n4), or # rel. to primary ind. means ($n3-\mu_{n3}$ or $n4 -\mu_{n4}$).	$n3-\mu_{n3}$	$n4 -\mu_{n4}$	n3.	n4	s3	s3
industry diversification	-.0309 (.01)	-.0211 (.01)	-.0329 (.01)	-.0229 (.01)	-.0317 (.01)	-.0317 (.01)
interaction of industry diversification and R&D spending: industry diversification × rd/a	.510 (.02)	.379 (.04)	.511 (.03)	.428 (.04)	.537 (.02)	.539 (.02)
interaction of industry diversification and advertising: industry diversification × adv/a	.161 (.32)	.0168 (.91)	.264 (.12)	.0821 (.62)	.174 (.32)	.174 (.33)
firm size	$s - \mu_s$	$s - \mu_s$	s	s	s	s
firm size: fractional rank of sales (s) or fractional rank of sales rel. to average for firms in the same core industry ($s - \mu_s$)	-.0639 (.01)	-.0746 (.01)	-.0178 (.53)	-.0227 (.50)	-.00872 (.77)	-.00889 (.76)

interaction of firm size and R&D spending (size × rd/a)	1.97 (.01)	2.50 (.01)	1.49 (.01)	1.83 (.01)	1.35 (.01)	1.35 (.01)
interaction of firm size and advertising (size × adv/a)	1.23 (.01)	1.02 (.01)	.732 (.12)	.389 (.47)	.667 (.18)	.665 (.18)
R^2	.0867	.222	.312	.412	.131	.131

Sample: 1,277 firms, except in 2.5 and 2.6 which use 1,205 firms because no pure play firms exist in some industries. T-test significance levels are in parenthesis.
[a]Sources: for n3 and n4, S&P Corporate Register, which is based on S&P's analyses; for s3, Compustat Industry Segment file, which contains numbers from annual reports.

Table 3. The stock market responses to subsequent foreign acquisitions, diversifying acquisitions and general acquisitions from 1978 to 1986 by firms in the 1978 cross section. Rates of capital investment are also shown.

international diversification				*Strategy Implied by*
firm should be multinational; i.e. beta_4~=~gamma_0~+~gamma_1 {rd / a} ~+~gamma_2 {adv / a} > 0.[a]	no	no	yes	yes
firm is already diversified internationally	no	yes	no	yes
number of firms - subsample sizes	197	72	536	472
percent of firms in subsample launching foreign takeover bids	3.05	13.9	8.58	12.1
initial average number of foreign countries containing subsidiaries	0	4.15	0	6.91
bids on foreign targets by these firms - sample size[b]	3	11	45	51
bidder percentage abnormal return on bid announcement	-.656	-.761	0.00	-.0927
fraction of firms subsample taken over via hostile raid	6.09	6.94	9.89	10.4
fraction of firms subsample taken over via friendly merger	27.4	18.1	28.5	21.6
fraction of firms subsample taken over	33.5	25.0	38.4	32.0
domestic cross-industry diversification	*Strategy Implied by Table 2*			
firm should be diversified; i.e. beta_5~=~delta_0~+~delta_1 {rd / a} ~+~delta_2 {adv / a} > 0.[a]	no	no	yes	yes
firm is already diversified across 3 digit industries[c]	no	yes	no	yes
firms - subsample sizes	219	907	47	104
percent of firms in subsample launching domestic cross-industry bids	2.74	8.94	0.00	4.81
initial average number of lines of business	1	4.64	1	3.94
domestic cross industry public bids by these firms - sample size[c]	9	99	0	5
bidder percentage abnormal return on bid announcement	-.138	-1.40	-	-2.69
fraction of firms subsample taken over via hostile raid	6.39	10.7	6.38	4.81
fraction of firms subsample taken over via friendly merger	32.0	22.9	36.2	26.0
fraction of firms subsample taken over	38.4	33.6	42.5	30.8
corporate expansion in general	*Strategy Implied by Table 2*			
firm should be large; i.e. beta_6~=~eta_0~+~eta_1 {rd / a} ~+~eta_2 {adv / a} > 0.[a]	no	no	yes	yes
firm is already larger than the 3-digit industry average sales	no	yes	no	yes
number of firms - subsample size	459	162	436	220
percent of firms in subsample launching domestic public bids	4.36	16.0	5.96	18.2

average initial value of firm's fixed assets.[d]	187	2,244	124	1,565
subsequent real capital expenditure per dollar of fixed assets.[e]	2.38	1.56	3.45	1.87
public domestic takeover bids by these firms - sample size[c]	141	27	28	49
bidder percentage abnormal return on bid announcement	.149	-1.75	.993	-1.84
fraction of firms subsample taken over via hostile raid	6.75	17.9	7.34	12.2
fraction of firms subsample taken over via friendly merger	24.8	17.9	32.3	17.3
fraction of firms subsample taken over	31.6	35.8	39.7	29.5

[a] *Based on an equally weighted average of the relevant significant regression coefficients from Table 2.*
[b] *The returns event window is from from day -2 to day +1. The sample includes only bids for which bidder returns are available, and does include multiple bids by the same firm. Target values on day -2 must also be available for second and third panels. Target values are not available for foreign acquisitions, so changes in bidder value over target value are not given in the top panel.*
[c] *As listed in Standard and Poor's Register of Corporations, Directors and Executives.*
[d] *Inflation adjusted value of fixed assets in 1978.*
[e] *1978 to 1986 annualized real compound growth. Samples are reduced to 240, 101, 270 and 162 firms because 1986 data are unavailable for some firms.*

Notes

1. Matsusaka (1993a, 1993b, 1996) finds that, in the 1960s, line of business diversification created value. Thus, the average value of diversification may have declined over time. Servaes (1997) contradicts Matsusaka's empirical findings.

2. See Caves (1985) for an overview of the economics of information in this context.

3. Harris *et al.* (1993), Manzon, Sharp, and Travlos (1994), Jacob (1996), and others show that transfer pricing by multinationals is economically important. Possessing intangibles, which are difficult to value, may make transfer pricing easier. Harris *et al.* (1993) estimate the effect of transfer pricing opportunities on firm value to be small compared to that of internalization. Shih (1994) shows that tax considerations are also important in domestic diversifying takeovers. The relative importance of taxes in the two types of control transactions in unknown.

4. See Burke (1978) and others.

5. Our sample of foreign acquisitions is from Morck and Yeung (1992). Our samples of domestic diversifying acquisitions and domestic acquisitions in general are from Morck, Shleifer and Vishny (1990). We use their definition of a diversifying acquisition as the two firms sharing no three digit line of business, as defined in *Dun and Bradstreet's Million Dollar Directories*. Our source of analogous data for the cross section is *Standard and Poor's Register of Corporations, Directors and Executives*. The virtue of Dun and Bradstreet's data is that all SIC codes are ranked in importance, whereas Standard and Poors' data merely lists the SIC code of the primary business and then a series of unranked secondary codes. The Standard and Poors data is, however, listed alphabetically by company and is therefore much easier to use.

6. We have repeated the analysis using larger windows and found similar results.

7. See note 3.

8. The t-ratio of 5.99 is from a *t*-test to reject the hypothesis that $b_1 = 0$ in the O.L.S. regression $d_0 = b_0 + b_1 d_1 + e$ where d_0 is a dummy variable set to one if the relevant coefficients in Table 2 indicate, on average, that the firm should diversify, and set to zero otherwise; and where d_1 is a dummy set to one if the firm is already diversified and to zero otherwise. A *t*-test to reject $b_1 = 0$ is algebraically equivalent to an *F*-test in an *ANOVA* setting to reject the hypothesis that the fraction of diversified firms that should be diversified equals the fraction of undiversified firms that should be diversified. More complex ^{2} tests yield virtually identical confidence levels.

9. Similar multiple regression frameworks fail to reveal analogous significant effects for the other panels of Table 3. Since target size and the presence of other foreign bidders are difficult, if not impossible, to ascertain in foreign takeovers, this approach is particularly unsatisfactory for the top panel.