Strategic Management Journal
Strat. Mgmt. J., **21**: 155–174 (2000)

CURVILINEARITY IN THE DIVERSIFICATION–PERFORMANCE LINKAGE: AN EXAMINATION OF OVER THREE DECADES OF RESEARCH

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While an extensive literature examines the diversification-performance relationship, little agreement exists concerning the nature of this relationship. Both theoretical and empirical disagreements abound. This study synthesizes findings from three decades of research to address major theoretical issues that remain open to debate. We derive three competing models from the literature and empirically assess these using meta-analytic data drawn from 55 previously published studies. The results of our tests indicate that moderate levels of diversification yield higher levels of performance than either limited or extensive diversification. Thus, we provide support for the curvilinear model; that is, performance increases as firms shift from single-business strategies to related diversification, but performance decreases as firms change from related diversification to unrelated diversification. The results also indicate major effects from variation in diversification and performance operationalizations. Copyright © 2000 John Wiley & Sons, Ltd.

INTRODUCTION

Perhaps the most researched linkage in the strategic management literature is that involving diversification and performance (Chatterjee and Wernerfelt, 1991), and yet this area of inquiry falls far short of consensus. This observation leads us to conclude that this research domain—while *large*—has not yet reached *maturity*. A research stream is best characterized as mature when (1) a substantial number of empirical studies have been conducted, (2) these studies have generated reasonably consistent and interpretable findings, and (3) the research has led to a general consensus concerning the nature of key relationships. The diversification-performance literature fails to satisfy the last two criteria. Inconsistency in findings from more than 30 years of research and the lack of consensus regarding this linkage reveals that "there is still considerable disagreement about precisely how and when diversification can be used to build long-run competitive advantage" (Markides and Williamson, 1994: 149), a conclusion that is shared by many (e.g., Hall and St. John, 1994; Hoskisson and Hitt, 1990; Hoskisson *et al.*, 1993; Seth, 1990). Clearly, this research stream is voluminous, but it is not mature as defined by an empirically-shaped consensus.

Diversification-performance (DP) research spans a number of business disciplines. First, industrial organization economists considered the relative performance of diversified and undiversified firms (e.g., Arnould, 1969; Gort, 1962; Lang and Stulz, 1994; Markham, 1973). Later inquiries from strategic management (e.g., Bettis, 1981; Christensen and Montgomery, 1981; Markides and Williamson, 1994; Nayyar, 1992; Rumelt, 1974, 1982) and finance (e.g., Galai and Masulis, 1976; Higgins and Schall, 1975; Levy and Sarnat, 1970; Lewellen, 1971) followed a more defined

Key words: diversification; performance; corporate strategy; curvilinearity
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CCC 0143–2095/2000/020155–20 $17.50

Received 28 March 1998
Final revision received 9 August 1999

paradigm, focusing specifically on performance differences between related and unrelated diversifiers. Clearly the threat of fragmentation of findings is great, owing to the myriad approaches and frameworks from which this research has been generated.

Despite the proliferation of studies on the subject, no clear consensus exists regarding the state of knowledge to date. Questions persist, including those pertaining to associations between level and/or type of diversification and firm performance (Berger and Ofek, 1995; Hoskisson and Hitt, 1990; Lang and Stulz, 1994; Ramanujam and Varadarajan, 1989). The purpose of this study is to bring a degree of clarity to the diversification-performance literature by reviewing, critiquing, and synthesizing major theoretical perspectives on the subject. Even more central to our efforts, we empirically evaluate with precision the functional form of the overall diversification-performance relationship using meta-analytic data. Though a great deal of research has been focused on this linkage, to date these findings have not been systematically combined to assess the nature and shape of the relationship.

In our review, critique, and synthesis of theoretical perspectives, we derive our own view of the diversification-performance linkage, and we then test this view empirically. Although our theory development efforts meet the criteria for sound theory building (cf. Bacharach, 1989; Whetten, 1989), we do not put forth theoretical positions that are simultaneously grand and new. Our mission is to evaluate theory already in place while not unduly expanding the existing complex theoretical array. Our purpose is one of theoretical synthesis and reconciliation, followed by definitive empirical testing (as definitive as possible).

Prior to moving to our theory section, it is worth noting the recent trend toward reduced diversification among larger American firms (e.g., Lichtenberg, 1990; Markides, 1990; Porter, 1987; Williams, Paez, and Sanders, 1988). Markides (1995) found that as much as 50% of the *Fortune* 500 refocused during the 1980s. This shift reveals an implicit assumption among strategists that diversification and firm performance are related (i.e., that refocusing efforts improve financial outcomes). In light of the differences of opinion and inconsistent empirical evidence, this trend stands out. As our work unfolds, the trend will be evaluated.

THEORETICAL MODELS

The Linear Model

Beginning with Gort (1962), industrial organization economics spawned decades of research based on the premise that diversification and performance are linearly and positively related. This position rests upon several assumptions, including those derived from market power theory and internal market efficiency arguments, among others (Grant, 1998; McCutcheon, 1991; Scherer, 1980).

Market power advantages

The early literature on diversification asserts that diversified firms can employ a number of mechanisms to create and exploit market power advantages, tools that are largely unavailable to their more focused counterparts (Caves, 1981; McCutcheon, 1991; Scherer, 1980; Sobel, 1984). For example, diversification may allow a firm to blunt the efforts of competitors via predatory pricing, which is generally defined as sustained price cutting with the design of driving existing rivals from the market or discouraging potential rivals from future entry. Short-term losses are offset with gains from future higher prices (Saloner, 1987). Sustained losses can be funded through cross-subsidization whereby the firm taps excess revenues from one product line to support another (Berger and Ofek, 1995; Scherer, 1980). In the classic case of predation, a firm with "deep pockets" uses its asymmetric financial strength to drive a rival with "shallow pockets" from the market (Bolton and Scharfstein, 1990). However, a firm can also deter entry by constructing a reputation for predatory behavior or by signaling that such a response is likely in the event of new entry (Saloner, 1987).

Market power can also derive from the practice of reciprocal buying and selling. This tactic emerges when a diversified company establishes favorable reciprocal arrangements with firms that are simultaneously suppliers and customers. The focal company gives preference in purchasing decisions or contracting requirements to suppliers that are, or are willing to become, good customers (Scherer, 1980; Sobel, 1984). Greater diversification (i.e., involvement in more factor and product markets) yields increased opportunity for such reciprocity. For example, a company diversifying

by acquisition may arrange for its current suppliers to purchase goods from the businesses the company is acquiring (goods previously not offered by the company) (Grant, 1998).

Taken together, these market power arguments imply that diversification is positively associated with performance (see Figure 1a). But despite the conceptual appeal, empirical work has found little evidence of an association between diversification and the anticompetitive behavior hypothesized in market power arguments (Grant, 1998; McCutcheon, 1991). For example, game-theoretic models suggest that predatory pricing schemes may be efficacious under certain circumstances (Kreps and Wilson, 1982; Milgrom and Roberts, 1982; Saloner, 1987), or are likely to occur in some situations (Bolton and Scharfstein, 1990), but empirical evidence indicates that predatory pricing is seldom employed, and with limited results (Geroski, 1995). Furthermore, Scherer (1980) observes that predation may be useful for "narrow-line" enterprises as well as for conglomerates (Scherer, 1980), obscuring its role in the diversification-performance relationship. As with predatory pricing, empirical research on reciprocal buying has produced mixed evidence at best, which has shifted the focus of recent research away from market power as the justification for diversification activity (McCutcheon, 1991).

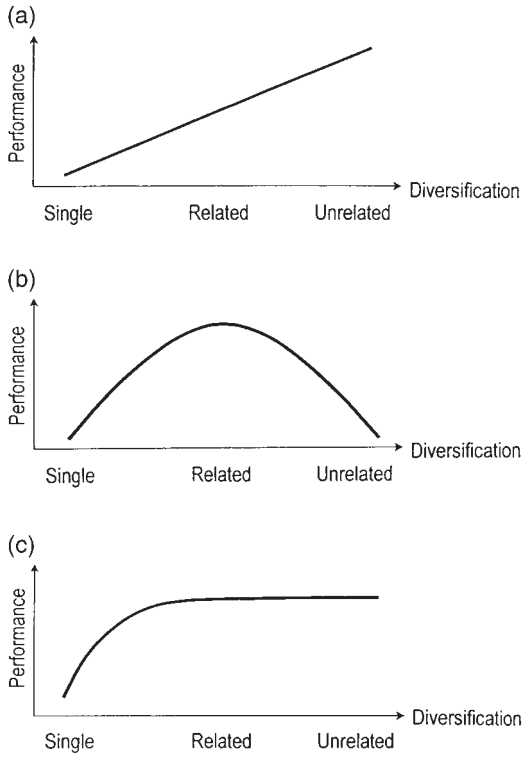

Figure 1. (a) The Linear Model; (b) The Inverted-U Model; (c) The Intermediate Model

Internal market efficiencies

A single-business firm has no access to investment from cross-subsidization, so its basic sources of capital are external—through debt and equity—which are more costly than internally generated funds, when efficiently managed (Froot, Scharfstein, and Stein, 1994; Lang, Poulsen, and Stulz, 1995). The diversified firm has much greater flexibility in capital formation since it can access *external* sources as well as *internally* generated resources (Lang and Stulz, 1994; Stulz, 1990). That is, the diversified firm can attract external funding for expansion, but it can also shift capital (and other critical resources, for that matter) between businesses within its portfolio (Meyer, Milgrom, and Roberts, 1992). Thus, diversification can generate efficiencies that are unavailable to the single-business firm (Gertner, Scharfstein, and Stein, 1994).

In addition to the flexibility in capital and labor markets that diversification provides, the head office of the diversified firm should be better positioned to optimize the allocation of these resources because it has superior access to information than do external markets (Shleifer and Vishny, 1991; Servaes, 1996; Williamson, 1986). For example, the home office can allocate investment cheaply and efficiently (vis-a-vis external sources), directing capital away from slow-growing, cash-generating operations to businesses in the portfolio that are expanding rapidly and have great commercial potential, but need investment (Scherer, 1980; Shleifer and Vishny, 1990). This is especially true for relatively new ventures which lack a track record and for which limited information is available to external sources of capital, even though these sources would otherwise show great interest in investing (Grant, 1998).

Though many have concluded that diversified firms gain significant financial benefits from using internal markets for capital and other resources, (e.g., Grant, 1998; Ravenscraft and Scherer, 1987; Rumelt, 1982; Taylor and Lowe, 1995; Williamson, 1986), support for this position is not univer-

sal (McCutcheon, 1991). For example, Jensen (1996) has argued that managers of a diversified firm may be inclined to invest any free cash flows (i.e., cash flow exceeding that required to fund all positive net present value investments in the firm's present operations) in ways that support organizational inefficiencies. In other words, managers may be drawn to overinvest in undeserving projects (Berger and Ofek, 1995; Bolton and Scharfstein, 1990; Stulz, 1990). Furthermore, Bhide (1990), among others (cf. Comment and Jarrell, 1995; Markides, 1992; Matsusaka, 1993), mounts the case that internal market advantages from diversification were prevalent in the 1960s, but the information asymmetries that produced this edge diminished during the 1970s and 1980s due to economic, technological, and regulatory changes.

Other advantages

Still other advantages may accompany diversification. For example, a firm may have excess firm-specific assets that cannot be sold due to transaction costs and other imperfections (e.g., brand reputation, customer loyalty, and narrowly-focused technologies). Diversification may permit the firm to exploit these resources that would otherwise prove non-performing (Markides, 1992). Finance researchers point out the tax and financial benefits associated with diversification (e.g., Berger and Ofek, 1995; Froot, Scharfstein, and Stein, 1993; Galai and Masulis, 1976; Lewellen, 1971; Madj and Myers, 1987; Servaes, 1996). Finally, conventional theory suggests that diversification yields portfolio effects—reducing the firm's overall risk by combining businesses with less than perfectly correlated financial flows (e.g., Barney, 1997; Berger and Ofek, 1995; Grant, 1998; Lewellen, 1971; Sobel, 1984)—which has a salutary effect on performance (Lang and Stulz, 1994). And risk reduction may bode well for debt capacity and cost of capital, in part because it allows the firm to further exploit the tax advantages available from increased borrowing (Melicher and Rush, 1973; Shleifer and Vishny, 1992).

Implications for performance

Integrating the arguments outlined above, a linear and positive linkage is suggested, and presentations of theory continue to mention these arguments as part of the diversification-performance puzzle. But does the evidence support this position? Over the past 40 years, the U.S. economy has witnessed two major shifts in diversification—an increase during the 1960s and a decrease during the 1980s. Is this a tacit rejection of the linear model? In a recent review of relevant research, Denis, Denis, and Sarin (1997) conclude that empirical evidence suggests the costs of high levels of diversification outweigh the benefits, that focused firms outperform their more diversified counterparts. However, it should be noted that these findings are not universal across (or within) studies (cf. Duboksfy and Varadarajan, 1987; Matsusaka, 1993; Michel and Shaked, 1984; Servaes, 1996). These inconsistencies have led to research using alternative models, particularly those that are curvilinear in orientation.

Curvilinear Models

In contrast to the arguments presented above, a number of researchers have developed theory positing a curvilinear DP relationship. This theory recognizes that increasing diversification may not be associated with concomitant increases in performance, at least not through the entire relevant continuum. Two alternatives have surfaced in the literature—the Inverted-U Model and the Intermediate Model. Each of these posits that some diversification (i.e., moderate levels or related diversification)[1] is better than none; however they differ in their predictions of the performance trend as firms move toward even greater (usually

[1]We recognize that level and type of diversification are conceptually distinct, but we do not differentiate them here. For our purposes, assuming that single-business, related, and unrelated diversification are equivalent to low, moderate, and high diversification simplifies our task. In support of our approach, empirical research consistently indicates that type of diversification is strongly associated with continuous data representing level of diversification. Montgomery (1982), for example, found type of diversification to be very strongly related to level of diversification (i.e., diversification assessed in terms of Rumelt's categories was very strongly related to diversification assessed on a continuous scale as level or amount of diversification). Further, it is very common for researchers to convert measures of type of diversification into continuous data representing level of diversification (e.g., Denis *et al*., 1997; Grinyer, Yasai-Ardekani, and Al-Bazzazz, 1980; Hoskisson *et al*., 1993; Keats and Hitt, 1988; Lubatkin, Merchant, and Srinivasan, 1993).

unrelated) diversification. These curvilinear models are each presented below.

The Inverted-U Model

Limited diversification represents a strategy of restricted business where the firm focuses on a single industry, thus limiting opportunities to leverage resources and capabilities across divisions. The arguments outlined above (see linear model section) indicate that limited diversifiers as a group are unlikely to generate above average profits. Lubatkin and Chatterjee (1994) observe that single-business firms do not have the opportunity to exploit between-unit synergies or the portfolio effects that are available only to moderately and highly diversified firms. That is, focused enterprises do not have multiple businesses, so they do not enjoy scope economies. Also, as Lubatkin and Chatterjee (1994) indicate, these firms bear greater risk since they have not "diversified away" that risk by combining less than perfectly correlated financial streams from multiple businesses. This has negative implications for the debt capacity, cost of capital, and market performance of single-business entities (Lubatkin and Chatterjee, 1994; Shleifer and Vishny, 1991).

In contrast to limited diversification, related diversifiers become involved in multiple industries with businesses that are able to tap a common pool of corporate resources (Lubatkin and O'Neill, 1987; Nayyar, 1992), thus yielding advantages to the firm. Theoretical rationales suggesting the superiority of related diversification have proliferated, but perhaps the most common of these focuses on advantages derived from economies of scope (Markides and Williamson, 1994; Seth, 1990). Specifically, related diversifiers generate operational synergies by designing a portfolio of businesses that are mutually reinforcing. Since they are related in some way, units are able to share resources or otherwise boost revenues by bundling products, enjoying the windfall from a positive brand reputation, and the like (Barney, 1997).

Porter (1985) goes into great detail to explain how related diversifiers can share activities between businesses in order to boost financial performance, but these may best be illustrated by case examples. For instance, Baker Hughes delivers products and services to oil and gas companies around the world. Since these buyers require a broad range of goods and services, Baker Hughes offers drilling equipment, well completion services, and environment management instruments through three separate—yet obviously related—business units. Therefore, sales staff can offer a number of products and services to a client firm in one visit, yielding beneficial marketing economies of scope. Compaq Computers is attempting to harness production economies by expanding their work station product line to complement their core business in personal computers. At Texas Instruments, defense electronics, semi-conductor, and computer businesses share R&D activities and manufacturing facilities in an effort to leverage efforts across units and gain necessary efficiencies. Markides and Williamson (1994) refer to such efforts as "asset amortization" since the firm is able to distribute the cost of an asset already capitalized by spreading its use across multiple operations. Beyond the economies of scope that derive from activity sharing, related firms may also benefit from learning curve efficiencies, intrafirm product/process technology diffusion, and restricted access to factors of production that are necessary for operations stemming from a specific industry (Barney, 1997).

While benefits accrue to diversification, at some point these efforts are also associated with major costs. For example, Grant, Jammine, and Thomas (1988) recognize the growing strain on top management as it tries to manage an increasingly disparate (and therefore, less familiar) portfolio of businesses. Markides (1992) delineates other costs, such as control and effort losses (due to increased shirking), coordination costs and other diseconomies related to organization, inefficiencies from conflicting "dominant logics" between businesses, and internal capital market inefficiencies. Given these dynamics, one could argue that the marginal costs of diversification increase rapidly as diversification hits high levels. Thus, one could easily conclude that firms experience some optimal level of diversification, with performance decrements to either side of that point of maximization.

Taken together, these and other arguments form the platform for the notion that related diversification is superior to that which is unrelated or conglomerate in nature. Combining these arguments with those supporting related diversifi-

cation's superiority over limited diversification, an inverted-U relationship is suggested for diversification and firm performance (see Figure 1b). However, some have questioned the logic of this wisdom, suggesting that an Intermediate Model may be more plausible.

The Intermediate Model

Few have questioned the superiority of related over limited diversification. However, the relative performance contribution of related versus unrelated diversification is often debated. Considering the arguments that follow, it may be that related and unrelated diversification are somewhat equal in their impact on performance (i.e., performance levels for related and unrelated diversification are somewhat equal). The primary issue in this controversy arises from concerns that related firms may not be able to exploit fully the relatedness designed into the portfolio of businesses. Markides and Williamson (1994) refer to this as "exaggerated relatedness," suggesting a "mirage effect" when assessing apparent similarities between business units. They argue that related diversifiers will outperform their unrelated counterparts only to the degree that they are able to exploit relatedness "to create and accumulate *new* strategic assets more quickly and cheaply than competitors" (Markides and Williamson, 1994: 150). Simply amortizing existing assets via economies of scope—the popular centerpiece of relatedness theory—will yield short-term benefits at best. In the words of Shakespeare: "All that glisters is not gold."

In addition to these concerns, Nayyar (1992) points out that the activities that are necessary to exploit relatedness lead to costs that partially blunt the benefits of that strategy. For example, the benefits of relatedness require a significant degree of cooperation among involved business units. From a transaction costs perspective (Jones and Hill, 1988; Williamson, 1985), this cannot be achieved without intrafirm exchanges, which lead to inefficiencies resulting from governance costs (arising from coordination and integration demands), incentive degradation (as a result of agency effects), and bureaucratic distortions. Nayyar (1992) also mentions impediments to relatedness exploitation that result from a lack of communication between units, problems allocating joint costs, incentive distortions generated from intrafirm competition (rather than the necessary cooperation among managers), and incompatible technologies. Any portfolio of related businesses—no matter how well planned—will surely face such obstacles to performance. Put another way, synergy initiatives often fall short of management expectations (Goold and Campbell, 1998), thus blunting the primary advantage of related diversification over unrelated alternatives.

So far, these arguments highlight the challenges associated with managing the related portfolio, which may attenuate the performance benefits of relatedness. Going further, unrelated strategies may present some unique advantages of their own derived primarily from financial synergies. For example, portfolio theory suggests that industry-specific risk can be reduced only through extra-industry diversification (Kim, Hwang, and Burgers, 1989). Therefore, unrelated diversification can do more to reduce risk since this strategy involves business units in multiple industries (Amit and Livnat, 1988a). Though some (Lubatkin and Rogers, 1989) would take issue with this position by arguing that related firms enjoy reduced risk owing to their superior competitive advantage, on balance, most still believe risk reduction to be a greater advantage for unrelated diversifiers (Barney, 1997). Furthermore, the lower risk that results from portfolio effects and reduced probabilities of bankruptcy (sometimes referred to as "coinsurance") can also lead to increased debt capacity (Seth, 1990). Because interest expenses are tax deductible, these firms may also enjoy the windfall of reduced taxes, even in the absence of operational synergies (Amit and Livnat, 1988a).

In general, the Intermediate Model can be tied to the notion that diversification yields positive but diminishing returns beyond some point of optimization.[2] Markides (1992) provides a helpful review of the arguments supporting this view. He points out that as a firm increases in diversification, it moves further and further away from its core business, and the benefits of diversification *at the margin* decline. This is consistent with Wernerfelt and Montgomery's (1988) observation that diversifying firms will deploy their assets in similar markets/industries first, going further afield only as excess capacity rec-

[2]We wish to express our thanks to an anonymous reviewer for pointing out this alternative explanation.

ommends. However, as these markets become more distant to the firm's core competencies, the firm gradually loses its ability to leverage its competitive advantage and increases in profitability begin to taper off. Thus, Markides (1992) concludes that the marginal benefits from diversification are best described as a "decreasing function." Gains from diversification beyond the optimum are likely to prove disappointing, especially when compared to gains wrought from increasing diversity at lower levels when the marginal function is more favorable. Given the impediments to fully exploiting relatedness and the unique benefits that derive from unrelated diversification, the Intermediate Model illustrated in Figure 1c may be a sound alternative to the inverted-U model.

Implications for performance

Singh and Montgomery (1987) argue that, generally speaking, it is easier for related firms to tap the benefits available to unrelated diversifiers than it is for the latter to exploit the sources of value creation that are available to the former (e.g., economies of scope and some market power advantages). Therefore, they conclude that related operations should outperform unrelated operations. However, this perspective does not take into consideration the impediments to relatedness or the advantages that accrue only to unrelated firms (e.g., coinsurance and other financial synergies). On the basis of theory alone, it is difficult to come to a definitive conclusion regarding the performance superiority of one strategy or the other (Seth, 1990). And though some empirical evidence seems to support the Inverted-U Model (e.g., Hoskisson and Hitt, 1990; Lubatkin and Chatterjee, 1994; Markides, 1992; Rumelt, 1974, 1982), this is not always the case (e.g., Bettis and Hall, 1982; Dubofsky and Varadarajan, 1987; Hitt and Ireland, 1985; Michel and Shaked, 1984; Palepu, 1985; Simmonds, 1990). Thus, questions regarding the diversification-performance linkage persist.

Hypothesis

As noted above it is difficult to conclude whether moderate (i.e., related) or extensive (i.e., unrelated) diversification is superior for firm performance. Even so, a preliminary hypothesis was constructed to guide our empirical work. Acknowledging the current edge in popularity for the Inverted-U Model, we present the following hypothesis:

> *Hypothesis: Diversification exhibits an inverted-U relationship with firm performance: diversification is positively related to performance across the low to moderate range of diversification and is negatively related to performance across the moderate to high range of diversification.*

METHODS

The results of any primary empirical study are affected by the research methods used in that study and by sampling error. One solution to these problems is to conduct multiple studies using varied research methods. If the results of the multiple studies are consistent, then strong statements can be made about the strength and generality of the findings. A second solution, available if other researchers have conducted studies in the appropriate area, is to quantitatively synthesize previously published studies. This meta-analytic approach is particularly attractive if previous researchers have conducted numerous studies and have for the most part reported statistics that can be converted into correlations or *d* coefficients. Such was the case in the diversification-performance area, and a meta-analytic approach to assessing the arguments presented above was therefore taken.

The hypothesis was tested with a form of meta-analysis that involves regressing correlations onto one or more hypothesized contingency variables (Hedges and Olkin, 1985). In other words, correlations were used on the dependent side of the equation while characteristics of samples were used on the independent side of the equation. In this work, the contingency variable being examined corresponds to restriction of range in the sample of firms. If a sample has been constructed such that only single-business firms and related diversifiers are represented, then we would expect a positive correlation for that sample (in theory, this sample would correspond to the portion of the curvilinear relationship where the slope of the function is positive). If a sample has been constructed such that only related and unrelated diversifiers are represented, then we would expect

a negative correlation (in theory this sample would correspond to the portion of the curvilinear relationship where the slope of the function is negative). Finally, if a sample has been constructed such that all types of firms are represented, then we would expect a correlation close to zero (in theory, this sample would include both the positive and negative portions of the function, resulting in indicators of linear association being close to zero).

For all points in the research process where judgment was necessary, we employed rigorous methods. Consistent with the recommendations of Wanous, Sullivan, and Malinak (1989), we conducted the meta-analysis with multiple raters so that judgments were made by two or more of the authors at each stage.

Data

We identified 82 relevant, quantitative studies of the diversification-performance linkage. Fifty-five of these studies, approximately two-thirds, yielded correlational estimates of the linkage of interest. Relevant studies were identified through a search of the ABI/Inform data base; through published reviews of diversification-performance research from the economics, finance, and management literatures (e.g., Datta, Rajagopalan, and Rasheed, 1991; Denis *et al*., 1997; Hoskisson and Hitt, 1990; Matsusaka, 1993; Ramanujam and Varadarajan, 1989); and through the tables of contents of premier journals in economics, finance, and management (e.g., *American Economic Review*, *Econometrica*, *RAND Journal of Economics*, *Journal of Finance*, *Journal of Financial and Quantitative Analysis*, *Academy of Management Journal*, and *Strategic Management Journal*). Table 1 lists the 82 studies.

We excluded from our data base of 82 studies those that did not contain at least one of the following performance constructs: growth (comprising sales growth and earnings growth), profitability (comprising return on assets, return on equity, return on sales, and return on total invested capital), risk-adjusted returns (comprising Jensen, Treynor, and Sharpe measures), and unadjusted market value (comprising market-to-book value and Tobin's *q*). These performance constructs underlie the bulk of diversification-performance research. Examining additional constructs would have resulted in few studies being added to our data base.

We also excluded from our data base those studies that were based entirely on data used in other studies already included in our work. Adding such studies would have created unnecessary nonindependence in our data.

Measures

Diversification-performance correlations

Product-moment correlations between diversification and performance were obtained for 71 different samples contained in the 55 usable studies; note that our unit of analysis is the sample rather than the study. In some cases, we transformed a t value, an F value, a Z value, or a standardized mean difference into a product-moment correlation. Formulae necessary for transforming various statistics into product-moment correlations can be found in Glass, McGaw, and Smith (1981), Hunter and Schmidt (1990), and Rosenthal (1991).

If correlations with more than one performance construct were obtainable for a given sample (e.g., sales growth, return on assets, return on sales, and Jensen's alpha), we obtained all of the correlations. Next, within each sample, correlations associated with growth, profitability, risk-adjusted return, and unadjusted market value were separately averaged, resulting in a maximum of four diversification-performance correlations per sample. Across samples, then, four sets of correlations were generated, one for each of the major performance constructs. In our regression work, the two sets of correlations based on accounting performance measures (growth and profitability) were analyzed separately from the two sets of correlations based on market measures (risk-adjusted returns and unadjusted market value). Given the differences between accounting and market-based measures of performance, this approach seemed wise.

Restriction of range

A three category dummy variable was used to represent restriction of range. If a sample had only single-business firms and related diversifiers, the sample was coded as 1–0–0 to indicate restriction away from the high end of diversifi-

Table 1. Studies Included in the Database[a]

Author(s)	Year	Author(s)	Year
Amit & Livnat	1988a	Hoskisson & Johnson	1992
Barton	1988	Hughes & Oughton	1993
Bass et al.	1977	Imel & Helmberger	1971
Beattie	1980	Itami et al.	1982
Bergh	1995a	Jacquemin & Berry	1979
Bergh	1995b	Jahera et al.	1993
Bergh & Holbein	1997	Johnson & Thomas	1987
Bethel & Liebeskind	1993	Johnson et al.	1993
Bettis & Hall	1982	Jose et al.	1986
Bishara	1980	Keats	1990
Bishara	1981	Keats & Hitt	1988
Buhner	1987	Kim et al.	1989
Busija et al.	1997	Kim et al.	1993
Cable & Yasuki	1985	Lane et al.	1998
Capon et al.	1988	Lang & Stulz	1994
Carter	1977	Lecraw	1984
Chang & Choi	1988	Lim & Teck	1995
Chang & Thomas	1989	Lubatkin & Chatterjee	1991
Chatterjee & Blocher	1992	Lubatkin & Chatterjee	1994
Chatterjee & Wernerfelt	1991	Lubatkin et al.	1993
Christensen & Montgomery	1981	Lubatkin & Rogers	1989
Ciscel & Evans	1984	Markides & Williamson	1994
Dundas & Richardson	1982	Melicher & Rush	1973
Gassenheimer & Keep	1995	Melicher & Rush	1974
Gomez-Mejia & Palich	1997	Michel & Shaked	1984
Grant & Jammine	1988	Montgomery	1985
Grant et al.	1988	Mosakowski	1997
Grinyer et al.	1980	Nathanson & Cassano	1982
Habib & Victor	1991	Nguyen et al.	1990
Hall & St. John	1994	Palepu	1985
Hamilton & Shergill	1992	Palmer et al.	1993
Hill	1983	Qian	1997
Hill	1988a	Riahi-Belkaoui & Pavlik	1993
Hill & Hansen	1991	Robins & Wiersema	1995
Hill et al.	1992	Rumelt	1982
Hill & Snell	1988	Servaes	1996
Hitt et al.	1997	Simmonds	1990
Holzman et al.	1975	Smith & Weston	1977
Hood & Young	1979	Thompson	1985
Hoskisson	1987	Varadarajan	1986
Hoskisson et al.	1993	Weston & Mansinghka	1971

[a]Several available studies were not incorporated into our data base because the researchers used data from other studies already included in our data base. These studies are as follows: Amit & Livnat (1988b), Amit & Livnat (1988c), Amit & Livnat (1989), Bergh & Lawless (1998), Bettis (1981), Bettis & Mahajan (1985), Dubofsky & Varadarajan (1987), Gassenheimer & Keep (1998), Hamilton & Shergill (1993), Hill (1988b), Hitt & Ireland (1986), and Varadarajan & Ramanujam (1987).

cation. If a sample had only related and unrelated diversifiers, the sample was coded as 0–0–1 to indicate restriction away from the low end of diversification. Finally, if a sample had all types of firms, the sample was coded as 0–1–0 to indicate no restriction of range.

To ensure valid codes, two of the three authors coded restriction of range. The Perreault and Leigh (1989) index was used to estimate interrater reliability, and the estimate was sound (0.86). Disagreements were resolved by discussion.

In collecting data from the 55 studies, we were very proactive in seeking samples that exhibited

restriction of range. Without such samples, we could not test our hypothesis in a meta-analytic framework. In some cases, samples were inherently restricted because of the purposes of the original researchers (e.g., Bettis and Hall, 1982; Johnson and Thomas, 1987). In other cases, however, overall samples were not restricted, but they could be broken apart to provide new restricted sets of firms. We broke apart samples whenever we could calculate separate correlations for the newly created restricted sets of firms (we could do so for six studies). For example, Lubatkin and Rogers (1989) constructed an overall sample that included single-business firms, related-constrained firms, and unrelated firms. For, each of the three types of firms, means and standard deviations for risk-adjusted returns were reported. Thus, we could initially focus on the single-business and related-constrained firms, and use the means and standard deviations for these two types of firms to create a standardized mean difference and then a correlation which reflected a restricted set of firms (restricted away from the high end of diversification). We could then focus on the related-constrained firms and the unrelated firms and use the means and standard deviations associated with these two types of firms to create a second correlation which reflected a different restricted set of firms (restricted away from the low end of diversification). By following this procedure, a small amount of nonindependence was created for our analyses (the same related firms from the overall sample were used in both of the new samples), but this nonindependence is minor as we only applied this procedure to a few studies.

RESULTS

Regression models for accounting-based correlations

In the first regression analysis, the 71 diversification-performance correlations based on accounting measures of performance were regressed onto restriction of range. Because restriction of range was a three category dummy variable, two of the three categories were used in the regression modeling while the third served as the reference category (see Maddala, [Chapter 9: 1977], and Neter, Wasserman, and Kutner, [Chapter 10: 1983] for further information on dummy variables in regression models). The results suggest that samples of firms restricted away from the high end of diversification exhibit more positive correlations relative to unrestricted samples while samples of firms restricted away from the low end of diversification exhibit more negative correlations relative to unrestricted samples (see Model 1 in Table 2). Point estimates from the regression equation clearly indicate that samples restricted away from the high end of diversification yield positive correlations while samples restricted away from the low end of diversification yield negative correlations. Thus, diversification appears to have an inverted-U curvilinear relationship with performance: positive effects occur as firms move from a single-business strategy to a related diversification strategy (detectable as a linear effect in samples restricted away from the high end of diversification), but negative effects occur as firms move from a related strategy to an unrelated strategy (detectable as a linear effect in samples restricted away from the low end of diversification).

To increase confidence that our results were not spurious, we conducted an additional regression analysis using the accounting-based correlations. In this second regression, we included *operationalization of diversification* and *operationalization of performance*. Diversification operationalization was coded into four categories: Rumelt approach, Herfindahl approach, entropy approach, and the simple count-of-industries approach. Performance operationalization was coded into two categories: growth and profitability. Coding was done by two of the authors, with interrater reliability estimates for the two variables being very good (0.96 and 0.99, respectively).[3]

The results of the second regression analysis indicate that restriction of range has important effects even after controlling for different

[3]For a few samples, more than one operationalization of diversification had been used. In these cases, we drew multiple correlations from the sample and treated them as if they had come from different samples. Similarly, as mentioned earlier, for some samples, correlations for both growth and profitability were available. In these cases, we drew multiple correlations from the sample. Although this approach introduces some nonindependence into the data, it makes the greatest use of the available data and allows us to test for differences across various operationalizations of diversification and across alternative operationalizations of accounting-based performance. Huber, Miller, and Glick (1990), Miller and Cardinal (1994), and many others have adopted this same approach.

Table 2. Results of regression analyses[a]

Variables	Diversification-performance: Accounting-based performance[b] Model 1	Model 2	Diversification-performance: market-based performance[c] Model 3
Restriction of range (Restricted away from high end or not)	0.122*** (0.028)	0.152*** (0.030)	0.281*** (0.063)
Restriction of range (Restricted away from low end or not)	–0.103*** (0.029)	–0.065* (0.030)	0.095 (0.053)
Operationalization of diversification (Herfindahl or not)		0.112*** (0.022)	
Operationalization of diversification (Entropy or not)		0.080*** (0.019)	
Operationalization of diversification (Count-of-industries or not)		–0.057 (0.031)	
Operationalization of accounting performance (Profitability or not)		–0.138*** (0.034)	
Operationalization of market performance (Risk-adjusted return)			
Intercept	–0.059	0.021	–0.157
Multiple R	0.281***	0.433***	0.394***
Adjusted R^2	0.052***	0.111***	0.078***

[a]Table entries are unstandardized regression coefficients; standard errors, adjusted following Hedges and Olkin (1985), are in parentheses.
[b]Seventy-one correlations were being predicted.
[c]Twenty-five correlations were being predicted.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

approaches to operationalizing diversification and performance. Further, the results suggest that diversification and performance operationalizations have important effects: using the Herfindahl or entropy approach yields more positive correlations relative to the Rumelt approach, and using growth yields more positive correlations relative to profitability (see Model 2 in Table 2). Point estimates from the regression equation are plotted in Figures 2a and 2b to provide a vivid picture of the various effects. As shown, for samples restricted away from the high end of diversification, seven of eight point estimates are positive (eight point estimates from four diversification operationalizations X two performance operationalizations). For samples restricted away from the low end of diversification, six of eight point estimates are negative. With 13 of 16 correlation estimates supporting the inverted-U pattern, our hypothesis is supported.

Regression models for market-based correlations

In the next regression analysis, the 25 diversification-performance correlations based on market measures of performance were regressed onto restriction of range. As before, two of the three restriction of range categories were used in the regression modeling while the third served as the reference category. The results suggest that samples of firms restricted away from the high end of diversification exhibit more positive correlations relative to unrestricted samples but that samples of firms restricted away from the low end of diversification do not exhibit more negative correlations relative to unrestricted samples (see Model 3 in Table 2). Point estimates from the regression equation clearly indicate that samples restricted away from the high end of diversification yield positive correlations. Point estimates indicate that samples restricted away from the low end of diversification yield negative correlations, but as noted above these are not significantly different from the correlations yielded by unrestricted samples. In unrestricted samples, the relationship between diversification and performance is more negative than expected. In summary, diversification appears to have a curvilinear relationship with market-based performance. Positive effects occur as firms move from a single-business strategy to a related diversification strat-

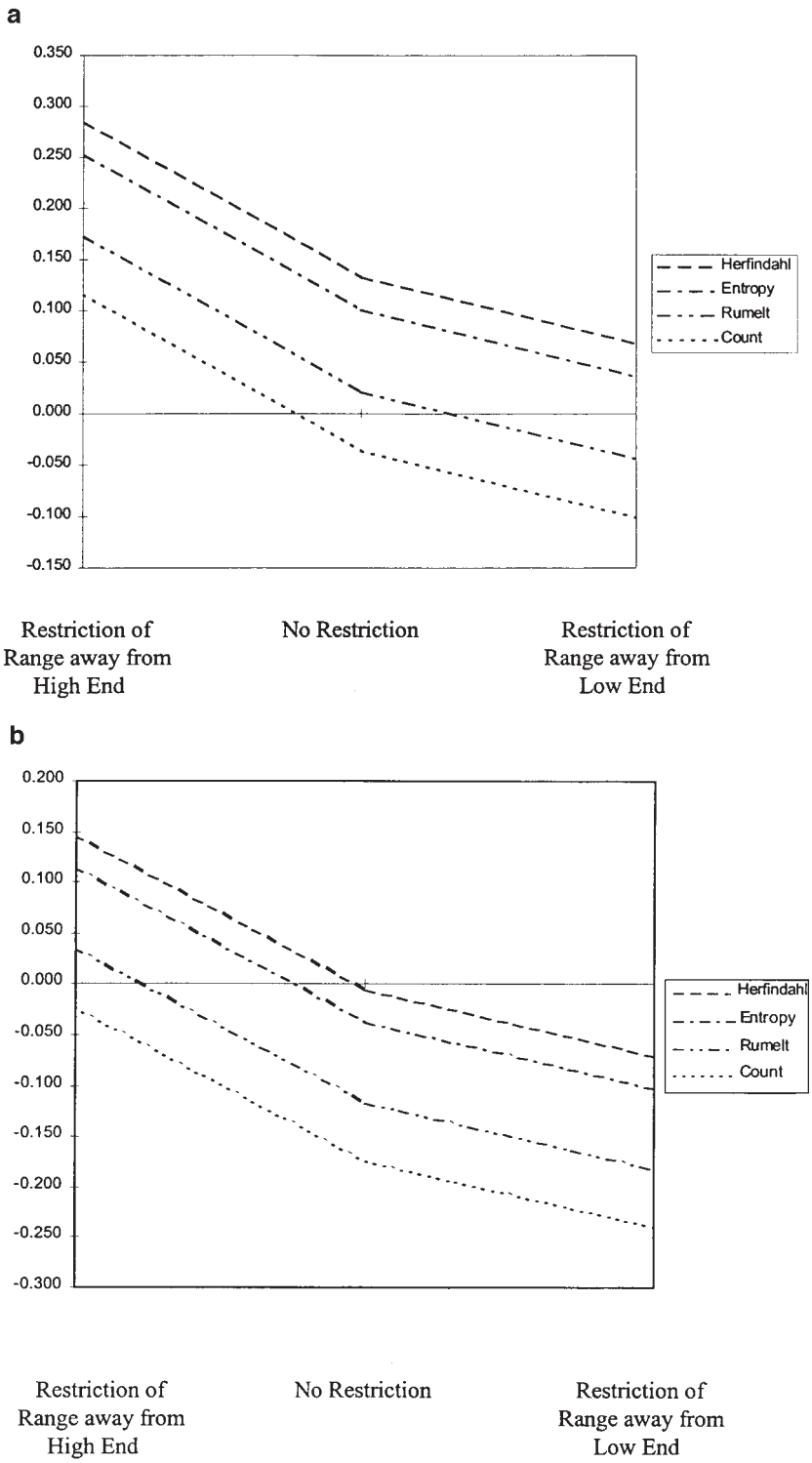

Figure 2. (a) Estimates from regression equation for diversification-growth correlations; (b) Estimates from regression equation for diversification-profitability correlations

egy (detectable as a linear effect in samples restricted away from the high end of diversification), and negative effects occur as firms move from a related strategy to an unrelated strategy (demonstrated by negative effects when unrelated firms are added to a sample that was previously restricted away from the high end). The relationship has characteristics of an inverted-U, but the results are not as straightforward as the accounting-based results.

To increase confidence that our results were not spurious, we planned to conduct an additional regression analysis adding operationalization of diversification and operationalization of performance as predictors. Two complications interfered with our plan.

The first complication concerned operationalization of diversification. For the 25 market-based correlations, 14 were based on the Rumelt approach. Only 11 correlations were based on the other three approaches collectively. With so few observations for each of the three alternatives to Rumelt, it would have been very difficult to draw conclusions about how any one of the alternative approaches affected the correlations. For example, it would have been difficult to draw conclusions concerning the effect of using the entropy approach when so few market-based studies have used this approach.

The second complication concerned confounding. For the 14 correlations based on the Rumelt approach, 13 were also based on risk-adjusted return. For the 16 correlations based on risk-adjusted return, 13 were also based on the Rumelt approach. With this degree of confounding, it would have been difficult to determine whether operationalization of diversification or operationalization of performance was important. With this problem and the problem discussed above, we decided to forgo our planned follow-up regression analysis in order to avoid the creation of an ambiguous set of results.

DISCUSSION

The two main purposes of this study were to present alternative models of the diversification-performance relationship as derived from the literature and to test those models using data generated from more than three decades of empirical research. In addition to testing the linear and curvilinear models, the impact of utilizing various measures of diversification and performance was also addressed.

Interpretation and implications

Diversification and accounting-based measures of performance

When examining accounting-based measures of performance, diversification appears to be positive for firms up to a point. Past a certain level, however, diversification seems to cause performance problems. In our work, this pattern emerges as a positive diversification-performance relationship in samples that do not include firms with high levels of diversification, and as a negative relationship in samples that do not include firms with low levels of diversification. With most of our results supporting the inverted-U pattern, and the overall analysis averaging across operationalizations of diversification clearly exhibiting the inverted-U pattern (Model 1 in Table 2), it is evident that strategic management researchers arguing against high levels of diversification have been on sound theoretical ground.

Although an inverted-U pattern is clear in the data, indicating the superiority of related diversification, the effect sizes are not quite as strong as expected. For the positive or left-hand side of the inverted-U, the strongest estimated correlation is 0.29, found when a Herfindahl measure is combined with growth (see Figure 2a). For the negative or right-hand side of the inverted-U, the strongest estimated correlation is –0.24, found when a count-of-industries measure is combined with profitability (see Figure 2b). Thus, while clearly important, diversification may not be quite as strong a player as some have imagined, at least not when accounting-based measures of performance are the focus.

Diversification and market-based measures of performance

When examining market-based measures of performance, diversification also seems to be positive for firms up to a point. Past a certain level, it appears to cause performance problems. A more fine-grained analysis involving differences in diversification and performance definitions is not possible due to limitations in the data. As noted

below, future research should address these limitations.

Diversification and performance

Arguments highlighting the benefits of related diversification and the problems of unrelated diversification are evidently sound. Arguments for related diversification, in comparison to limited diversification, suggest that single-business firms suffer from limited economies of scope and other disadvantages. Related diversifiers have advantages whereby they can convert underutilized assets and achieve economies of scope by sharing resources and combining activities along the value chain. Concurrently, arguments concerning the downside of unrelated diversification suggest not only muted benefits of increased diversification after a critical point, but also actual costs that hamper performance. Expanded diversification has been found to increase strain on top management and decision making, and on control and governance. Further, effort losses and diseconomies are issues. As it becomes more difficult to share activities and transfer competencies between units, the costs of increased diversification seem to outweigh any potential benefits beyond a certain point of relatedness.

Thus, our findings provide support for the Inverted-U Model. These findings are parallel to increasing anecdotal evidence in the business press that firms diversifying outside of their core businesses or competencies inherit increased costs that interfere with performance.

Limitations and future research

As mentioned earlier, we were unable to test a complete regression model for studies using market measures of performance because of the limitations of existing published research. Unfortunately, market measures of performance may be more relevant to diversification research since these capture expectations of future returns from firm performance (as opposed to past outcomes reflected in accounting-based measures), and market measures are less vulnerable to managerial discretion (Barney, 1997). The value of market measures is supported by Hoskisson *et al.* (1993) who found that market measures tended to be more highly intercorrelated than were typical accounting-based measures of performance, and the correlations between market and accounting measures were fairly weak (ranging from 0.15 to 0.30). This suggests that the former capture unique information, and with somewhat greater consistency (e.g., they escape the influence of managerial manipulations that may lead to short-term distortions reflected in other measures of performance). Despite the proliferation of work on the diversification-performance linkage, researchers have emphasized that which may represent the less useful aspect of performance. At any rate, this limitation prevents strong comparisons between results generated from accounting- versus market-based research.

The above critique applies to the literature in general, but at the same time it applies most forcefully to the management literature, as opposed to the economics and finance literatures. Management researchers have produced most of the work on diversification and performance and have frequently focused on accounting-based measures.

Another shortcoming of the overall literature relates to industry effects. Dess, Ireland, and Hitt (1990: 14) argue cogently for the importance of controlling for industry effects in strategy research, recognizing "the potential for misleading interpretations and alternative plausible explanations that can result if researchers do not control for possible industry influences." Recent empirical work (e.g., Powell, 1996; Rumelt, 1991; Schmalensee, 1985; Wernerfelt and Montgomery, 1988) has demonstrated that industry influence typically explains between 17 and 20 percent of the variance in firm performance and is therefore a substantive factor in strategy research. Further, it may be that diversification is more strongly related to performance in studies where industry effects have been controlled. Controlling for industry effects may allow unique variance explained by diversification to be unmasked. Miller and Cardinal (1994) found this to be true for planning in the planning-performance literature. Unfortunately, we were not able to study the impact of industry effects since only a small proportion of diversification-performance studies controlled for such effects.

The majority of the diversification-performance studies in our analysis also failed to control for a number of other variables that have demonstrated significant effects on firm performance independent of diversification. For example, very few

of the studies accounted for the impact of firm size; firm leverage; and advertising, capital, and R&D intensities, each of which have demonstrated effects on performance in prior research (Barton, 1988; Buhner, 1987; Chang and Thomas, 1989; Choi, 1989; Gomez-Mejia and Palich, 1997; Grant, 1987). Adjusting or accounting for these variables in future research may further clarify diversification-performance relationships.

Examining time period also may prove useful. Only a few studies have incorporated data from different decades and explicitly examined changes in the diversification-performance linkage over time. Our own post hoc analyses suggested time period was not a key factor (studies conducted in different decades, including the conglomerate era of the 1960s, produced similar outcomes), but fine-grained primary studies may uncover subtle time effects.

Finally, it is interesting to note that international and product diversification seem to have similar relationships with performance. That is, international diversification research (e.g., Geringer, Beamish, and daCosta, 1989) has demonstrated an inverted-U shaped pattern when tracked against firm performance. This indicates increasing advantages as both product and global diversification rise, but it also demonstrates the negative utility of these activities beyond some optimal level of diversity. Are these trends driven by the same underlying phenomena (e.g., cognitive and other human/organizational limitations)? How parallel do these trends run? Do they affect different firms in different ways (e.g., capital intensive firms vis-à-vis their labor-intensive counterparts)? These questions may open up new avenues for future efforts to complement the few studies (e.g., Hitt, Hoskisson, and Kim, 1997; Tallman and Li, 1996) published to date that look at both product and global diversification.

CONCLUSION

Consistent with arguments of many in strategic management (e.g., Lubatkin and O'Neill, 1987; Nayyar, 1992; Nguyen, Seror, and Devinney, 1990; Porter, 1985; Rumelt, 1974; Simmonds, 1990), we found that firm diversification is indeed related to accounting and market performance outcomes. The import of this study derives from its answer to what is perhaps the most researched (and yet unresolved) question in the strategic management literature: How exactly does diversification relate to performance? After synthesizing more than three decades of research, our study indicates an important answer: the linkage is inverted-U shaped, with differences in diversification and performance operationalizations influencing how this relationship presents itself in empirical research.

ACKNOWLEDGEMENTS

We would like to thank Don Hatfield and Steve Slezak for their helpful comments, as well as the Hankamer Sabbatical Committee, Baylor University, for its support of this work.

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