Summer 9-2-2013

Three Essays on Strategic Capital Allocation

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by

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A dissertation presented to the
Graduate School of Arts and Sciences
of Washington University in
partial fulfillment of the
requirements for the degree
of Doctor of Philosophy

August 2013

St. Louis, Missouri

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Acknowledgements

I am extraordinarily thankful to the co-chairs of my dissertation committee, Anne Marie Knott and Todd R. Zenger, for their countless hours of support and counsel—and manuscript edits. I would not have made it without them. The rest of my committee, comprised of Nicholas S. Argyres, Daniel W. Elfenbein, Radhakrishnan Gopalan, and Bruce Petersen, in addition to Lamar Pierce, provided invaluable feedback during the entire dissertation process. Many friends and colleagues were also critical to the successful completion of this project. Tao Ma was a true friend and confidante. Kyle McCawley, Matt Boever, Paul Kramper, and Sam Thompson kept me sane by keeping me on the roads; Jay Greathouse kept me entertained. I was lucky to start the program with Mike McLaughlin and then get to know James Yen, Erin Scott, and Tim Gubler along the way. Sarah Grantham made sure I was always in the right classes, and Tom Fields showed me what great classes look like. Mike and Deanna Davidson are inspiring friends in so many ways. So are Bill Laird and Ted Warin, who also challenge me in many ways as well. I'm thankful that my brother, Tom Vieregger, and my sister, Kristianne Buechler, will continue to mock my never-ending schooling. Mike and Nancy McCarthy helped support me at the start. Stephen Penman inspired me to go after the PhD, while John Hughes, John Khabbaz, and Tom Tryforos motivated me to keep one foot in the "real" world. Meanwhile, the staff at Pointers and Sasha's kept me nourished, and Darren the Cat sat next to me through every draft. I cannot thank my parents, Mary Anne and Hank Vieregger, enough. For everything. And finally, a very special thanks to my best friend, Ashlee Minton, who was, well, my best friend through it all.

Dedication

For my parents, Mary Anne and Hank, who taught me the love of learning…
I think I might finally be done with school.

Do Firms Really Allocate Capital So Inefficiently?

Abstract
The capital allocation process is a critical component of strategic execution for multidivisional firms. Despite this importance, strategy scholars have ceded much of the empirical work in capital allocation efficiency to the domains of finance and economics. The bulk of this research, as well as evidence from prominent field studies in strategic management, concludes that managers make significantly inefficient capital allocation decisions—a result that should be of concern to business managers and strategy scholars alike. This paper asks whether managers are truly allocating capital so inefficiently, or do they instead have a valid strategic rationale that explains their investment decisions. Building off the general framework of internal capital market efficiency from financial economics, this paper develops a new measure of *strategic* capital allocation. The new approach introduces a multidimensional measure to capture the strategic trade-offs between future growth and current profitability, which are faced by managers during the complex resource allocation process. In the first stage of the empirical analysis, managers are found to be allocating capital more than twice as efficiently than prior literature suggests. The second stage validates this multidimensional approach by demonstrating the predicted theoretical relationship between a strategic measure of capital allocation and firm-level value, namely, that managers appear to be capable of enhancing performance through strategic capital allocation.

1 INTRODUCTION

The capital allocation process is a critical component of strategic execution. Through the efficient allocation of internal capital resources, top-level managers of the multidivisional firm should be able to enhance firm-level performance (Chandler 1962; Williamson 1975; Stein 1997). Long-term competitive advantage requires them to develop unique combinations of resources through a strategic capital allocation process (Rumelt 1984; Wernerfelt 1984; Dierickx and Cool 1989). However, the central conclusions from prominent field research (Christensen and Bower 1996; Sull 1999), as well as the bulk of empirical results (Lamont 1997; Shin and Stulz 1998; Rajan, Servaes, and Zingales 2000; Billett and Mauer 2003; Gopalan, Nanda, and Seru 2007; Ozbas and Scharfstein 2010), suggest that the internal allocation of capital is significantly *inefficient*. While some instances of empirical work do find that multidivisional firms allocate capital efficiently (Khanna and Tice 2001; Maksimovic and Phillips 1998), the prevailing conclusion (Stein 2003) is that agency costs distort the resource allocation process within internal capital markets (Scharfstein and Stein 2000; Rajan et al. 2000). In the strategic management literature, recent research by Bardolet, Fox, and Lovallo (2011) also concludes that firms are inefficiently allocating capital among their business units, primarily due to naïve behavioral biases (Bromiley 1986; Barney and Zajac 1994; Gilbert 2001; Garbuio, King, and Lovallo 2011).

Given the critical link between resource allocation and strategy, the high and persistent levels of inefficient capital allocation documented in the literature should be of concern to business managers and strategy scholars alike. A concrete example from Billett and Mauer (2003) highlights the concern: the authors find that multidivisional firms efficiently allocate capital among only 25% of their operating segments; i.e., firms appear to be destroying value through inefficient capital allocation decisions as much as 75% of the time. This paper asks whether managers are truly allocating capital so inefficiently, or do they instead have a valid strategic rationale that explains their investment decisions. As suggested by the bulk of evidence cited above, strategy scholars have ceded much of the empirical work in capital allocation efficiency to the domains of finance and economics.[1] The interdisciplinary approach in this paper thus extends the general framework of internal capital market efficiency from financial economics (Berger and Ofek 1995; Rajan et al. 2000; Billett and Mauer 2003) to provide new insights into what I define as *strategic* capital allocation.

In the first stage of the empirical analysis I evaluate the efficiency of internal capital markets from a strategic perspective and compare it to the traditional approach from the extant literature. In contrast to prior work that relies on uni-dimensional measures (see Sections 2 and 3 for more detail), I develop a multidimensional measure of capital allocation efficiency to capture the strategic trade-offs between current profitability and future growth (Marris 1963; Marris 1964; Williamson 1964), which are faced by managers during the complex process of resource allocation (Bower 1970; Burgelman 1983). As previously noted, research by Billett and Mauer (2003) finds that firms are allocating capital efficiently among only 25% of their segments, and I replicate those results within a longer sample period from 1979 to 2009. Then, using the multidimensional measure of strategic capital allocation proposed in this paper, I find that firms are efficiently allocating capital 53% of the time, more than twice as often than prior literature suggests.

The validity of any new measure depends on its ability to systematically predict the expected relationships of the underlying theory (Venkatraman and Grant 1986), therefore the

[1] An exception in the strategy literature is the work by Bardolet et al. (2011). In the introduction to their empirical analysis, the authors remark, “Given the important role capital allocation plays in business strategy, it is surprising that this topic has received relatively little attention in the empirical strategy literature” (Bardolet et al. 2011, 1455).

second stage of the analysis attempts to validate the new, multidimensional measure of strategic capital allocation.[2] If the measure truly captures the strategic trade-offs faced by managers during the complex resource allocation process, these capital allocation decisions should enhance firm value. To validate this expected theoretical relationship, I calculate the value-added from internal capital market allocations (Rajan et al. 2000; Peyer 2002; Billett and Mauer 2003) and test its association with proxies of firm-level performance. Consistent with extant literature, value-added based on the uni-dimensional measure of internal capital market efficiency shows an insignificant (and sometimes negative) association with performance.[3] On the other hand, value-added from the strategic measure of capital allocation shows a positive and significant association in all tests, and the results are robust for up to five years following the resource allocation decision. These results validate the new, multidimensional measure of capital allocation efficiency—firms appear to be capable of enhancing performance through strategic capital allocation.

This paper makes two important contributions. First, the paper investigates a fundamental component of strategic management theory and practice—the efficiency of a firm's internal capital allocation processes—that has been largely neglected by strategy scholars of late. The internal capital market of the firm is a fundamental component strategic performance. The

[2] In this context, Peter (1979) defines validity as "the degree to which instruments truly measure the constructs they are intended to measure." Construct validity tests, for example, have traditionally been carried out in the strategy literature for firm-level diversification measures (Lubatkin, Merchant, and Srinivasan 1993) and more recently for business unit-level relatedness measures (Bryce and Winter 2009).

[3] The insignificant and negative associations are consistent with prior work showing a diversification discount for multidivisional firms (Lang and Stulz 1994; Berger and Ofek 1995; Servaes 1996). While this literature has been criticized for selection and measurement biases (Whited 2001; Campa and Kedia 2002; Graham, Lemmon, and Wolf 2002; Villalonga 2004; Chevalier 2004), research designs that examine the diversification discount both before and after the divestment decisions of multidivisional firms attempt to mitigate these biases (Gertner, Powers, and Scharfstein 2002; Dittmar and Shivdasani 2003; Burch and Nanda 2003; Ahn and Denis 2004). My research avoids this debate because it is not focused on the diversification discount, but on the internal allocation of capital within diversified firms. I am only comparing the efficiency of individual segments within each firm, not the efficiency (or market value, as in the diversification discount) between multidivisional and focused firms. The two strands of research are naturally related in that an inefficient internal capital market is often cited as an explanation for the diversification discount.

second contribution is of paramount importance for the practice of strategy: the results in this paper provide insight for managers on how to create value through strategic capital allocation.

The remainder of this paper is organized as follows. Section 2 provides a review of internal capital allocation efficiency in the strategic management and financial economics literatures, while Section 3 builds on this review to develop a new measure of strategic capital allocation. In Section 4 I describe the empirical methods, sample definition, and the construction of key variables for the analysis. Section 5 presents the empirical results, and Section 6 concludes. I also include a discussion of limitations and the significant contributions of this paper in the final section.

2 BACKGROUND AND LITERATURE REVIEW

A fundamental development of the M-form organization during the 1920s, as first chronicled by Chandler (1962) at DuPont, General Motors, and Standard Oil, is the introduction of a top-level executive committee responsible for the firm's long-term capital allocation decisions. These capital allocation decisions are conducted within an "internal capital market," where business-unit managers compete for the scarce resources of the firm (Williamson 1970). For the multidivisional firm, an internal capital market provides a significant amount of the resources available for the execution of its strategic objectives. A recent empirical investigation by McKinsey & Company, for example, estimates that "the amount of capital allocated or reallocated" within internal capital markets is more than the amount of external funding from equity and debt combined (Hall, Lovallo, and Musters 2012).

Research in strategic management has long recognized that the capital allocation process is a critical component of strategic execution. Chandler (1962, 16) goes so far as to define *strategy* in terms of the resource allocation process: "Strategy can be defined as the determination of the basic long-term goals" of the firm, as well as "the allocation of resources necessary for carrying out these goals." Similarly, Williamson (1975) analyzes the important functions of internal capital markets and argues that "the assignment of cash flows to high-yield uses is the most fundamental attribute" of multidivisional firms. In his seminal field research on the resource allocation process, Bower (1970) concludes in part that resource allocation drives strategy.[4] The link between strategy and capital allocation is particularly important from a resource-based view of the firm. Lippman and Rumelt (2003) describe strategy as "the problem of discovering or estimating the value of various resource combinations." Earlier, Rumelt (1984) postulates an entrepreneurial theory of strategy where firms make resource allocation decisions in an attempt to create competitive advantage. He concludes that the decision of where to compete by investing scarce resources is one of "the most critical strategic choices" faced by firms.

Despite the importance of the resource allocation process to strategic management (both in theory and in practice), much of the research on capital allocation efficiency has been carried out by scholars in finance and economics. The remainder of this section describes this work in more detail. First, I outline the theoretical perspectives of efficiency within an internal capital market; then I introduce prominent field studies and empirical results from strategy and financial economics, both of which overwhelmingly conclude that the capital allocation process is inefficient.

[4] In their review of the strategic resource allocation literature, Bower, Doz, and Gilbert (2005, 12) summarize this point succinctly: "How resources are actually allocated and used determines strategic outcomes—not the words on paper or policies." In the same volume, Gilbert and Christensen (2005, 84) describe the resource allocation process as being "inseparably connected to strategy."

Theoretical Background of Capital Market Efficiency

Williamson (1970; 1975) first introduces the theoretical argument that the internal capital allocation process can be value-enhancing for the multidivisional firm. In a world of limited contracting and bounded rationality, the ability of top management to allocate resources among divisions may limit the opportunism of divisional managers. Rather than automatically reinvesting free cash flow at the division level, profitable business units must return excess cash to the top-level managers of the firm. This "miniature" capital market within the firm can enhance allocation efficiency by subjecting all free cash flow to an "internal competition" among the business units (Williamson 1970; 1975). Work by Gertner at al. (1994) argues that top-level management in the multidivisional firm maintains a unique "control right," giving it unilateral decision-making over the reallocation of capital toward better-performing divisions.[5] Stein (1997) further develops a theoretical model where management utilizes this control right to engage in "winner picking," efficiently reallocating capital from the firm's "losing" projects to the "winners."

A different theoretical perspective, however, has dominated much of the extant literature. Agency costs, both at the level of top management and internally among divisions, can distort the capital allocation process and lead to inefficient investments.[6] Scharfstein and Stein (2000) develop a model where managers of relatively worse performing divisions exhibit "rent-seeking" behavior (Milgrom and Roberts 1990) in order to accumulate more compensation than their skills are objectively worth. Instead of compensating these managers with cash, top management distorts the internal capital market by rewarding them with additional capital subsidies from the

[5] The idea of a "control right" is first introduced by Grossman and Hart (1986).
[6] A working paper by Alok and Gopalan (2012) uses a unique dataset to examine how the compensation structures of business unit managers in multidivisional firms may act to mitigate these agency conflicts. Wulf (2002) finds that the compensation incentives and investment decisions of division-level managers are substitutes.

firm's relatively better performing businesses. Similarly, Rajan et al. (2000) describe how power struggles between divisions with heterogeneous investment opportunities can lead to an inefficient capital market within the firm. In their theoretical model, managers are more interested in developing the profitability of their divisions than the overall profitability of the firm, which drives top management to cross-subsidize the weaker performing divisions.

Bromiley (1986) and Barney and Zajac (1994) highlight the importance of behavioral phenomena on the resource allocation decisions of top management. The field work by Gilbert (2001) within the newspaper industry provides a compelling example. He shows that prospect theory and risk framing (Kahneman and Tversky 1984) can influence the cognitive architecture underlying the capital allocation process. Recent research by Garbuio et al. (2011) also applies constructs from psychology and behavioral science to explore how the capital allocation process is influenced by managerial heuristics and biases. The authors consider the possibility of adverse effects related to resource endowments, familiarity, extremeness aversion, anchoring, and partition dependence. Although Garbuio et al. (2011) allow that capital allocation based on heuristics might also be efficient, their propositions provide a summary outline of how managerial biases can result in suboptimal allocation decisions for the firm.

Field Research and Empirical Evidence of Inefficient Capital Markets

While the bulk of empirical evidence on capital allocation efficiency is rooted in the financial economics literature, I also highlight two prominent field studies that illustrate the resource allocation process from the perspective of strategic management.[7] Christensen and

[7] In addition to the works of Christensen and Bower (1996) and Sull (1999), which are detailed here, other scholars that have examined inefficiencies within in the resource allocation process include Eisenman and Bower (2000) in the cable industry, Noda and Bower (1996) in the regional telecom industry, and Kuemmerle (1999) in international expansion decisions.

Bower (1996) show that industry leaders failed to invest in new, strategically important products (i.e., the 5.25-inch hard-disk-drives for desktop personal computers in the early 1980s) that did not match the firms' current strategic context (which was focused on 8-inch drives for minicomputers). These once-leading firms tended to fail. In another example, Sull (1999) finds that top management at Firestone Tire & Rubber failed to make strong investments into new technologies (i.e., radial tires first developed by Michelin) during the 1960s and 1970s, in part due to Firestone's outdated strategic context (which was focused on bias tire technology). Firestone went on to lose a significant amount of market value before eventually being acquired.[8] In both field studies, top management recognized the threat from new and growing markets early in the investment process, but they continued to allocate capital to their still profitable businesses.[9]

Empirically, two examples of efficient internal capital markets come from Khanna and Tice (2001) in the retail industry and Maksimovic and Phillips (2002) in the manufacturing industry. Khanna and Tice (2001) examine the exogenous shock of WalMart's entry into new markets. They find that multidivisional firms with related divisions allocate less cash flow to their divisions with declining productivity, i.e., those competing against WalMart in its new markets. The results suggest that these retail firms operate an efficient internal capital market when facing external, competitive pressure. Maksimovic and Phillips (2002) use U.S. Census data to show that manufacturing firms appear to allocate capital efficiently at the plant level.

[8] The field research on Firestone (Sull 1999) is also an example of inefficient divestment, an area where strategy researchers have made interesting contributions to the analysis of resource allocation decisions (Duhaime and Grant 1984; Duhaime and Schwenk 1985; Shimizu and Hitt 2005; Shimizu 2007). For example, Elfenbein and Knott (2011) show that 85% of business exits occur later than what would be rationally predicted in an option-value model.

[9] In fact, the leading firms in the hard-disk-drive industry were the first to develop many of the new technologies, but they then failed to adjust their strategic context away from currently profitable product lines (Christensen and Bower 1996).

Investment in a productive plant increases after a positive demand shock in its own industry, as well as after a negative demand shock in other the industries where the firm operates.

These two, industry-specific studies notwithstanding, the preponderance of empirical evidence suggests that firms are not allocating their internal capital resources efficiently. Using the international oil crisis in 1986 as an exogenous shock, Lamont (1997) presents evidence that multidivisional oil firms were inefficiently subsidizing their divisions in unrelated, non-oil industries. Post-shock, the oil firms decreased these non-oil investments, even though the investment outlook of those industries was not affected by the shock and other firms in those industries did not decrease their investment levels. Shin and Stulz (1998) use a large-sample empirical test to find similar results. They show that a segment's association with the cash flow of other segments does not depend on whether the segment has the best investment opportunities within the firm. In an efficient internal capital market, we would expect that segments with better investment opportunities have priority in the allocation of capital, not that segments appear to be treated equally, as the evidence in Shin and Stulz (1998) suggests.

After they develop their theoretical model of rent-seeking divisions within the firm, Rajan et al. (2000) empirically demonstrate this inefficiency. They show that segments with relatively high investment opportunities make cash flow transfers and, conversely, that segments with relatively low investment opportunities receive cash flow subsidies. Billett and Mauer (2003) examine these cash flow transfers and subsidies directly, using cash flow and investment data at the segment level. They find that only 25% of segment-level investments are efficient. Gopalan, Nanda, and Seru (2007), in their study of Indian conglomerates, also examine cash flows directly at the level of the business group and demonstrate that excess cash tends to flow toward underperforming groups.[10] Even after receiving this internal funding, the subsidized business groups continue to exhibit lower performance, suggesting the excess cash was not used on profitable investment opportunities.

Using carefully matched segments, Ozbas and Scharfstein (2010) show that multidivisional firms tend to invest less than their standalone peers in industries with relatively high investment opportunities and more than those peers in industries with relatively low investment opportunities.[11] By looking at allocation decisions when managers have lower ownership stakes in the firm, the authors also argue that the inefficient capital allocation is likely due to agency costs. Stein (2003) summarizes the state of the empirical literature in his chapter on corporate investment in the *Handbook of the Economics of Finance*. He comes to the conclusion that "the weight of the current evidence" is that inefficient cross-subsidization exists within internal capital markets.

From a strategic management perspective, Bardolet et al. (2011) examine capital allocation decisions within the context of managerial biases (Zajac and Barney 1994; Gilbert 2001; Garbuio et al. 2011). The authors use a unique combination of empirical and experimental tests to show that firms are cross-subsidizing segments in a socialistic manner. They find that firms tend to allocate capital evenly among all of their business units, regardless of investment opportunity set, size, and industry. While their empirical results are consistent with those from

[10] Even more interesting, Gopalan et al. (2007) explain an underlying mechanism of these seemingly inefficient cash flow transfers. In contrast to a business segment in the U.S., Indian business groups can access the external capital markets directly. When an Indian business group is underperforming, its partners may subsidize the struggling business to help it avoid bankruptcy, because bankruptcy would have adverse effects on the surviving business groups as well.

[11] Ozbas and Scharfstein (2010) is an "extensive reworking" of Scharfstein (1998), originally published via the National Bureau of Economic Research (NBER). They employ a non-parametric matching procedure to control for size, age, and profitability, a significant improvement over matched samples for multidivisional segments and focused firms in prior literature.

the extant literature, the authors use experimental tests to conclude that a naïve tendency to diversify is driving these inefficient allocation decisions, as opposed to agency conflicts.

3 TOWARD A NEW MEASURE OF STRATEGIC CAPITAL ALLOCATION

This paper proposes that the empirical results in the extant literature may be driven largely by a measurement problem. From the traditional perspective, an internal capital market is deemed inefficient when the firm provides free cash flow to business units that have relatively worse investment opportunities than other units. The inefficient firm cross subsidizes these weaker divisions at the expense of divisions with relatively better investment opportunities. Researchers have traditionally employed uni-dimensional proxies to measure these investment opportunities for efficiency. These proxies include Tobin's Q (Shin and Stulz 1998; Rajan et al. 2000; Billett and Mauer 2003; Ozbas and Scharfstein 2010), sales growth (Lamont 1997), and return on assets (Billett and Mauer 2003).

I contend that these uni-dimensional measures are problematic because they ignore the possibility that firms make value-maximizing strategic trade-offs in the resource allocation process.[12] One critical trade-off is the need for multidivisional firms to make investment decisions based on both current profitability and for future growth (Marris 1963; Marris 1964). Building on Penrose's (1959) theory on the growth of firms, Marris (1963) shows that top management desires both profitability (i.e., size) and growth (i.e., positive changes in size). In the theoretical model, maximizing one strategic objective does not always maximize the other;

[12] Rajan et al. (2001) also point out that a proxy for a division's investment opportunities may need to be more nuanced than a uni-dimensional measure can capture. To account for the varying investment opportunities of large and small firms, they build a two-dimensional classification based on segment-level Tobin's Q and an asset-weighted Tobin's Q. Other, more-nuanced proxies include sales per square foot (Khanna and Tice 2001) and total factor productivity (Maksimovic and Phillips 2002), both of which show efficient allocations of capital in their respective industry samples. Wulf (2002) also uses a two-dimensional approach based on ROA and the subjective recommendations of managers to analyze the resource allocation decision.

managers are forced to make strategic trade-offs between the two objectives. Similar economic models that highlight the trade-off between current profits and future growth are also developed by Baumol (1959) and Williamson (1964).

Uni-dimensional measures of capital allocation efficiency may also lack the nuance to capture the complex, multilayered process of resource allocation (Bower 1970; Burgelman 1983). Bower (1970) documents the complexity of aligning the strategic objectives of a multidivisional firm to its capital allocation decisions.[13] He builds a multilayered model where top-level management (corporate), general managers in the middle, and operating managers at the business-unit level all interact within the resource allocation process. Because this process is spread across multiple levels of the firm, the separate actors make decisions simultaneously in a complex, iterative process. Whereas Bower's (1970) focus is on the structural context of the firm and its actors, Burgelman (1983) makes explicit the importance of the firm's strategic context in the resource allocation process. This strategic context comprises the top-down declarations of corporate strategy as well as the individual strategic initiatives coming from the bottom-up. Together, Bower (1970) and Burgelman (1983) highlight the complex nature of identifying, evaluating, and eventually funding the firm's investment opportunities.

If a uni-dimensional measure does not adequately capture the complex process of strategic capital allocation, it may misclassify an efficient internal capital market as an inefficient one, or vice versa. Further, if managerial allocation decisions are value-maximizing, a two-dimensional measure that captures a critical strategic trade-off should improve our understanding of the association between the capital allocation process and performance. In the next section I

[13] It is noteworthy that the original work of Bower (1970) was itself a response—from the perspective of corporate strategy and business policy—to the inability of the contemporaneous economics research, which was focused strictly on hurdle rates and the cost of capital, to capture the complexity of the resource allocation process. Allocation decisions of multidivisional firms are not simply made in the boardroom from a list of projects ranked by NPV, but instead are formulated on a business-by-business basis (Bower 1986).

begin to build a new measure of capital allocation efficiency that attempts to account for these two neglected phenomena in the literature.

Building a Measure of Capital Allocation Efficiency

In order to build a measure of capital allocation efficiency, it is first necessary to establish the proposed construct of "efficiency." I begin by following prior literature that classifies each segment within multidivisional firms on the basis of its investment opportunities, which I proxy for using Tobin's Q.[14] If the Tobin's Q of the focal segment is higher than the asset-weighted average Q for the rest of the firm (i.e., all segments not including the focal segment), it is classified as having high investment opportunities. Similarly, a segment has low investment opportunities when its Q is lower than the asset-weighted average Q of the rest of the firm.[15] A classification for return on assets (ROA), a proxy for segment performance, can be built in an analogous manner.[16] An individual segment is classified as having high (low) profitability when its ROA is higher (lower) than the weighted-average ROA for the rest of the firm.

Next, by directly examining the cash flows (*cf*) and capital expenditures (*capx*) at the segment level, each segment is classified as being either a *subsidized segment* or a *transferring segment*. When the segment's cash flow is less than the capital expenditure investment within the segment ($cf < capx$), it is classified as a subsidized segment. These segments require cross-subsidizations from the firm to fund their capital investment needs. On the other hand, when the

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[14] Tobin's Q, measured as the ratio of a firm's market value to the book value of its assets, is a standard proxy for the investment opportunities of the firm. Intuitively, a higher Tobin's Q indicates higher investment opportunities; a Tobin's Q greater than one suggests that capital investments will yield positive returns, as measured by stock market value.

[15] Because Tobin's Q cannot be calculated directly at the segment level, I follow Billett and Mauer (2003) in the construction of a fitted Q, which is described in more detail in Section 4.

[16] In their work, Billett and Mauer (2003) alternately use two separate proxies for the investment opportunities of the segment, either Tobin's Q or ROA. Their construction of internal capital market efficiency is analogous for the two proxies, and the empirical results they present are also consistent when analyzing each proxy separately.

segment's cash flow exceeds that of its capital expenditures (*cf* > *capx*), it is a transferring segment. These segments generate free cash flow that is transferred back to the firm.[17]

The final step in the construction of an efficiency measure of capital allocation is to classify each segment as either *efficient* or *inefficient*. Here, a theory of strategic capital allocation differs from prior literature.

Efficient capital allocation within the existing regime. According to the current measures of internal capital market efficiency, segments with stronger investment opportunities should be subsidized by those with weaker investment opportunities. Within the general construct of efficiency outlined above, a subsidized segment is efficient (from the perspective of prior literature in financial economics) when it has high Q. Conversely, a subsidized segment is inefficient if it has low Q; the firm should not cross subsidize segments with weaker investment opportunities by providing them with excess cash flow. A transferring segment (i.e., one which generates free cash flow) is inefficient if it has high Q, because segments with stronger investment opportunities should be reinvesting all of their cash. And conversely, a transferring segment is efficient if it has low Q; segments with weaker investment opportunities should transfer free cash flow back to the firm.

Efficient capital allocation within the strategy regime. This paper contends that such a uni-dimensional proxy for internal capital market efficiency may not capture the strategic trade-offs and complexity inherent in the resource allocation process. Specifically, a measure must account for not only the investment opportunities of the segment, but also for its current profitability. Based on early work by Marris (1963; 1964), I construct a simple matrix to categorize each business segment along two dimensions: the growth potential of the business

[17] Top management in the multidivisional firm has discretion to invest this excess cash in other business segments or to make external acquisitions, to return the cash to shareholders in the form of dividends or stock buybacks, or to simply hold the cash on the balance sheet.

(captured by Tobin's Q) and its current profitability (captured by ROA). The nuance here is to capture the unique contribution of the segment's investment opportunities *in conjunction with* its current profitability. Each segment is thus classified within a 2x2 matrix as having either high Q or low Q *and* either high ROA or low ROA. The remainder of the section now describes the theory of strategic capital allocation within the construct of this matrix.[18]

From a strategic management perspective, an efficient transfer reallocates free cash flow from business units with low Q and high ROA to subsidize investment opportunities in business units with high Q and low ROA. The former is an example of a profitable segment with minimal new growth opportunities, where additional investment of free cash flow is not expected to deliver profitable growth. The latter segment is where the firm needs to increase investment to establish its profitability. It is precisely these investments (in high Q and low ROA segments) that are captured by the implications of strategic resource combinations in Rumelt (1984) and Lippman and Rumelt (2003). Within the construct of the matrix, a transferring (subsidized) segment with low Q and high ROA is efficient (inefficient), while a transferring (subsidized) segment with high Q and low ROA is inefficient (efficient).

Segments with low Q and low ROA are the relatively worst performing lines of business within the firm. They are underperforming and have minimal new growth opportunities, and by definition, do not make compelling investments. Providing cash flow subsidies to these segments is always considered inefficient. Within the matrix, a transferring (subsidized) segment with low Q and low ROA is efficient (inefficient). It is important to emphasize here that all capital

[18] The categorization of strategic capital allocation that I outline in this section is similar to the normative prescriptions of the growth-share matrix originally developed in the late-1960s by the Boston Consulting Group (BCG). In the BCG matrix, free cash flow from Cows is used to subsidize investments in fast growing Question Marks (or Wildcats), while Stars and Dogs should be cash flow positive and self-sustaining (Henderson 1979; Stern and Deimler 2006). A theory of strategic capital allocation may seem either self-evident or controversial for some, because the general ideas were broached more than forty years ago. The approach adopted in this paper, while similar to the BCG matrix, is not a direct empirical test of its prescriptions (Nippa, Pidun, and Rubner 2011; Pidun et al. 2011).

expenditures in a low Q and low ROA segment are not necessarily inefficient. These underperforming segments with lower growth opportunities can still be efficient, as long as they do not require cross-subsidizations and are generating net positive cash flow for the rest of the firm.

The final strategic classification for high Q and high ROA segments differs from the traditional regime and bears some additional explanation. Drawing on entrepreneurial theories of strategy, where firms face the risk of over-investing in businesses where reinvestment rates are higher than growth and profitability rates (Rumelt 1984), I categorize a transferring (subsidized) segment with high Q and high ROA as efficient (inefficient). Subsidizing the high Q-high ROA segments with excess cash flow thus represents a strategic risk of overinvestment, which may never produce net positive cash flows. Further, the sustained success and future growth of firms depend not only on the exploitation of their existing resources, but primarily on the development of new resources (Wernerfelt 1984), e.g., by subsidizing the firm's high Q-low ROA segments. Performance based on current resources is transitory, so firms must continually invest in new ones (Dierickx and Cool 1989), because building new strategic assets is necessary to sustain long-term competitive advantage (Markides and Williamson 1994; Agarwal and Helfat 2009). All of these arguments support the importance of not over-investing in the existing sources of the firm's current performance by subsidizing segments with high Q and high ROA.

4 METHODOLOGY

This paper compares the measurement of capital allocation efficiency under the existing approach and a new approach grounded in strategic management. I conduct the empirical analysis in two stages. In the first stage, I construct a two-dimensional measure of strategic capital allocation and carry out a behavioral test of efficiency. If this new approach captures the strategic trade-offs faced by managers during the complex resource allocation process, I expect to find that capital allocation is significantly more efficient than prior literature suggests. In the second stage of the empirical analysis, I conduct a performance test of managerial investment decisions to validate the strategic measure of capital allocation efficiency. If managers are making this strategic trade-off in a value-maximizing manner, the strategic allocation of capital should be positively associated with firm-level performance.

Stage 1: Behavioral Test of Strategic Capital Allocation

The behavioral test of allocation efficiency is a simple count of the inefficient segments as determined both under the traditional regime and when employing the new, multidimensional measure of strategic capital allocation. To compare the new approach of strategic capital allocation against a uni-dimensional measure, I follow the prescriptions described in the previous section to classify each segment within each firm as either efficient or inefficient. As described above, I expect the two-dimensional measure to indicate managers are acting more efficiently than prior measures for two reasons. First, the new measure should better capture the strategic trade-offs faced by top-level management, and second, it should also better capture the overall complexity of the strategic resource allocation process.

Stage 2: Validate the Measure of Strategic Capital Allocation

The validity of any new measure depends on its ability to capture and predict the expected theoretical relationships (Venkatraman and Grant 1986). Strategic capital allocation attempts to measure management's ability to reallocate capital toward "winners" and away from "losers." Intuitively, firms which make these value-maximizing strategic trade-offs should perform better than those which do not. If the new measure of strategic capital allocation is valid, it should be reflected in firm performance—the measure should be positively associated with market value. Meanwhile, based on the extant literature, I do not expect the traditional measure of capital allocation efficiency to show any association with firm performance. I test these expected empirical outcomes by calculating the firm-level measure of value-added from the internal capital market for both the traditional regime and the strategy regime.

Construction of the value-added measure. I follow Rajan et al. (2000) in calculating a measure of value-added from internal capital market allocations for each firm in each year:

$$\text{Segment Value Added} = \frac{\left|\left(ROA_{i,t} - ROA_{-i,t}\right) * Amount_{i,t}\right|}{\sum_{i=1}^{n} TotalAssets_{i,t}}$$

The value-added measure calculates the amount (*Amount*) of each subsidy or transfer at the segment level as the absolute value of the difference between the segment's cash flows and its capital expenditures.[19] To capture the economic magnitude of the capital allocation decision for each segment, the subsidy or transfer amount is weighted by the difference between the focal segment's ROA and the ROA of the rest of the firm. The whole measure is scaled by total assets to control for firm size.

[19] Because a firm can only reallocate free cash flow in an amount that is actually generated by its segments, I also follow Billett and Mauer (2003) by not allowing transfers to exceed subsidies at the firm level. Further, any cash flow transfers must account for dividend payouts to shareholders, so an asset-allocated share of any firm-level dividends is subtracted from the amount of each transferring segment in the firm. Formulaically, the adjusted amount from a transferring segment is

$$Transfer_i = \min\left[PTransfer_i, \frac{PTransfer_i}{\sum_{i=1}^{n} PTransfer_i}\left(\sum_{i=1}^{n} Subsidy_i\right)\right],$$

where $PTransfer_i$ is the potential transfer amount of segment *i*, measured as the positive difference between cash flow and capital expenditures adjusted for any dividend payouts. Likewise, the $Subsidy_i$ amount is the negative difference between cash flow and capital expenditures.

This segment-level value is then multiplied by negative one (–1) for inefficient subsidies and transfers (as classified for each approach in the previous section), because these managerial decisions are assumed to detract from value-added. Finally, the firm-level value-added measure is the aggregation of all segment-level values. The intuition behind the value-added measure captures the basic premise that efficient allocations of capital should add to value, while inefficient allocations should detract from it.

I calculate two value-added measures for each firm in each year. One measure follows the uni-dimensional classification scheme for efficiency from the extant literature, while the other follows the theory of strategic capital allocation. Note that the general method for both calculations is exactly the same, following the process described above. Any difference between the two approaches, then, is a result of their different classification schemes for efficiency. For example, a subsidized segment with low ROA is inefficient when using the uni-dimensional measure, but if the segment is low ROA *and* high Q the strategy regime would classify it as efficient; it is this difference between classification schemes that will result in unique calculations of value-added for each regime.

Empirical tests. To test the association between the value-added measures of internal capital market efficiency, I regress firm-level performance on each measure of capital allocation value-added:

$$Y_{j,t} = \beta_0 + \beta_1 X_{j.t} + \beta_2 Z_{j.t} + \varsigma_j + \gamma_t + \varepsilon_{j.t},$$

where the primary dependent variable Y is the firm's market value of equity[20] and where X indicates the separate calculations of value-added from either the traditional regime or the strategy regime. Standard controls Z from the related literature in finance and economics are

[20] I also find robust results using measures of firm-level ROA and Tobin's Q as the dependent variables. Both of these output variables, however, present identification issues because the classification schemes for capital allocation efficiency require the use of both ROA and Tobin's Q on the right-hand side of the model as well.

employed (i.e., liquidity, leverage, the log of consumer price index-adjusted assets, and total number of segments), and the model implements fixed-effects with firm-specific intercepts and fiscal-year dummies. The summary statistics and correlation matrix are presented in Table 1. If the new measure of strategic capital allocation is capturing the complex, value-maximizing trade-offs that managers face between future growth opportunities and current profitability, the coefficient on β_1 for the strategy regime should show the expected positive association with firm-level performance, while β_1 for the traditional regime should be insignificant.

Sample Description

I follow prior research on the efficiency of internal capital markets in constructing my data sample (see, e.g., Berger and Ofek 1995, Billett and Mauer 2003, or Ozbas and Scharfstein 2010). I start with all multisegment firms between 1979 and 2009 from the Compustat Segment File. Observations are excluded if capital expenditure data is missing or if complete data is not available to calculate the segment's annual cash flow using operating profit and depreciation.[21] I also collect the corresponding firm-level values from Compustat. Firms with less than $20 million in either total revenue or total assets are excluded, as are firms in the agricultural (SIC 0-999) and financial sectors (SIC 6000-6999). Two years of complete data are required.

Prior literature also excludes firms where the sum of segment-level values are not within a prescribed percentage (usually 1% or 5% for revenue and 25% for assets) of the reported values at the firm level. The rationale is to limit observations with potential reporting errors between segment-level and firm-level data. These differences, however, are not necessarily indicative of reporting errors, but instead are often the natural result of managerial discretion

[21] Interest expense and tax expense are only recorded at the firm level. To calculate segment-level cash flow, I follow prior literature in allocating these firm-level expenses based on the asset size of each segment.

afforded to firms in their segment-level reporting of accounting numbers.[22] The conclusions in this paper are consistent whether these firms with differences are excluded from the sample or not, so I report all results with the fuller data set. Similar to prior literature, I scale the amounts of segment-level revenue and segment-level assets to match those from the firm-level report.[23]

The final sample from 1979 to 2009 is comprised of 89,468 segment-year observations and 30,257 firm-year observations. By way of comparison, the sample in Billett and Mauer (2003) ranges from 1990 to 1998, and is comprised of 5,857 segment-year observations. All of the empirical results reported in this paper are consistent to those when I limit my sample period and selection criteria to match Billett and Mauer (2003).[24]

Construction of key variables in the sample. I closely follow prior literature to construct the primary variables for the analysis. Segment-level cash flow (*cf*) is calculated as the segment's operating profit (*ops*) plus depreciation (*dp*). I also adjust *cf* for the segment-level asset-weighted average for taxes (*txt*) and interest (*xint*), since these variables are not available directly at the segment level. Return on assets at the segment level is calculated as *ops* divided by its beginning-of-period total assets (ops_t / at_{t-1}).

Tobin's Q cannot be calculated directly at the segment level because market values are not available, so I follow Billett and Mauer (2003) in the construction of a fitted Q. First, I calculate the Tobin's Q of all single-segment firms (Q_{ss}) and perform separate industry-year regressions of this Tobin's Q on each firm's total assets (TA_{ss}), operating profit (OPS_{ss}), and revenue ($Sales_{ss}$):

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[22] In a current working project, Ma and Vieregger (2012) observe firms that report segment- and firm-level discrepancies in their 10-K typically provide a descriptive rationale in the management discussion section for these differences.

[23] For example, if the sum of segment revenue is 3% less than the total of firm revenue, each segment is scaled by an asset-weighted 3%, so the segment and firm totals match in the final analysis.

[24] When I replicate the sample construction in Billett and Mauer (2003), I have 6,418 segment-year observations. The small difference is likely due to changes in the Compustat Segment File over the years.

$$Q_{ss,j,t} = \beta_0 + \beta_1 TA_{ss,t} + \beta_2 OPS_{ss,t} + \beta_3 Sales_{ss,t} ,$$

where *j* is the two-digit SIC industry of the single-segment firm and *t* is the fiscal year.[25] Next, I use these industry-year coefficient estimates to predict a fitted Tobin's Q at the segment level, based on the actual assets, profitability, and revenue of each segment:

$$\hat{Q}_{i,t} = \hat{\beta}_0 + \hat{\beta}_1 TA_{i,t} + \hat{\beta}_2 OPS_{i,t} + \hat{\beta}_3 Sales_{i,t} .$$

The result is a fitted Q for each segment within the sample of multidivisional firms.[26] This estimation approach endeavors to reduce the measurement error inherent in using single-segment peers as a proxy for the Q of individual segments in a multi-segment firm.

5 EMPIRICAL RESULTS

The empirical analysis in this paper considers the measurement of capital allocation efficiency based on both extant theory and the principles of strategic management. The first stage of the analysis compares the efficiency of segment-level allocations using the uni-dimensional measure developed in Billett and Mauer (2003) against a new, multidimensional measure of strategic capital allocation. In the second stage, I attempt to confirm the validity of the new measure of strategic capital allocation.

Stage 1: Behavioral Test of Strategic Capital Allocation

The results from the first test are presented in Table 2. Column A is a simplified reproduction of the original results from Billett and Mauer (2003).[27] They find that firms are

[25] These firm-level characteristics represent the key data available for segments in the Compustat Segment File. *TA* is the log of CPI-adjusted total assets. *OPS* and *Sales* are scaled by total assets.
[26] The fitted Q is truncated if it is larger (smaller) than the maximum (minimum) of the Tobin's Q from the industry-year regression from the first step.
[27] In their paper, Billett and Mauer (2003) present these results within categories based on the financial constraints of each segment. I merely condense those results here.

allocating capital efficiently at the segment level only 24% of the time, and their results are consistent whether alternately using Tobin's Q or ROA as the proxy for investment opportunities.

Column B corroborates these results using the much larger sample in this paper.[28] Similar to Billett and Mauer (2003), I show that a uni-dimensional measure for internal capital markets finds efficient allocation only 27% of the time. It is compelling that these results are consistent over the complete time period in this paper, from 1979 to 2009. Equally important, the replication of these results also finds that 55% of segments are subsidized segments (compared to 57% in Billett and Mauer 2003), while the remaining 45% are transferring segments (compared to 43%). I conclude that my replication is accurate.

Next, I evaluate internal capital market efficiency following the principles of strategic management, as detailed in Section 3. Column C of Table 2 shows the main results from the first stage of the empirical analysis. Compared to the uni-dimensional measure employed in Columns A and B, I find that firms allocate capital efficiently 53% of the time under a strategic measure of capital allocation efficiency—more than twice as often than under the current approach. The results suggest that managers do face a strategic trade-off between current profitability and future growth opportunities during the resource allocation process. The failure to account for these trade-offs, which have been neglected in prior literature on the resource allocation process, significantly increases the appearance that firms are allocating capital inefficiently at the segment level.

[28] The sample size in this paper is much larger than in Billett and Mauer (2003) due to two factors. The first is the longer timeframe (1979-2009 compared to 1990-1998). The second reason is described in detail in the sample description; the sample in this paper does not drop observations where segment-level aggregations of revenue or assets differ from those of firm-level reports. The results in this paper are consistent when the sample size matches that in Billett and Mauer (2003) and when the observations with assumed discrepancies are also dropped.

Stage 2: Validate the Measure of Strategic Capital Allocation

In the behavioral test above, I find that managers appear to allocate capital significantly more efficiently when the analysis accounts for both current profitability and future growth opportunities. In the second stage I attempt to validate these results by testing the association of strategic capital allocation with firm-level performance. If the new measure of strategic capital allocation is capturing the complex, value-maximizing strategic trade-offs managers face, the measure should show a positive association with performance.

Table 3 presents the main results for the test of validity. Models 1-4 are baseline tests for the association between the uni-dimensional measure of internal capital market efficiency and market value. As expected, the coefficients in Models 1-4 demonstrate that a the existing measure need not show a significantly positive association with firm performance. The results are comparable to those in Billett and Mauer (2003), who find that the overall measure of value-added is not significantly different from zero in their tests of excess value. They also show that firms only create value by making efficient transfers to segments that are otherwise financially constrained, a key idea behind internal capital market efficiency from a finance perspective.

Models 5-8 in Table 3 demonstrate that the new measure of strategic capital allocation efficiency appears valid. While the results presented here use the market value of equity as the dependent variable, similar results are obtained when using ROA and Tobin's Q as proxies for firm-level performance. Models 5 and 6 show a significantly positive association between the value-added measure of strategic capital allocation and the market value of equity. The one-year lag on the measure of value-added from strategic capital allocation in Models 7 and 8 is also significant, suggesting an important relationship between the value-maximizing strategic trade-offs that managers face today and firm-level performance in the future. This result is consistent with long-term performance implications of strategic capital allocation decisions.

To investigate these long-term implications more explicitly, I perform additional tests of the association between the value-added measures of efficiency and firm-level performance. As a way to capture the cumulative value of prior investment decisions, I sum the value-added measure across multiple years for each firm to create new explanatory variables for both regimes. I calculate cumulative value-added for three years and for five years in each regime. The results from these tests are presented in Table 4, and they provide strong evidence for the long-term importance of strategic trade-offs faced by managers. Consistent with the main regression results above, Models 1-3 show that the value-added measure from the extant approach is not significant in any tests. In Models 4-6, however, the measure of strategic capital allocation is significantly associated with firm performance at three and at five years. The strategic implications of capital allocation decisions appear to be important for up to five years following management's original investment decision.

6 CONCLUSION

The capital allocation process is a critical component of strategic execution for multidivisional firms. Chandler (1962) goes so far as to define *strategy* in terms of the resource allocation process, and many others have explicitly recognized capital allocation decisions as the most important component for the success of multidivisional firms (Williamson 1975; Bower 1970; Rumelt 1984; Bardolet et al. 2011). Despite this importance, strategy scholars have ceded much of the theoretical and empirical work in capital allocation efficiency to the domains of finance and economics (Stein 2003). The bulk of this research (Lamont 1997; Shin and Stulz

1998; Rajan, Servaes, and Zingales 2000; Billett and Mauer 2003; Gopalan, Nanda, and Seru 2007; Ozbas and Scharfstein 2010), as well as the evidence from prominent field studies in strategic management (Christensen and Bower 1996; Sull 1999), concludes that managers make significantly inefficient capital allocation decisions—a result that should be of concern to business managers and strategy scholars alike.

This paper asks whether managers are truly allocating capital so inefficiently, or do they instead have rational, strategic objectives that explain their investment decisions. Building off the general framework of internal capital market efficiency from financial economics (Berger and Ofek 1995; Rajan et al. 2000; Billett and Mauer 2003), this paper develops a new measure of *strategic* capital allocation. The new approach introduces a multidimensional measure to capture the strategic trade-offs between future growth and current profitability (Marris 1963; Marris 1964; Williamson 1964), which are faced by managers during the complex resource allocation process (Bower 1970; Burgelman 1983). In the first stage of the empirical analysis, managers are found to be allocating capital more than twice as efficiently than prior literature suggests. The second stage validates this multidimensional approach by demonstrating the predicted theoretical relationship between a strategic measure of capital allocation and firm-level value, namely, that managers appear to be capable of enhancing performance through strategic capital allocation.

One limitation of the research design in this paper is that a normative link between capital allocation efficiency and firm-level performance requires the researcher to prescribe a definition of efficiency. While little theory exists, I attempt to mitigate some concern by drawing on the established precepts of the resource-based theory of the firm (Wernferfelt 1984; Dierickx and Cool 1989; Rumelt 1994; Markides and Williamson 1994; Lippman and Rumelt 2003; Agarwal and Helfat 2009). I further attempt to moderate the normative limitations of this approach in

Stage 2 of the empirical analysis. By demonstrating the consistency of the value-added measure of strategic capital allocation with its theoretical predictions, the results here validate the new, multidimensional of strategic capital allocation. Considering the significance of the results, however, additional large-scale and industry-specific empirical work may still be necessary to bolster our understanding of strategic capital allocation.

This paper makes two important contributions, which I will explore in turn for the remainder of this paper. First, the paper investigates a fundamental component of strategic management theory and practice—the efficiency of a firm's internal capital allocation processes—that has been largely neglected by strategy scholars of late. The third contribution is of paramount importance for the practice of strategy: the results in this paper provide insight for managers on how to create value through strategic capital allocation.

Because of the importance of internal capital market efficiency to strategic execution (Chandler 1962; Williamson 1975; Bower 1970), this paper endeavors to establish that the an influential research agenda on the resource allocation process should once again be driven by scholars from the strategy disciplines. We know that managers make strategic trade-offs in the complex process of resource allocation, but prior examinations of capital allocation efficiency have neglected to consider the impact of these trade-offs.[29] We also know that resource allocation within the multidivisional firm is a complex, multilayered process (Bower 1970), formulated not only by top-down declarations of corporate strategy but also by bottom-up strategic impetuses (Burgelman 1983). An appreciation for these strategic trade-offs and complexities, as well as the managerial biases inherent in them (Garbuio et al. 2011; Bardolet et al. 2011), may yield further insights into strategic capital allocation.

[29] Porter (1996) argues that managing complex trade-offs between strategic activities is the very essence of strategy.

A second contribution from this paper is of practical concern to top management teams responsible for their firms' capital allocation decisions. Recent articles in practitioner-oriented journals, such as the *Journal of Applied Corporate Finance* (Pidun et al. 2011) and *McKinsey Quarterly* (Hall et al. 2012), highlight the importance of the resource allocation process to top-level management teams. The new measure of strategic capital allocation in this paper builds on the extant empirical results, following a interdisciplinary, integrative approach (Jemison 1981) to research, which is important for business managers. Nearly three decades ago, Bettis (1983, 414) wrote:

> Relevant results from modern financial theory should be incorporated into the strategic management literature, and conversely. … Ultimately such a synthesis is essential, or else practitioners will be forced to select among contradictory paradigms—a most undesirable circumstance.

Despite the importance of the resource allocation process to practitioners, the bulk of research in both strategy and financial economics has accepted the paradigm (Kuhn 1962) that top-level managers of multidivisional firms quite regularly misallocate capital resources. This paradigm of inefficiency has driven a research agenda that focuses on managing agency costs in order to limit either the ignorance or malfeasance of managers. The results in this paper, however, suggest that managers may indeed be able to create value through the resource allocation process, and future research should seek to explore theories of how managers can best improve performance through strategic capital allocation.

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Table 1: Data Correlations

	ICM	Lag ICM	SCA	Lag SCA	Liquidity	Leverage	Log Assets	Segments
ICM	1.000							
Lag ICM	0.760	1.000						
SCA	0.021	0.069	1.000					
Lag SCA	0.035	0.199	0.596	1.000				
Liquidity	-0.058	-0.087	0.014	0.035	1.000			
Leverage	-0.022	-0.023	0.028	-0.007	-0.296	1.000		
Log Assets	0.024	0.011	-0.016	-0.013	-0.073	0.078	1.000	
Segments	-0.050	-0.050	0.064	0.056	-0.031	-0.050	0.030	1.000

ICM = Value Added Measure of Internal Capital Market

SCA = Value Added Measure of Strategic Capital Allocation

Table 2: Stage 1 Empricial Results

	Column A B&M (2003) ICM		Column B ICM Replication		Column C Strategic Capital Allocation	
	Segments	Percentage	Segments	Percentage	Segments	Percentage
Efficient Subsidized	850	25%	14776	30%	11225	23%
Inefficient Subsidized	2502	75%	34676	70%	38227	77%
Total Subsidized	3352	57%	49452	55%	49452	55%
Efficient Transferring	573	23%	9457	24%	36524	91%
Inefficient Transferring	1932	77%	30559	76%	3492	9%
Total Transferring	2505	43%	40016	45%	40016	45%
Total Efficient Segments	1423	24%	24233	27%	47749	53%
Total Inefficient Segments	4434	76%	65235	73%	41719	47%
Total Segments	5857	100%	89468	100%	89468	100%

Column A is a condensed version of Table 2 from Billett and Mauer (2003). Column B replicates the finance ICM measure using the larger sample size in this paper. Column C presents the capital market efficiency based on the strategic capital allocation.

Table 3: Stage 2 Regression Results

Dependent Variable = Firm Market Value

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
ICM Value Added	0.083	-0.034						
	(0.063)	(0.055)						
Lag of ICM Value Added			-0.089	-0.184**				
			(0.072)	(0.078)				
SCA Value Added					0.216*	0.278**		
					(0.124)	(0.133)		
Lag of SCA Value Added							0.238**	0.193**
							(0.117)	(0.094)
Liquidity		0.004		0.007		0.004		0.007
		(0.011)		(0.013)		(0.011)		(0.013)
Leverage		-1.411***		-1.400***		-1.412***		-1.396***
		(0.094)		(0.106)		(0.093)		(0.106)
Log of CPI Adj. Assets		0.681***		0.709***		0.682***		0.708***
		(0.025)		(0.028)		(0.025)		(0.028)
No. of Segments		0.022**		0.025**		0.022**		0.026**
		(0.010)		(0.011)		(0.010)		(0.011)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	6.463***	2.083***	6.561***	1.742***	6.463***	2.079***	6.563***	1.750***
	(0.029)	(0.194)	(0.047)	(0.202)	(0.029)	(0.194)	(0.047)	(0.202)
N	30257	29485	25223	24563	30257	29485	25223	24563
R^2	0.305	0.436	0.324	0.457	0.305	0.437	0.324	0.457

All standard errors in parentheses are clustered at the firm level: * p<0.10 ** p<0.05 *** p<0.01

Table 4: Long-term Implications of Capital Allocation Decisions

Dependent Variable = Firm Market Value

	[1] ICM 1-Year	[2] ICM 3-Year	[3] ICM 5-Year	[4] SCA 1-Year	[5] SCA 3-Year	[6] SCA 5-Year
Value-Added Measures	-0.034	-0.053	-0.039	0.278**	0.156**	0.160**
	(0.055)	(0.046)	(0.043)	(0.133)	(0.068)	(0.075)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.083***	1.886***	2.367***	2.079***	1.897***	2.390***
	(0.194)	-0.285	-0.37	(0.194)	-0.285	-0.37
N	29485	17526	12184	29485	17526	12184
R^2	0.436	0.45	0.448	0.437	0.45	0.449

All standard errors in parentheses are clustered at the firm level: * p<0.10 ** p<0.05 *** p<0.01

Regressors for ICM and SCA are the summation of either 3-years or 5-years of value-added from capital market efficiency.

Chasing their Tails: Why Do Firms Subsidize Underperforming Business Units?

Abstract
Firms repeatedly fail to exit from underperforming lines of business. Despite the prevalence and economic import of this failure to exit, scant empirical research explores the managerial motives of delayed exit. To address this question, I build a novel sample of underperforming business units that are being cross-subsidized by the internal capital market of conglomerate firms. Within this sample, firms repeat their subsidizing investments approximately 48% of the time, and the average length of cross-subsidization is an additional 5.6 years. In the main test of the paper, I examine the extent to which these seemingly inefficient investment decisions are driven by perceived synergies between the firm's business units. While I do find evidence that synergies may provide a strategic rationale for the prevalence of cross-subsidization, managers are ultimately not enhancing firm-level performance via these synergistic investment decisions. Additional tests suggest that hubris and escalation of commitment may be playing a more significant role.

INTRODUCTION

Firms repeatedly fail to exit from underperforming lines of business. Elfenbein and Knott (2011), for example, find that nearly 50% of exit occurs more than three years after an economically-modeled threshold would predict. In another study, 65% of divestitures resulting from external pressures were only executed after long delays and in the face of persistent underperformance (Dranikoff, Koller, and Schneider 2002). Ravenscraft and Scherer (1991) demonstrate that managers delay exit until the business unit has significantly underperformed for as many as seven years, and Caves (1998) finds that these divestitures tend to occur at the bottom of macroeconomic business cycles. More recently, Brauer and Wiersema (2012) find that exiting at the peak of a divestiture wave, i.e., when the decision is likely to be imitative of competitors, generates the lowest stock market returns. Practitioner anecdotes of delayed exit are also plentiful (e.g., Horn, Lovallo, and Viguerie 2006). In the strategic management literature, Sull (1999) details how Firestone Tire and Rubber subsidized its bias tire production during the 1970s, even though the market was disappearing and the business was losing money. He concludes: “Although the motives for delaying exit may have been admirable, the financial results were disastrous” (Sull 1999, 448).

Considering the prevalence and economic import of the problem, scant empirical research has been conducted to understand the managerial motives of delayed exit.[30] In a comprehensive review of the literature on divestment, Brauer (2006, 775) specifically calls for research on the “potentially anomalous cases” of delayed divestment, where firms fail to exit their underperforming business units. Elfenbein and Knott (2011), as noted above, is an exception. They decompose rational versus behavioral effects on organizational delay to find evidence that,

[30] I purposely distinguish here between traditional research on the divestment decision, which I will review briefly in the next section, and research on the delayed divestment of underperforming business units.

while a portion of delay is rational, the behavioral biases of managers play a significant role in the decision to delay exit. These biases are exacerbated by separated ownership and control. Anecdotal conclusions from practitioner journals often find similar results, explaining failure to exit as a result of the psychological biases of managers not willing to “let go” of failing businesses (Horn et al. 2006). Likewise, the predominant conclusion from the literature on internal capital markets is that firms consistently make inefficient investment allocation decisions (see Bardolet, Fox, and Lovallo 2011 for an example and a review of the literature).[31] In this paper, I integrate the literature of divestitures with that of internal capital markets to examine whether managers are instead following a rational strategy of delayed exit—making repeated, cross-subsidizing investments in underperforming business units, in an attempt to exploit synergies that can create returns to scale or scope.

To examine the question of delayed exit, I begin by constructing a novel sample of underperforming business units that are also being repeatedly cross-subsidized via the internal capital market of diversified firms. A business unit is cross-subsidized when its capital investments exceed its internally generated cash flows because, as standalone firms, these units would likely need access to prohibitively expensive external markets for this additional financing.[32] I use a competing hazards model to estimate the likelihood of exit within this sample. In addition to the primary exit event, the competing hazards model can account for contingent events, which allows me to also control for the efficient *re*-allocation of capital that may precede exit. My primary variable for the strategic rationale of delayed exit is the relatedness between the subsidized business unit and other units within the firm, drawing on the

[31] Vieregger (2012) is an exception.
[32] External capital is likely to be prohibitively expensive for these business units precisely because they are underperforming and have minimal growth opportunities. They lack cash flow to support new debt payments and are unlikely to attract equity capital either.

general interindustry relatedness index from Bryce and Winter (2009) to construct a proxy for synergy.[33]

This sample of capital investment decisions, examined from within the firm's internal capital market, provides a compelling setting to examine why firms fail to exit their underperforming business units. Within the sample, the probability of repeating a cross-subsidizing investment from one year to the next is approximately 48%, which is the second-most persistent type of conglomerate investment. On average, these firms then continue to cross-subsidize the underperforming business for another 5.6 years. My main results show that firms are significantly more likely to continue their cross-subsidization of an underperforming business unit when that unit is highly related to another unit within the firm. Controlling for potential explanations that may be related to structural-economic and managerial-agency antecedents of divestiture, I conclude that managers may be delaying exit in order to maintain synergies between their business units. In a final test, however, I demonstrate that these "synergistic" cross-subsidizations are not associated with increased performance at the firm-level.

These results suggest that managers are overestimating the potential for synergies as a basis for their internal investment decisions. Roll (1986) draws a similar conclusion in his investigation of corporate mergers and acquisitions (M&A). He defines the hubris hypothesis as the willingness of bidders to pay more than market price for acquisitions, primarily because they believe in potential synergies. The ex-post empirical evidence demonstrates that synergies often fail to generate value, and that acquiring firms, on average, pay too much for their targets. One explanation for this evidence is the inherent information asymmetry in the M&A setting. The bidder must derive a value for the target based on incomplete information, incorporating the

[33] I am thankful to Professor Bryce for making the full dataset of relatedness percentiles and z-scores available to me.

"estimated economies due to synergy" (Roll 1986, 199), and these estimates can ultimately lead to valuation error and takeover premiums. The problem of information asymmetry, however, should be significantly less prominent for the internal investment decisions studied in this paper, so the prevalence of inefficient cross-subsidizations is particularly striking here.

The remainder of this paper is as follows. I begin by summarizing the antecedents of divestiture from prior literature and then introduce a theoretical background of exit delay. Next, I describe my sample and empirical approach, before presenting the main results. I conclude in the final section.

PRIOR LITERATURE

Divestitures include the spin-offs, carve-outs, sell-offs, and shuttering of individual business units by conglomerate firms. Regardless of their size and scope, divestitures constitute "a crucial element in the continuum of governance modes" for all firms (Lee and Madhavan 2010, 1345). Yet, as described above, firms repeatedly delay exit. To understand the potential drivers of the seemingly-inefficient exit delay documented in the academic and practitioner literature, I build on Porter (1976) to classify the antecedents of divestiture within three theoretical constructs: structural-economic; managerial-agency; and strategic. These antecedents form the basis for the examination of delayed exit, and I will now review each in turn.

Structural-economic

Structural-economic factors comprise the economic characteristics of an industry or macroeconomic environment that may compel a conglomerate to delay exit, even when the business unit is earning a rate of return below its cost of capital. Two prominent factors in the divestiture literature are environmental uncertainty and technological change. Damaraju, Barney, and Makhija (2011) consider the decision to divest from the perspective of real options theory (Tong and Reuer 2007) and hypothesize that environmental uncertainty increases the value of real options for divestiture. In this case, it may be optimal to retain a business unit when the current value of that unit is unknown (Li et al. 2007). Under conditions of high uncertainty, they find supporting empirical evidence that firms are more likely to delay exit. On the other hand, Bergh and Lawless (1998) hypothesize that firms may be more likely to divest under conditions of environmental uncertainty because they are unable to effectively manage their diverse business units. Using a measure of uncertainty based on the volatility of industry sales, they conclude that divestitures are sensitive to environmental uncertainty for the highly diversified firms in their sample. Similarly, Chatterjee, Harrison, and Bergh (2003) and Bergh (1998) find that environmental uncertainty spurs divestment activity, which in turn affects firm performance. Technological change can also influence divestment decisions. If firms fail to keep pace with either operating efficiencies or innovative developments, they may face higher rates of obsolescence, and thus be forced to exit sooner, when technological change is high (Harrigan 1982; Jovanovic and MacDonald 1994).[34] This effect is not always consistent, though, because high technological change in the form of environmental turbulence can enhance firm competence and result in a decision to delay exit (Tushman and Anderson 1986).

[34] Other industry-specific antecedents of divestiture, such as industry concentration and growth, business lifecycle and competitive intensity, come from the fields of industrial economics and organizational ecology (e.g., Ilmakunnas and Topi 1999). Brauer (2006) summarizes these factors and concludes that they are considered less important for divestment research today.

Managerial-agency

Managerial-agency factors are characterized by principal-agent theory, where delayed exit may be exacerbated by ineffective corporate governance and misaligned managerial incentives. According to an agency theory of investment, managers have incentives to diversify because growth increases their power (Jensen 1986). Effective corporate governance, then, is necessary to limit managerial malfeasance by aligning incentives between the internal and external capital markets (Walsh and Seward 1990). To be sure, weak internal governance is often blamed for overdiversification in the first place (e.g., Johnson, Hoskisson, and Hitt 1993; Hoskisson and Turk 1990; Hoskisson, Johnson, and Moesel 1994), where overdiversification is defined as growth beyond the optimal level for shareholders (Markides 1992). To cite one example in particular, Hoskisson and Turk (1990) find that poor corporate monitoring and inadequate compensation schemes lead to higher levels of product-market diversification.[35] Behavioral biases need also be curbed by corporate governance, lest managers delay exit either as a result of their unwillingness to admit past investment mistakes (Ravenscraft and Scherer 1987; Boot 1992) or their escalation of commitment to an underperforming business unit (Staw 1981; Ross and Staw 1993).

Strategic

Strategic antecedents of divestiture are primarily concerned with the interrelatedness of the various businesses within the conglomerate firm. According to Teece's (1982) economic

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[35] The finance literature also examines the value-reducing effects of overdiversification. Lang and Stulz (1994), for example, show that Tobin's q and diversification are negatively related, suggesting that firms are overdiversifed. Similarly, Berger and Ofek (1995) find evidence that diversified firms have values that average approximately 15% below the sum of the imputed values of the individual business units. In more recent work, Hoechle, Schmid, Walter, and Yermack (2012) conclude that this "diversification discount" is at least in part the consequence of agency problems and poor corporate governance.

theory of the multiproduct firm, managers should allocate internal capital resources toward businesses that are related functionally, technologically, or geographically, i.e., toward investment opportunities where the managers exhibit a relative advantage based on tacit yet transferable organization knowledge.

Empirically, the results are decidedly mixed. Consistent with theory, some research finds that acquisitions of unrelated business units underperform (Chatterjee 1986; Chatterjee 1992; Singh and Montgomery 1987) and are subsequently divested (Duhaime and Grant 1984; Ravenscraft and Scherer 1987).[36] Likewise, refocusing on the core business of the firm by reducing the level of unrelated diversification tends to increase market value (Markides 1992; Markides 1995). Other studies, however, find that related acquisitions do not create more value than unrelated ones (Lubatkin 1987; Seth 1990; Matsusaka 1993), and that the outperformance observed in other settings may be a function of market structure as opposed to the relatedness of the diversification (Christensen and Montgomery 1981). Issues of relatedness measurement are also important (Robins and Wiersema 2003). Another explanation for these mixed results may also be the important distinction between the concepts of relatedness (i.e., the similarity between firms) and complementarity (i.e., the valuable combination of differences between firms), in particular when considering strategic and market factors (Harrison et al. 1991; Kim and Finkelstein 2009).

The research examining relatedness and exit also finds mixed results (Ravenscraft and Scherer 1991; Kaplan and Weisbach 1992; Sharma and Kesner 1996; Chang and Singh 1999; Shimizu 2007; O'Brien and Folta 2009). In a meta-analysis, Lee and Madhavan (2010) find no statistically significant evidence that relatedness acts as a moderator between divestiture and

[36] An important component of diversification and divestiture is also the origin of the business unit in question, e.g., whether it was developed internally or acquired (Karim 2006; Karim 2009).

subsequent performance. To explain these contradictory results, Lee, Folta, and Lieberman (2012) contend that relatedness can simultaneously both enhance the chance of survival (via synergies) and increase the rate of exit (via the ability to redeploy resources). None of these studies, however, examines the role of strategic relatedness within the context of delayed exit decisions, which is an important contribution of this paper.

THEORY DEVELOPMENT

The foundation of divestiture research is naturally rooted in the economics of acquisitions and diversification. Since at least Penrose (1959), scholars have recognized that economies of scale and scope can foster sustained competitive advantage for conglomerate firms. Management seeks to fully employ its indivisible resources as a "jig-saw puzzle," where the relevant pieces include products, markets, and production technologies (Penrose 1959, 69). More formally, firms efficiently diversify via economies of scope when the joint production of two or more outputs is less than the cost of producing each separately (Panzar and Willig 1981). These unit-cost economies are only valuable for conglomerates when managers utilize proprietary knowhow (i.e., organization knowledge) across indivisible and specialized assets for production (Teece 1980). Further, it is in related lines of business where these economies of scope are likely to be maximized, in part due to the commonality of knowhow and assets across businesses (Teece 1982).[37]

An assumption underlying much of the early empirical research on divestitures is that exiting a business unit implies the management team made an investment mistake (Boot 1992). As noted in Brauer (2006), though, recent practitioner surveys indicate that senior managers

[37] Teece (1982) does point out that unrelated diversification may be valuable when the conglomerate's internal capital market can assess and select efficient investment opportunities (Williamson 1975).

consistently view divestitures as purposeful and strategic options, and as deliberate means to enhance firm value (KPMG 2002; Accenture 2003).[38] By creating more efficient uses of firm resources, and by enabling the firm to regain competitiveness, divestitures can be a critical part of strategic growth for conglomerate firms (Berry 2009). Indeed, just as divestiture can be seen as a strategic option, so too can the decision to delay divestiture. Divesting business units that possess valuable yet tacit resources, such as those found in legacy lines of business, may even impair operating performance if managers do not accurately assess the interrelatedness of the divested unit to the rest of the firm (Feldman 2011). Firms may also delay divestiture if diversification is undertaken as a process of searching for valuable matches between related resources, and the uncertainty of this experimentation takes time for management to resolve (Matsusaka 2001).

Business-unit synergies may motivate a rational decision to delay exit and can take on two different forms. In the first type of synergy, scale/scope economies result when business units share a common resource whose unit-cost decreases with scale. Accordingly, marginal cost in the primary business unit would increase following a divestiture of the related unit. An alternative form of synergy is demand complementarity, where revenues for one business will increase when revenues increase in a related unit.[39] In both cases, the decision to delay exit may ultimately be profit maximizing. By cross-subsidizing the underperforming business unit, the firm is in effect maintaining the synergistic relationship to the benefit of the firm as a whole.

[38] An academic survey of CEOs by Hamilton and Chow (1993) finds that the desire to reverse management's investment mistakes was only the 10th-ranked motive for the decision to divest. Other important motives for divestiture include the desire to focus on core business activities (2nd-ranked), the desire to shift resources to business units with higher growth opportunities (5th-ranked), and a desire to avoid the high investment needs of the divested business unit (9th-ranked).

[39] The methods based on relatedness in this paper will pick up effects from the first form (scale/scope economies) but may miss effects from the second (complementarities) if no other firms within the interrelatedness index also exhibit the exact nature of the complementarity.

Where no synergies exists, Brauer and Wiersema (2012, 1474) succinctly capture the economic importance of the efficient divestment of underperforming business units: “According to transaction costs economics and resource-based theory, divestitures can result in better resource utilization and the removal of negative synergies or diseconomies of scale and scope across the firm’s portfolio, thus leading to value creation.” The decision to delay exit, then, has significant economic implications. In this paper, I examine cases where firms delay exit from underperforming business units and investigate whether business-unit synergies provide a strategic rationale for these seemingly inefficient capital allocation decisions.

METHODOLOGY

Research setting

For the conglomerate firm, the decision to divest a business unit is conducted by top management within the context of an “internal capital market,” where business-unit managers compete for firm investment (Chandler 1962; Williamson 1970). Research in strategic management recognizes the importance of a strategic allocation process for the efficient allocation of these scarce resources (Williamson 1975; Bower 1970; Lippman and Rumelt 2003).[40] While some strategy authors in the divestment literature address this link (e.g., Hoskisson and Turk 1990; Liebeskind 2000), the bulk of empirical work on allocation efficiency at the business unit-level has been carried out in the financial economics literature (see Stein 2003 for a comprehensive review). The overwhelming conclusion from this research is that firms do not allocate capital efficiently (e.g., Lamont 1997; Shin and Stulz 1998; Rajan, Servaes, and Zingales 2000; Billett and Mauer 2003; Gopalan, Nanda, and Seru 2007; Ozbas and Scharfstein

[40] Chandler (1962, 16) defines strategy in terms of the resource allocation process: “Strategy can be defined as the determination of the basic long-term goals” of the firm, as well as “the allocation of resources necessary for carrying out these goals.”

2010). By connecting these two literatures explicitly, the research setting in this paper allows me to investigate the capital allocation decisions for each business unit at a micro-level. Within the internal capital market of the firm, I am able to examine when managers choose to cross-subsidize underperforming business units, i.e., the actual decisions that result in delayed exit.

Sample and data

The sample includes all publicly-traded firms in the Compustat Segment database from 1979 to 2009. Following prior literature (e.g., Rajan, Servaes, and Zingales 2000; Billett and Mauer 2003) and the approach developed in Vieregger (2012), each unit is categorized along two dimensions: profitability (ROA) and investment opportunities (Tobin's Q). If the ROA (Tobin's Q) is higher than the asset-weighted average ROA (Tobin's Q) for the rest of the firm (i.e., all business units not including the focal unit), the unit is classified as having high performance (high investment opportunities). Likewise, a business unit has low performance (investment opportunities) when its ROA (Tobin's Q) is lower than the asset-weighted ROA (Tobin's Q) of the rest of the firm. To identify the relatively worst performing business units for use in this paper, I focus on the subsample of units that simultaneously have a lower ROA and a lower Tobin's Q than the rest of the firm.

Next, I identify whether the business unit is being cross-subsidized by the firm's internal capital market. By directly examining the cash flows and capital expenditures at the business-unit level, a business unit is being cross-subsidized when its capital expenditures exceed the amount of its internally generated cash flow. These business units require additional cash flow from the firm's internal capital market to fund their investment needs. Because business units with simultaneously low ROA and low Tobin's Q are the relatively worst performing in the firm, they do not represent a compelling source for profitable investments. As such, providing cash flow subsidies to these segments is considered inefficient, and a repeated pattern of cross-subsidization implies a management decision to delay exit.[41]

For a business unit to be included in the final sample for this paper, I require it to be both underperforming and cross-subsidized for at least two consecutive years. Firms may engage in diversification as a search process that requires experimentation (i.e., entering new lines of business and observing the results) to resolve uncertainty (Matsusaka 2001). This experimentation may take the form of cross-subsidizing an underperforming business unit in the short-run, because management needs time to assess the value of its investment decision. By repeatedly deciding to cross-subsidize that unit, however, I assume that management is no longer "searching," but is instead investing in the underperforming business unit for other reasons, either rational or not. Figure 1 depicts the timeline of data events for the sample, resulting in 11,128 business unit-year observations.

Table 1 characterizes the level of investment and divestiture behavior of the full sample.[42] As indicated above, each business unit is categorized based on its ROA and Tobin's Q, in addition to whether it is being cross-subsidized. The transition matrix here presents the probabilities that any one investment type will transition from one state to another, from one year to the next, where the rows indicate the number and percentage for each type of transition. As can be seen along the diagonal of the matrix, the most likely outcome for any investment type is to perpetuate it. This effect is most-pronounced for cross-subsidizing the worst underperforming

[41] It is important to emphasize that all investments in these relatively worst performing business units are not necessarily considered inefficient. As long as they do not require cross-subsidizations, these business units, while underperforming, are still generating net positive cash flow for the rest of the firm. These investment decisions are thus considered efficient.

[42] The full sample from 1979 to 2009, before sorting based on the relative ROA and Tobin's Q, is comprised of 89,468 business unit-year observations, where 25,498 (28.8%) are both underperforming and cross-subsidized for at least one year during the sample period.

(LQ-LR Sub = 47.7%) and not subsidizing the best overperforming (HQ-HR = 51.8%) categories; the probability that other investment types persist is between 19.9% and 35.2%. Nearly half of the time, a firm that cross-subsidizes an underperforming business unit will repeat that investment during the next year.[43] By itself, the fact that investments in the worst underperforming units are as likely to persist as investments in much better performing ones (and more likely than all others) is compelling. It is precisely these investments that I examine in the remaining empirics.

Estimation approach

I implement a competing hazards model to estimate the instantaneous probability of exit, given that either (*i*) no exit has occurred or that (*ii*) the firm has not decided to re-allocate its capital resources.[44] Traditional hazard analysis, as used in prior literature, would only estimate the probability of exit under the (false) assumption that firms do not change their allocation decisions from one period to the next. Within the context of an internal capital market, however, a firm can decide to reduce its investment in an underperforming business unit, such that the business unit is no longer being cross-subsidized.[45] In this case, it is no longer as critical for the firm to consider exiting the unit, even if the unit continues to be underperforming, because it is now generating net positive cash flows. While the traditional hazard model would conflate both exiting and re-allocating as the same event, a competing hazards model can capture the alternative event of re-allocating resources away from the underperforming business unit.

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[43] It is also interesting to note that the probability of exiting the worst underperforming investments is not significantly higher than exiting any other, better-performing investment; the probability of exit for all units, regardless of performance or investment opportunities, is approximately between 21% and 23%.
[44] In STATA, competing hazards analysis is carried out with the -stcrreg- command. As of version 11.1, the command did not offer an option to fit the model in the accelerated failure-time (AFT) method.
[45] The performance of the business unit could also improve.

Formally, the model estimates the competing hazard rates of whether the firm exits the business unit or efficiently alters its investment decision via the re-allocation of capital. The instantaneous transition rate is defined as:

$$r_k(t) = \lim_{\Delta \to 0} \frac{\Pr(t \leq T < (t+\Delta t), D=k | T \geq t}{\Delta t},$$

where *k* refers to either exit or re-allocation as outcomes in *D*. The decision to exit is the focal event; re-allocation is the competing event. The probability *Pr* describes the likelihood of experiencing one of the mutually exclusive outcomes during the time interval from *t* to ($t + \Delta t$), conditional on still being at risk, where *T* is the total time at risk. Similar to standard survival analysis, each transition rate is specified using the Cox proportional hazard model:

$$r_k(t) = r_0(t)\exp(\beta \mathbf{X}),$$

where X is my vector of covariates, which are described in detail in the next section. To interpret the results, a positive (negative) coefficient on the estimated parameter *β* means that the variable of interest leads to a faster (slower) occurrence of the focal event, which in this case is exit. If relatedness is a strategic rationale for delayed exit, I would expect to find a negative coefficient on my proxy for synergy, i.e., where higher relatedness delays exit.

Variables

To test the proposition that firms may have a strategic rationale for delaying exit, I make use of the Bryce and Winter (2009) interindustry relatedness index to develop my proxy for strategic relatedness.[46] The index provides a percentile relatedness rank for every possible dyad

[46] In their original research, Bryce and Winter (2009) demonstrate the construct validity of their interindustry relatedness index for manufacturing firms; I find consistent results in this paper using both their full sample and a manufacturing sample.

of business units based on 4-digit SIC industries, calculated as the likelihood distance between two different units. To construct my measure of strategic relatedness, I compare the dyad score of the underperforming business unit against each of the other business units within the firm, and I record the highest dyad score for the unit. This measure captures the maximum level of unit-to-unit relatedness for that firm's underperforming business unit, which I then use as my proxy for synergy between units. The key advantage of this measure is that it is based on the *strategic* relatedness of business units (Markides and Williamson 1994).[47]

To control for other potential drivers of (and barriers to) divestiture, I include measures for the structural-economic and managerial-agency antecedents, as discussed in the theory section above. For structural-economic factors, I follow Bergh and Lawless (1998) and Bergh (1998) in constructing a proxy for environmental uncertainty, measured as the 5-year volatility of industry-wide sales for each firm (Snyder and Glueck 1982). To control for technological change related to process efficiency improvements, I follow Harrigan (1982) in calculating a technological scale effect as the ratio of gross PP&E to the number of employees. Firms that cannot match increases in scale will face unit-cost disadvantages and be expected to divest their underperforming business units sooner. To capture the role of innovative technological changes, I also control for industry-adjusted R&D intensity, measured as R&D over sales less the corresponding 2-digit SIC mean.

Managerial-agency variables for the monitoring and control of managers imply that weaker governance structures result in greater agency problems (e.g., Core, Holthausen, and Larcker 1999). These control variables include board size, where a larger board is considered less effective (Jensen and Yermack 1996); the proportion of independent directors as a proxy for

[47] In a robustness check on the measure of relatedness, discussed in the results section, I also examine the relationship between the business unit and the core business of the firm as a whole. The results from these tests are inconsistent, providing further support for the use of Bryce and Winter's (2009) strategic measure of relatedness.

board independence (e.g., Rosenstein and Wyatt 1990; Byrd and Hickman 1992; Yermack 1996; Pfeffer 1989); and the separation of Board Chairman and CEO to measure the level of CEO influence on the board. Managerial-agency variables for the incentive alignment between managers and shareholders also aim to decrease agency effects. These control variables include the percentage of long-term compensation for the CEO (e.g., Anderson, Bates, Bizzok, and Lemmon 2000) and CEO tenure, which can either proxy for CEO entrenchment or the likelihood that a new CEO will exit the underperforming businesses previously favored by a predecessor.

I also include financial control variables for the return on assets (ROA) of both the business unit and firm, because prior research has shown that each is an important antecedent of divestiture (Dranikoff et al. 2002; Duhaime and Grant 1984; Harrigan 1981; 1982; Markides 1992; Montgomery and Thomas 1988; Pashley and Philippatos 1990; Chang 1996; Duhaime and Grant 1984; Hamilton and Chow 1993; Hitt, Hoskisson, Johnson, and Moesel 1996; Hoskisson and Johnson 1992). The control variables are developed from various databases, including ExecuComp (1992-2009), the RiskMetrics Directors File (1996-2006), and Thompson Financial/CDA Specturum. Once all controls are included, the subsample from 1996 to 2006 includes a total of 629 unique business units, with 272 exit events and 175 re-allocation events.[48] The large number of re-allocation events provides further support for the importance of using a competing hazards model in this analysis. Because these subjects are considered over time, these units combine for 1,344 business unit-years at risk. Table 2 lists the univariate statistics and correlations of the variables.

[48] The remaining 182 subjects are right-censored.

RESULTS

When all controls are included in Model 3 of Table 3, the coefficient on the maximum relatedness variable of BWI Max Relatedness is –1.181, and it is highly significant. Because the dependent variable is probability of exit, the interpretation of the result is that the likelihood of exiting the underperforming business unit decreases as its maximum relatedness to other business units increases. Greater relatedness between business units leads to more, repeated cross-subsidizing of underperforming business units. An increase of one standard deviation in the level of relatedness decreases the likelihood of exiting that business unit in the next period by 7.5%. The coefficients for the structural-economic and managerial-agency antecedents are generally insignificant but still consistent with expectations of divestiture theory. Firm-level ROA and business unit-level ROA are both negative and significant as expected; firms delay exit as performance increases. Introducing controls for divestiture antecedents limits the sample period to years 1996-2006, so Model 4 estimates the BWI Max Relatedness measure without controls for the years 1980-2009. The relatedness coefficient is smaller but still negative and highly significant.

Are these investments efficient?

The very premise of this analysis is that repeatedly cross-subsidizing the firm's worst underperforming business units is an inefficient investment decision. However, given that these investments appear to be supported by a strategic rationale related to business unit synergy, it is possible that classifying the investment decision as inefficient would be a mistake. By cross-subsidizing the underperforming business unit, firms may in fact be contributing synergies to other business units, either by lowering the scale economies of shared resources or by increasing demand complementarities. In this case, making repeated cross-subsidizing investments would not be a case of delayed exit but would instead be profit maximizing.

To examine the overall effectiveness of these investment decisions, I extend the analysis in Vieregger (2012) by establishing a counterfactual investment efficiency schema. In the original schema, each business unit within the conglomerate firm is categorized as either efficient or inefficient, based on its current performance (ROA) and growth opportunities (Tobin's Q), as well as whether it is being cross-subsidized (i.e., its capital expenditures exceed its internally generated cash flow) via the internal capital market of the firm. As described above in the Sample section, a business unit has either high or low performance and high or low growth opportunities, relative to whether its ROA or Tobin's Q is higher or lower than the weighted-asset average of the rest of the firm. Subsidizing business units is inefficient when they have high ROA-high Q, high ROA-low Q, and low ROA-low Q (as in the sample of this paper). Under the counterfactual schema, I instead assume that cross-subsidization is actually an *efficient* allocation of capital resources when the low ROA-low Q business unit is *highly* related to another within the firm (see Figure 2). In the results reported here, highly related is defined as a Max Relatedness BWI score that is greater than the median.[49] The remainder of the new schema follows Vieregger (2012) in every other way, such that I am isolating the decision to cross-subsidize these relatively worst performing business units.

Next, I follow Rajan et al. (2000) to calculate the firm's value-added from capital allocation in each year, which captures the overall efficiency of the internal capital market:

$$\text{Value Added} = \frac{\left|\left(ROA_{i,t} - ROA_{-i,t}\right) * Amount_{i,t}\right|}{\sum_{i=1}^{n} TotalAssets_{i,t}}$$

[49] Robustness checks not tabulated here show that increasing or decreasing the cut-off criterion for highly related does not affect the tenor of the results.

For each business unit, the value-added measure calculates the amount ($Amount_{i,t}$) of the cross-subsidy or transfer (i.e., the amount that cash flow exceeds capital expenditures), weighted by the relative ROA of the focal unit ($ROA_{i,t} – ROA_{-i,t}$) and scaled by firm total assets ($TotalAssets_{i,t}$).[50] Finally, the firm-level measure is the sum of all business-unit measures, where the value-added of inefficient business units is multiplied by negative one (–1), because these managerial decisions are not value enhancing. I calculate the value-added for each firm in each year, both for the original schema in Vieregger (2012) and the counterfactual schema based on efficient synergistic investments in this paper. The two measures will thus only vary when the firm makes a cross-subsidizing investment in a highly related business unit.

Model 1 in Table 3 matches the results first reported in Vieregger (2012), where the firm-level measure of value-added is positively and significantly associated with market value.[51] Firms that follow the original schema appear to be enhancing firm value. If, on the other hand, firms are enhancing value by cross-subsidizing their underperforming but related business units, I would expect the coefficient in Model 2 of Table 3 to be significantly greater than that from the original schema. Instead, Model 2 shows that the coefficient on the value-added measure from the counterfactual schema is smaller (0.014) and no longer significantly associated with market value. These results suggest that, while firms may indeed be following a strategic rationale when making these cross-subsidizing investment decisions, the decisions themselves do not appear to enhance firm performance. Cross-subsidizing these underperforming business units via an internal capital market is in fact inefficient.

[50] Weighting by ROA controls for the economic magnitude of the cross-subsidy or transfer.
[51] Robustness checks show that value-added is also strongly associated with other measures of performance, such as ROA and Tobin's Q.

What is driving these inefficient investments?

Additional analysis suggests that the inefficient pattern of cross-subsidizations observed in this paper reflects an escalation of managerial commitment to the underperforming business unit (Staw 1976; Staw and Ross 1978). Recall that business unit-observations enter the sample of delayed exit when a firm makes two consecutive cross-subsidizing investments in one of its relatively worst underperforming units. To test the likelihood of entering into this sample, I create a binary variable that captures whether a firm decides to initiate the cross-subsidization of an underperforming business unit. The variable is set equal to one (1) if the business unit is underperforming and the firm initially decides to cross-subsidize it; if the firm decides to not cross-subsidize an underperforming business unit, the binary variable is set equal to zero (0). Using this binary variable of the decision to initiate cross-subsidization as the dependent variable, Table 5 shows the probit analysis including all controls for the 1996-2006 sample, matching the competing hazards model above. The coefficient on BWI Max Relatedness is not significantly different from zero, suggesting that relatedness does not influence the firm's likelihood of entering into a cross-subsidizing and underperforming investment.[52] The only significant coefficient is on the ROA of the business unit, which is highly negative as expected; the lower the ROA of the unit, the less likely is the firm to subsidize it.

These results are interesting because my proxy for synergy appears to play an asymmetrical role in the investment decision. Faced with the decision of whether to cross-subsidize an underperforming business unit, the firm is not motivated by the relatedness of the unit in *initiating* the investment (i.e., making it for the first time); however, given that a cross-subsidizing investment has been made for two consecutive years (as in the main result above),

[52] If I eliminate the control variables to expand the sample size (not tabulated), the coefficient on BWI Max Relatedness becomes significantly negative, suggesting that increased synergy may actually decrease the likelihood of initiating an inefficient investment decision.

relatedness plays a highly significant role in *continuing* that investment. Once the firm has committed to the cross-subsidization of an underperforming business unit, it will escalate that inefficient investment for an average of another 5.6 years.

Further evidence suggesting an escalation of commitment to the underperforming business unit comes from the variable for CEO tenure, which is the only significant control in the original model from Table 3. A one standard deviation increase in the tenure of the CEO decreases the likelihood of exiting the underperforming business unit in the next period by almost 14%. In other words, newer CEOs are significantly more likely to exit underperforming businesses, suggesting that they are immune to any commitment that was previously driving the continuation of the inefficient investment.

To further test the role of CEO tenure in influencing an escalation of commitment, I use the Wilcoxon test to compare the survival functions of new CEOs against CEOs with longer tenure. The Wilcoxon test is a nonparametric rank test similar to the log-rank test, which tabulates the expected number of exits for each group and compares them against the observed number of exits.[53] If new CEOs are more likely to exit underperforming business units, the Wilcoxon test should reject the null hypothesis that the survivor functions of the new CEOs is the same as that of longer-tenured CEOs. The results are consistent with these expectations. Whether CEOs are identified as "new" during their first year (Pr>chi2 = 0.0568) or during their first two years (Pr>chi2 = 0.0028), both tests demonstrate significantly different hazard functions across new and not-new CEOs. In other words, newer CEOs do not demonstrate a commitment to continue inefficient investments in underperforming business units.

[53] The Wilcoxon test is constructed in the same way as the log-rank test, but I do not expect the hazard functions to vary proportionally over time, i.e., more firms will exit at earlier analysis times. The Wilcoxon test also assumes that the censoring patterns do not differ among the test groups. I achieve consistent results using both tests.

Robustness checks on relatedness

As a robustness check on the validity of the proxy for synergy employed for the main results of this paper, I follow prior convention in examining the relationship between the business unit's industry and the core industry of the firm. I classify a business units as "core" if its segment SIC industry is the same as that of the primary SIC industry for the firm as a whole; I create three separate binary variables (one each for the 2-digit, 3-digit and 4-digit SIC industries) where the variable is equal to one (1) if the business unit shares the same SIC industry as the firm. If these SIC-based indicators are valid, I would expect the survivor functions of the core business units to vary significantly from those of the non-core units; similar to the results from the relatedness variable developed in this paper, I would expect firms to cross-subsidize the core business units longer than the non-core.

I formally test the equality of the survival function for the core versus non-core business units by using the Wilcoxon test, described above. If the SIC-based indicators for core business units are valid, the Wilcoxon test should reject the null hypothesis that the survivor functions of the core group is the same as the non-core group. However, the chi-squared from each of the three different SIC equality tests provides inconsistent results. Only the 2-digit SIC industry demonstrates significantly different hazard functions across core and non-core (Pr>chi2 = 0.0003), while the tests for 3-digit (Pr>chi2 = 0.4930) and 4-digit (Pr>chi2 = 0.7863) are insignificant. These inconsistent results suggest that, only when core is broadly defined at the 2-digit SIC industry, does it influence the cross-subsidization of underperforming business units. Finally, I also test the BWI Max Relatedness measure by comparing the survivor functions of units with high relatedness against those with low relatedness, based on median scores. Consistent with the conclusions in this paper, the chi-squared results indicate that the survival function for highly related business units is significantly different from that of lowly related ones (Pr>chi2 = 0.0000).

In further checks (not tabulated here), I calculate the entropy measure of diversification, developed by Jacquemin and Berry (1979) and Palepu (1985), and re-estimate the competing hazards model. I substitute the BWI Max Reldatedness variable with the three separate measures of entropy, total diversification (DT), related diversification (DR), and unrelated diversification (UR). While these measures are calculated at the level of the firm, and as such are not perfect substitutes for a business unit-level of synergy, they still represent traditional means to evaluate the diversification strategy of conglomerates. In my tests, none of the entropy coefficients are significant, but their signs were in expected directions. DT and DR were negative and insignificant, while DU was positive and insignificant; as the related diversification strategy of the firm increases, I would expect its likelihood of delayed exit to increase as well.

The insignificance of the entropy signs, as well as the inconsistent results from the SIC-based hazard ratios for core/non-core business units, provide additional support for the proxy of synergy developed in this paper. The use of strategic measures of relatedness, such as one developed from the Bryce and Winter (2009) index, is critical when examining the strategic decision to delay exit.

CONCLUSION

Inefficient subsidies of underperforming business units represent the second-most persistent type of investment in firms, where the rate of persistence (48%) is nearly as high as that for efficient transfers from the high performing units (52%). This paper examines why firms are making such inefficient investments. I find first that a dominant rationale appears to be the relatedness between business units. The main results from my proxy of business unit synergy indicate that the likelihood of exiting an underperforming business unit decreases as its maximum relatedness to other business units within the firm increases. One conclusion is that firms may believe that exiting these business units would result in increasing scale economies or decreasing complementarities, thus reducing market value. To examine whether firms may in fact be acting optimally by subsidizing these underperforming business units, I examine the impact on market value. The results for a counterfactual analysis, where these cross-subsidizing investments in highly related business units are considered efficient, does not find support for the idea that firms are creating value. Indeed, these subsidizing investments do appear to be inefficient.

This logic resembles Roll's (1986) hubris hypothesis, where firms are overestimating the value of synergy in the mergers and acquisition (M&A) process. In the case of M&A activity, the hubris result is not necessarily surprising because a significant amount of information asymmetry can exist between the bidder and the target, leading to valuation errors. Within the internal capital market of a conglomerate firm, however, the result is indeed surprising. The firm should have access to detailed and accurate information on its business units and resources. They also have operating results. Additional tests on the decision to initiate a cross-subsidizing investment suggest that escalation of commitment may be driving these repeated, inefficient investment decisions.

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Figure 1: Timeline of Data Events for the Sample

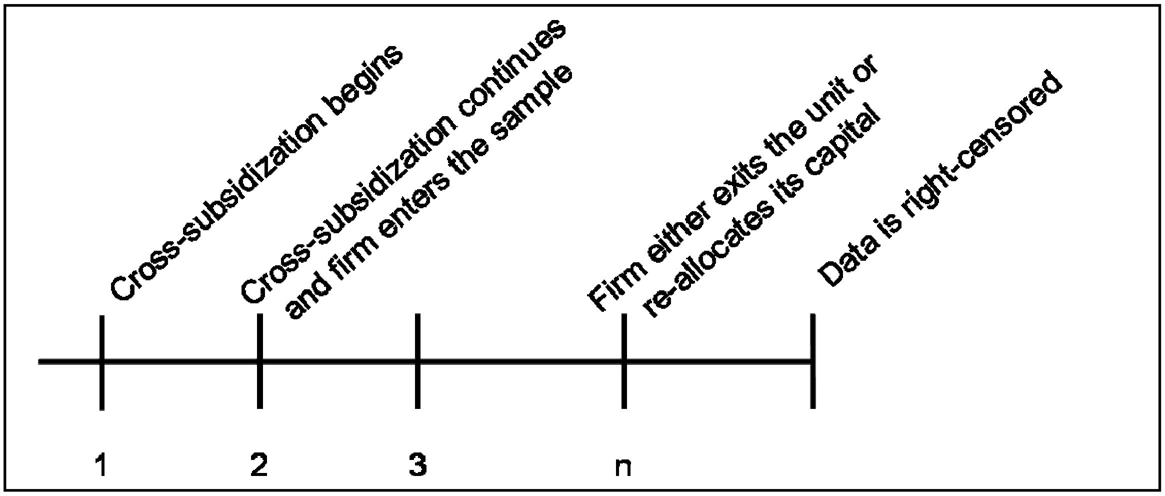

Figure 2: Original and Counterfactual Schema for Underperforming Business Units

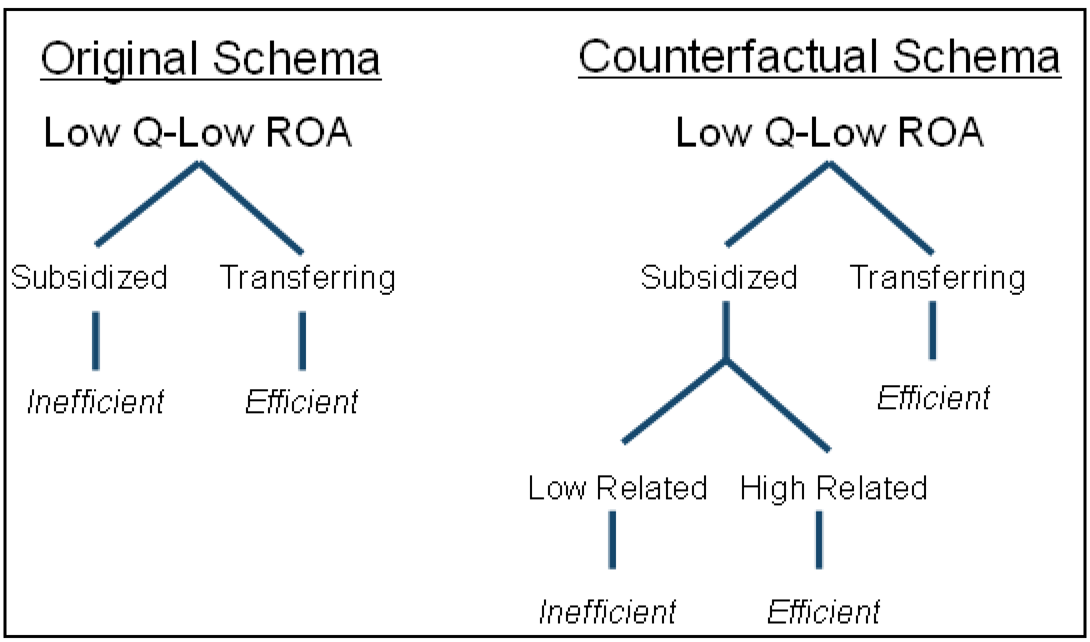

Table 1: Transition Probability Matrix from Year *n* to Year *n*+1

		Year n+1									
		Exit	LQ-LR Sub (Inefficient)	LQ-HR Sub (Inefficient)	HQ-HR Sub (Inefficient)	HQ-LR Sub (Efficient)	LQ-LR Trans (Efficient)	LQ-HR Trans (Efficient)	HQ-HR Trans (Efficient)	HQ-LR Trans (Inefficient)	Total
	LQ-LR Sub	**5,425**	**11,128**	687	889	2,308	1,111	501	919	360	23,328
	(Inefficient)	**23.3**	**47.7**	2.9	3.8	9.9	4.8	2.2	3.9	1.5	100.0
	LQ-HR Sub	**908**	775	**818**	672	224	71	293	334	18	4,113
	(Inefficient)	**22.1**	18.8	**19.9**	16.3	5.5	1.7	7.1	8.1	0.4	100.0
	HQ-HR Sub	**2,186**	1,013	699	**3,732**	1,090	73	243	1,487	75	10,598
	(Inefficient)	**20.6**	9.6	6.6	**35.2**	10.3	0.7	2.3	14.0	0.7	100.0
	HQ-LR Sub	**2,623**	2,436	228	926	**3,521**	214	142	688	382	11,160
	(Efficient)	**23.5**	21.8	2.0	8.3	**31.6**	1.9	1.3	6.2	3.4	100.0
Year n	LQ-LR Trans	**1,244**	941	53	69	192	**1,858**	527	619	436	5,939
	(Efficient)	**21.0**	15.8	0.9	1.2	3.2	**31.3**	8.9	10.4	7.3	100.0
	LQ-HR Trans	**1,433**	516	355	274	155	410	**1,896**	1,743	122	6,904
	(Efficient)	**20.8**	7.5	5.1	4.0	2.3	5.9	**27.5**	25.3	1.8	100.0
	HQ-HR Trans	**4,892**	872	383	1,674	705	552	1,690	**12,180**	565	23,513
	(Efficient)	**20.8**	3.7	1.6	7.1	3.0	2.4	7.2	**51.8**	2.4	100.0
	HQ-LR Trans	**725**	312	33	69	328	455	137	632	**785**	3,476
	(Inefficient)	**20.9**	9.0	1.0	2.0	9.4	13.1	3.9	18.2	**22.6**	100.0
	Total	**19,436**	17,993	3,256	8,305	8,523	4,744	5,429	18,602	2,743	**89,031**
		21.8	20.2	3.7	9.3	9.6	5.3	6.1	20.9	3.1	**100.0**

The transition matrix presents the probabilities that any one investment type will transition from one state to another, from one year to the next, where the rows indicate the number and percentage for each type of transition. Business units are categorized based on their performance (ROA) and investment opportunities (Tobin's Q) relative the asset-weighted amounts for the rest of the firm as a whole: L = low; H = high; Q = Tobin's Q; R = ROA; Sub = Cross-subsidizing investment (where capital expenditure exceeds cash flow); Trans = Transferring (where cash flow exceeds capital expenditure).

Table 2: Data Summary and Correlations

		Obs	Mean	SD	Min	Max		1	2	3	4	5	6	7	8	9	10
1	Unit ROA (%)	1344	0.011	0.188	-3.310	0.462		1.000									
2	Firm ROA (%)	1344	0.104	0.087	-0.352	0.866		0.151	1.000								
3	Independent Directors (%)	1344	0.681	0.164	0.000	0.933		0.030	0.047	1.000							
4	No. of Directors (log)	1344	2.294	0.234	1.386	3.219		0.103	-0.005	-0.006	1.000						
5	CEO is Chairman	1344	0.206	0.405	0.000	1.000		-0.141	-0.015	-0.120	-0.138	1.000					
6	CEO Tenure (log)	1344	8.266	0.675	4.277	9.978		-0.001	0.030	-0.211	-0.107	-0.152	1.000				
7	CEO Long-term Incentives (%)	1344	0.372	0.288	0.000	1.000		0.051	0.197	0.160	0.085	-0.115	-0.119	1.000			
8	R&D Intensity	1344	0.005	0.023	-0.268	0.073		0.033	-0.031	-0.027	-0.009	-0.077	0.029	-0.057	1.000		
9	Technological Scale (log)	1344	5.075	1.276	1.210	8.839		-0.002	-0.102	0.054	0.189	0.004	0.005	0.025	-0.033	1.000	
10	Max Relatedness	1344	0.146	0.054	-1.284	0.182		0.043	-0.020	0.025	0.053	-0.034	-0.016	0.036	-0.002	-0.037	1.000

Table 3: Competing Hazards Regression Analysis

	[1]	[2]	[3]	[4]
Focal Event:	Exit	Exit	Exit	Exit
Competing Event	Re-allocation	Re-allocation	Re-allocation	Re-allocation
BWI Max Relatedness (Synergy)		-1.058***	-1.129***	-0.933***
		(0.252)	(0.383)	(0.237)
Structural-Economic Controls				
Environmental Uncertainty	-0.359		-0.400	
	(0.435)		(0.441)	
Technological Scale	0.045		0.045	
	(0.055)		(0.055)	
Industry-Adusted R&D Intensity	-2.672		-2.819	
	(2.317)		(2.341)	
Managerial-Agency Controls				
Board Size	0.094		0.093	
	(0.292)		(0.290)	
Independent Directors	-0.178		-0.131	
	(0.370)		(0.375)	
CEO is Board Chairman	0.031		0.011	
	(0.162)		(0.164)	
CEO Long-term Compensation	0.236		0.233	
	(0.239)		(0.239)	
CEO Tenure	-0.174**		-0.171*	
	(0.087)		(0.087)	
Firm-level ROA	-1.034		-1.072	
	(0.719)		(0.724)	
Business Unit-Level ROA	-0.949***		-0.937***	
	(0.179)		(0.179)	
Calendar-Year Dummies	Yes	Yes	Yes	Yes
No. of Subjects	629	629	629	4716
No. of Exit Events	272	272	272	2781
No. of Competing Events (Re-allocation)	175	175	175	1316
No. Censored	182	182	182	619
Observations	1344	1344	1344	15233
Time-at-Risk	1344	1344	1344	15233
Log Pseudolikelihood	-1309.23	-1321.29	-1308.13	-21270.62
Wald chi2	134.43	97.49	142.66	685.63
Prob > chi2	0.0000	0.0000	0.0000	0.0000

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Comparison Between Original and Counterfactual Schemas

Dependent Variable = Log of Firm Market Value

	Original Schema [1]	Revised Schema [2]
Value-Added	0.278**	0.014
	(0.128)	(0.057)
Controls	Yes	Yes
Year Dummies	Yes	Yes
Firm Fixed-Effects	Yes	Yes
Constant	2.141***	2.146***
	(0.198)	(0.198)
N	30209	30209
R^2	0.436	0.435

Standard errors in parentheses are clustered at the firm level

* p<0.10 ** p<0.05 *** p<0.01

Table 5: Probit Analysis

Dependent Variable = Initiating Investment	
BWI Max Relatedness (Synergy)	-0.368
	(0.556)
Structural-Economic Controls	
Environmental Uncertainty	-0.377
	(0.253)
Technological Scale	0.034
	(0.034)
Industry-Adusted R&D Intensity	2.023
	(1.469)
Managerial-Agency Controls	
Board Size	-0.118
	(0.163)
Independent Directors	-0.096
	(0.274)
CEO is Board Chairman	-0.049
	(0.102)
CEO Long-term Compensation	0.070
	(0.148)
CEO Tenure	-0.039
	(0.064)
Firm-level ROA	1.452
	(1.120)
Business Unit-Level ROA	-4.277***
	(1.060)
Constant	1.419**
	(0.719)
Observations	1339
Pseudo R2	0.0646

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Managerial Foresight and Corporate Investment

Abstract
Managers generate value through the implementation of unique strategies. We argue that managers exhibit foresight when they make unique investment decisions today that deliver above-normal returns in the future. The main objectives of this paper are to define a theory of managerial foresight and to introduce a new measure that captures foresight. We also highlight the characteristics of managers and firms that appear to exhibit foresight.

"We're happy to be once again a large owner of a business with both *unique assets* and *outstanding management*." — Warren Buffett, 1995 Letter to Shareholders

foresight (n): the ability to predict what will happen in the future; prescience

1. Introduction

Managers generate value through the implementation of unique strategies (Litov, Moreton, and Zenger 2012). Whether via the acquisition of new businesses, the construction of new plants, or the research and development of new drugs, all strategies that require the investment of capital resources are carried out within strategic factor markets (Barney 1986). These markets are necessarily imperfect, because managers faced with uncertainty and ambiguity will develop varying expectations about the future value of particular strategies (Demsetz 1973; Lippman and Rumelt 1982; Barney 1986; Amit and Schoemaker 1993). Indeed, some managers will exhibit foresight—the ability to make unique investments today that deliver above-normal returns in the future—by exploiting the imperfections in strategic factor markets. Leaving aside luck as an explanation, this foresight is primarily driven by the proprietary insights that managers possess about the firm's accumulation of strategic capabilities and assets (Dierickx and Cool 1989), which can ultimately lead to the establishment of competitive advantages for the firm (Barney 1991; Ahuja, Coff, and Lee 2005; Kunc and Morecroft 2010). This paper outlines a theory of managerial foresight and introduces a new measure to identify managers who exhibit this foresight.[54] We contend that foresight leads to unique investment decisions, i.e., investments that

[54] Ahuja et al. (2005, 793) have called for more research into the theory and empirics of managerial foresight: "Accordingly, the question of how much foresight managers actually have seems to be fairly important for the strategic management literature."

are not immediately recognized by the firm's competitors or the external capital market in general. It is these unique strategies that can generate above-normal returns.

2. Setting

The setting for our investigation of managerial foresight is the capital investment decisions of firms. A large and significant literature on the association between corporate investment and internal cash flow concludes that firms typically overinvest and may destroy value by doing so (see Stein 2003 for a review in the financial economics literature). Conversely, some firms exhibit what in retrospect appears to be foresight in their investment decisions. For example, Costco Wholesale Corp. made large investments in growth and expansion during the mid-1990s, investments that set the foundation of its profitable trajectory even through today. Other firms that made seemingly-large investment decisions during the mid-1990s include Circuit City Stores Inc., Target Corp., and Lowe's Companies Inc.—all of which enjoyed stock market appreciation during the period. Appendix A provides a short analysis of managerial foresight in the retail industry starting in 1996.

In order to study managerial foresight, we need to provide a definition: managers with foresight make unique investment decisions today that deliver above-normal returns in the future. We operationalize uniqueness by examining the levels of investment which deviate from the expectations of the external capital market. The investigation of investment levels is important because the market often penalizes firms when they invest either too much (e.g., by overexpanding) or too little (e.g., by holding large cash reserves). An example of the former case comes from Amazon, which is constantly reinvesting significant sums of its retained earnings. Even after its Q3 2011 results were reported in line with market expectations, the company's stock was pounded after executives announced they would be investing more to support the long-term growth prospects of the company.[55] An example of the latter case is Apple. Management at Apple is often criticized (and is currently being sued) for not returning more of its cash hoard to investors.[56] Because of this penalty for underinvesting and overinvesting, firms should only pursue investment levels that deviate from market expectations when they have a compelling strategic rationale for doing so.

Our definition of managerial foresight thus requires a theory of market expectations. Conceptually, we define underinvestment as investing less than an expected level, while overinvestment is investing more. Empirically, we employ residual analysis to measure investment deviation as a function of the market's expectations of investment, derived from three components: the firm's current investment level; its market-to-book ratio; and a market-based prediction of investment, which is derived from industry regression analyses. Other approaches to measure deviation include examining the level of investment greater than (or less than) an industry average (e.g., Campbell et al. 2011), or the use of proxies for managerial optimism/overconfidence, based on option holding or insider buying patterns (e.g., Malmendier and Tate 2005). We employ the residual approach because it enables us to make firm-level predictions of investment levels and calculate the deviation from expected levels directly.[57]

Some firms exhibiting foresight will deliver above-normal returns through competitive advantages because they possess and accurately utilize their proprietary information (Dierickx and Cool 1989; Barney 1991; Ahuja, Coff, and Lee 2005). This information allows managers to exploit imperfections in strategic factor markets by investing either less (underinvesting) or more

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[55] http://www.nytimes.com/2011/12/17/business/at-amazon-jeff-bezos-talks-long-term-and-means-it.html?pagewanted=all&_r=0
[56] http://www.businessweek.com/articles/2013-02-26/too-much-cash-isnt-good-for-apple
[57] Some limitations of the approach are considered in the concluding section.

(overinvesting) than is currently expected by the external capital market (Demsetz 1973; Lippman and Rumelt 1982; Barney 1986; Amit and Schoemaker 1993). Underinvesting with foresight allows firms to avoid losses by abstaining from value-destroying investment opportunities, while overinvesting with foresight allows firms to more fully exploit growth opportunities. Because these investment levels are not anticipated by the external capital market, firms with foresight can earn above-normal returns from their more accurate expectations of return potential (Barney 1986).[58]

Distinguishing between foresight and luck within this context is critical yet perhaps empirically impossible: "Our guess is that whatever the formal approach, two of the ubiquitous tools in capital budgeting are a wing and a prayer, and serendipity is an important force in the outcome" (Fama and French 1997, 179). Barney (1986) also recognizes that the attainment of competitive advantages may merely be the result of a firm's good fortune and luck. Indeed, without a theory of managerial foresight, the sources of competitive advantage would be indistinguishable from luck (Ahuja, Coff, and Lee 2005). The preliminary approach presented in this paper makes no special claim to resolving the confounding factor of luck, but we do recognize its vital importance to the interpretation of our empirical design and results.

2.1 Prior Empirical Literature

Starting with Barney (1986), the establishment of competitive advantage has long relied on the theoretical concept of foresight. Despite this importance, scant research has attempted to identify cases of managerial foresight empirically. This section provides a brief overview of one empirical study related to our work here.

[58] We employ industry-adjusted return on assets (ROA) to proxy for returns. We will discuss the empirical approach and its limitations in the next section.

Ahuja, Coff, and Lee (2005) examine whether managers have foresight to identify their key patents ex ante, and the authors look at insider trading patterns as a signal of this foresight. They point out that, while foresight is necessary for rent accumulation (absent luck), managers may use the information asymmetry inherent in this foresight to appropriate rents for themselves at the expense of shareholders. Empirically, they show that insider purchases by senior managers increase in the number of patents, as well as with patent activity in the year before, during, and after the patent application is filed. These results suggest that managers do exhibit foresight related to patents and that they trade on this proprietary information. Ahuja et al. (2005) do not, however, examine whether managers actually increase wealth as a result of their insider trades.

3. Empirical Design

The sample includes all firms from Compustat that make capital investments (*capx*) and have complete data for our analysis between 1996 and 2006.[59]

We employ residual analysis to categorize the investment decisions of firms based on their deviation from expectations of the external capital market (Richardson 2006; Biddle, Hilary, and Verdi 2009). Residual analysis enables us to capture firm-level deviations from the expected level of investment, which is estimated from a market-based regression model. The expected level of investment from this approach will vary over time and thus reflect the influence of industry-wide economic conditions during the year.

In the first step, we regress firm-level investment on the firm's market-to-book ratio at the beginning of the period, which is our measure of the market's expectation of the firm's

[59] Note that some of our analysis requires data in year t+3, so we also use forward data from 2007 to 2009 for return on assets (ROA).

investment opportunities.[60] No other control variables are included in the first-stage regression because the impact of these effects will be investigated in the second stage.

$$I_{i,t} = \beta_0 + \beta_1 MTB_{i,t-1} + \sum YearIndicator + \sum IndustryIndicator + \varepsilon_{i,t}$$

I is firm *i*'s investment level (*capx*) scaled by the beginning assets in year *t*, and *MTB* is firm *i*'s market-to-book ratio at the beginning of the year. This first-stage regression is estimated cross-sectionally for each industry-year based on the Fama and French (1997) 48-industry classification.[61] Each industry must have a minimum of 20 firm-year observations in each given year. Then, using the firm's market-to-book ratio, we calculate the expected level of investment (*I-hat*) as a function of the estimated industry-year coefficient on *MTB* for each firm's industry.

$$\hat{I}_{i,t} = \beta_0 + (\beta_{j,1} * MTB_{i,t-1})$$

And finally, the deviation from market expectations (i.e., the residual, *I-tilda*) is calculated as the difference between the firm's actual level of investment during the year (*I*) and the predicted level (*I-hat*).

$$\tilde{I}_{i,t} = I_{i,t} - \hat{I}_{i,t}$$

To classify firms as either overinvesting or underinvesting, we split the sample of firms into quartiles based on the magnitudes of their residuals (Biddle, Hilary, and Verdi 2009). We sort firms yearly based on the residuals and classify the bottom (top) quartile as firms that are

[60] Biddle et al. (2009) find consistent results when they use either Tobin's Q or sales growth (both together and separately) as their proxy for investment opportunities in the market model.

[61] Fama and French (1997) start with 4-digit SIC industries and develop a classification system with 48 industries. One objective of the approach is to more accurately estimate the cost of equity for industries. The classification system is widely used in asset pricing, corporate finance, and economics. See Wulf (2002) for its use in the context of internal capital markets.

underinvesting (overinvesting), such that the most negative (positive) residuals are classified as underinvesting (overinvesting). The investment levels of firms within the two middle quartiles are considered to be consistent with the expectations of the capital market. This group constitutes the firms at the benchmark investing level.

In our preliminary analysis, we examine the profitability of the firm's investment as a measure of the rents accruing to the firm, using industry-adjusted return on assets (ROA) as the proxy. For each firm, we compare its industry-adjusted ROA during the year of investment against its industry-adjusted ROA three years hence. For a firm to exhibit above-normal returns, we require that the industry-adjusted ROA in t+3 is both positive (i.e., higher than the industry average for that year) and increasing (i.e., the firm's ROA in t+3 is higher than its ROA in t).[62]

In our empirical design, then, managers exhibit foresight when the firm's investment level deviates from market expectations (i.e., the firm is either underinvesting or overinvesting according to the market model) and its investments yield above-normal returns in the future (i.e., ex post future industry-adjusted ROA is both positive and increasing). We provide univariate summary statistics in the next section.

4. Descriptive Statistics

A primary objective of this paper is to examine the prevalence of foresight and the characteristics of firms exhibiting such foresight.

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[62] Of course, using ROA is not without concerns. Another approach to measure the above-normal returns of the firm might be its cumulative abnormal returns based on stock price. We discuss the advantages and limitations of both measures more fully in the concluding section of this paper.

4.1 Data Summary

The full sample from 1996 to 2006, which is used in the first-stage regression to estimate industry-year levels of expected investment, is comprised of 75,163 firm-year observations (see Table 1). Our sample is further limited by the number of firms that do not contain data for ROA in *t*+3, so the main sample of analysis contains 54,573 firm-year observations.[63] The annual number of firm-year observations is relatively stable throughout the ten-year sample period, and the individual years for 1996 and 2006, as well as for the retail industry (Fama-French industry 42), are also presented in Table 1.[64]

Insert Table 1 About Here

Figure 1 depicts histograms of the residuals for various samples.[65] The top two histograms show the distribution of residuals for the full years, separately, of 1996 and 2006. Both appear to be approximately normally distributed, although they also both exhibit a longer tail to the right. The value at the 99th percentile is farther away from zero than that of the 1st percentile (see Table 1). While the mean for each year is zero, the medians residuals for both years are negative. The bottom two histograms show the distribution of the retail industry (Fama-French industry 42) in 1996 and 2006. Again, the distribution for the retail industry in 1996 appears generally normal (with a longer tail to the left), but for 2006 the retail industry definitely

[63] Firms that do not contain data in *t*+3 can be said to have "exited" the sample. These firms may exit for any number of reasons, which may be both positive or negative for the firms, and accretive or dilutive for shareholders. In subsequent tests, we will also consider the characteristics of these exiting firms.
[64] In the Appendix, we provide a short analysis of managerial foresight in the retail industry as of 1996.
[65] In all histograms, the data beyond the 1st and 99th percentiles have been removed for presentation purposes. I do not drop the outliers from the overall analysis because a test of deviation is in some ways an examination of outliers. Table 1 lists the 1st and 99th percentiles because they capture the general tenor of the data more accurately than the minimum and maximum values.

shows a block pattern distribution between -0.05 and -0.01. A large number of firms appear to be underinvesting in this particular industry-year sub-sample.

Insert Figure 1 About Here

To categorize firms as either underinvesting or overinvesting, the full sample is split into quartiles based on the magnitude of residuals. Firms are sorted annually; the bottom quartile (i.e., the most negative residuals) are the underinvesting firms and the top quartile (i.e., the most positive residuals) are the overinvesting firms. After splitting the sample based on quartiles, 18,798 (25%) firms are categorized as underinvesting; 18,784 (25%) as overinvesting; and 37,581 (50%) are considered to have investment levels consistent with market expectations (see Panel A of Table 2).

Insert Table 2 About Here

From Table 1, we also see that the median residual for the full sample is -0.017, suggesting that on average firms appear to be underinvesting relative to market expectations. The residuals at the 1st percentile (most negative) and 99th percentile (most positive) are -0.315 and 0.548. The 25th percentile-split for underinvesting comes at -0.040; the 75th percentile-split for overinvesting comes at 0.012.

Because we use a strict line to separate the sample into three groups, one concern is whether these categories are actually different from each other. In order to examine the sample mean between two or more groups, we use one-way analysis of variance with the Bonferroni multiple-comparison test to reduce bias from multiple groups (see Table 3).[66] The sample mean of the residual for the benchmark category (-0.02) is significantly larger (p=0.000) than the sample mean of the residual for the underinvesting category (-0.13). Likewise, the sample mean of the residual for the overinvesting category (0.16) is significantly larger (p=0.000) than the sample means for both the benchmark and the underinvesting categories. We conclude that the three categories of residuals capture distinct subsets of the data.

Insert Table 3 About Here

As discussed above, we lose observations when determining managerial foresight because the analysis requires the firm to have ROA at *t*+3. As a result, we can categorize foresight for 54,573 firm-year observations (see Panel B of Table 2). Within this sample, the quartile split for deviation from expected levels of investment also changes, but only slightly. The middle two benchmark quartiles, which originally comprised 50%, now increases to 50.9% of the sample. The underinvesting category decreases to 23.5% of the sample, and overinvestment increases to 25.6%. It thus appears that underinvesting firms are slightly less likely to survive to *t*+3, while overinvesting firms are slightly more likely. We do not believe these changes introduce any significant bias into the results. Figure 2 presents some evidence as to why underinvesting firms are less likely to survive, as the median firm-level ROA at time *t* for the underinvesting firms that exit is negative and significantly smaller than all other categories. These underinvesting firms are already struggling with lower ROA at the start of the analysis period. For all of the exit categories, the firm-level median ROA is lower at the start of the analysis period.

[66] The command for oneway analysis of variance in Stata is -oneway-.

Insert Figure 2 About Here

Within the sample as a whole (see Panel C of Table 2), which includes all firms that exit from the sample due to data limitations, we find that approximately 22.4% of the underinvesting firms exhibit foresight (2,877 firm-year observations out of 12,820) and 25.0% of overinvesting firms exhibit foresight (3,491 out of 13,960). We categorize about 3.8% of firms as underinvesting with foresight and 4.6% of firms as overinvesting with foresight; approximately 8.4% of all firms are considered to be investing with managerial foresight, i.e., they are deviating from market expectations and experiencing above-normal future returns.

4.2 Investment Deviation & Performance

Prior literature typically concludes that underinvestment or overinvestment relative to some benchmark is not value-enhancing. However, if some managers are deviating from expected levels of investment based on proprietary information (i.e., they are investing with foresight), we might expect these deviations to yield above-normal returns. One way to examine the effectiveness of the investment decision is to evaluate the change in ROA after the decision has been made.

Figure 3 depicts the median firm-level ROA at years *t* and *t*+3 for each of the groups for underinvesting, benchmark, and overinvesting. The figure suggests that median ROA is lowest for the underinvesting group and highest for the overinvesting group, consistent with expectations. Firms with higher ROA are more likely to generate excess cash flow, which they may then reinvest into the firm.[67] It is also interesting that the median ROA in *t*+3 is lower than that for the benchmark and overinvesting firms, while it is slightly higher for underinvesting. These results may suggest a type of reversion to the mean in firm-level performance.

Insert Figure 3 About Here

Figure 4 provides a similar analysis for median ROA when we further separate the groups based on foresight. By construction, the median ROA in time t+3 is the highest for the two groups that are underinvesting with foresight (Under/Yes) and overinvesting with foresight (Over/Yes). What is interesting is that the underinvesting firms with foresight (Under/Yes) exhibit a significantly higher median ROA in time *t* than the underinvesting firms with no foresight (Under/No), suggesting that the firms with foresight have already attained defensible competitive advantages in some form. The same, however, is not true for the overinvesting firms. Overinvesting firms with foresight (Over/Yes) have approximately the same median ROA in time t than overinvesting firms with no foresight. This result suggests that the characteristics of overinvesting firms may play a pivotal role in whether they invest with foresight.

Insert Figure 4 About Here

Table 4 provides some preliminary evidence that the relationship between deviations from investment level and firm performance may be more nuanced than prior literature assumes. The table depicts a one-way analysis of variance test for the mean change in industry-adjusted ROA between year *t* and *t*+3. The mean change is simply the industry-adjusted ROA in year *t*+3

[67] We will explore the idea of a cash flow effect more fully in the next two subsections.

less that from *t*, such that positive (negative) numbers indicate improvement (decline) in ROA. The results suggest that overinvesting firms, on average, actually have a significantly higher change in mean ROA than that of the benchmark category. Underinvesting firms, on the other hand, do not demonstrate any significant difference in their mean change in ROA relative to either overinvesting firms or the benchmark group.

Insert Table 4 About Here

4.3 Managerial & Firm-level Characteristics

We next employ tests of sample means to explore the characteristics of managers and firms that exhibit foresight. These tests compare the sample means across groups when there are more than two groups, and they provide univariate indications of what characteristics may influence firms to either underinvest or overinvest. The characteristics included in this preliminary analysis are: age of the CEO; current tenure of the CEO; whether the CEO is optimistic/overconfident; the percentage of independent directors on the corporate board; whether the firm contains multiple business units; and the amount of the firm's cash flow. When we require each observation to have all managerial and firm-level characteristics, the sample size is reduced to 5,125 firm-year observations.

4.3.1 Characteristics of Investment Deviation

Panel A of Table 5 provides the split for the deviation from expected levels of investment within the characteristics sample of 5,125 firm-year observations. Recall that we split the full data sample into quartiles, where the bottom (top) quartile is classified as underinvesting (overinvesting). Within the smaller sample here, only 16.1% of firms are classified as underinvesting, providing further evidence that these firms tend to exit the sample sooner due to lower performance. Overinvesting firms, on the other hand, still constitute 25.1% of the sample.

Insert Table 5 About Here

Panel B of Table 5 summarizes the sample means and standard deviations for all of the characteristics variables. Sample means highlighted in bold are statistically different than the sample mean of the benchmark group. Appendix B provides the detail statistics for the one-way analysis of variance for each variable.

An interesting conclusion from the analysis of variance statistics is the tendency for the sample mean of the characteristics variables in the overinvesting group to be significantly different than the sample mean of the benchmark. For example, the CEO tenure of overinvesting firms is significantly longer than benchmark firms (p=0.004). Likewise, overinvesting firms, relative to the benchmark group, have more optimistic CEOs (p=0.000) and have a smaller percentage of independent directors (p=0.002). In other words, optimistic CEOs are more likely to overinvest, and the smaller percentage of independent directors suggests a reduced level of corporate control may play in role in enabling that overinvestment.

An interesting difference between underinvesting firms and overinvesting firms is the corporate structure, where underinvesting firms are significantly more likely to have multiple business units. The binary variable for the multisegment characteristic is set equal to 1 if the firm contains multiple business units. The sample mean for underinvesting firms is 0.34, which is significantly larger than the overinvesting group (mean=0.27; p=0.001). The sample mean of overinvesting firms is also significantly smaller than the benchmark (p=0.005).

Consistent with prior literature, we also find strong evidence for a cash flow effect on investment. The sample mean of cash flow for overinvesting firms is significantly larger than that of underinvesting firms (p=0.000) and of the benchmark group (p=0.000). Likewise, the sample mean of underinvesting firms is significantly smaller that that of the benchmark (p=0.000). Firms with more cash flow tend to overinvest relative to a market-model benchmark, while firms with less cash underinvest.

4.3.2 Characteristics of Managerial Foresight

Panel A of Table 6 details the further breakdown of the smaller sample with managerial and firm-level characteristics (5,125 firm-year observations). Similar to Section 4.1 above, the underinvesting and overinvesting firms are further categorized as having foresight if they exhibit both positive and improving industry-adjusted ROA in *t*+3. Panel B of Table 6 is also analogous to Panel B of Table 5, where we provide sample means and standard deviations of the characteristics variables, which are split across groups based on investment deviation and industry-adjusted ROA performance. Appendix C provides details of the one-way analysis of variance statistics for the sample mean differences across the groups.

Insert Table 6 About Here

Characteristics variables where the sample mean for the underinvesting group with declining ROA and the overinvesting group with declining ROA are both significantly different from the benchmark group include CEO tenure, CEO optimism, the percentage of independent directors, and cash flow. Firms tend not to exhibit foresight when they have CEOs with longer tenures, CEOs who are more optimistic, where boards have fewer independent directors, and firms have more cash flow; these firms deviate from the benchmark investment levels and decrease their returns on investment by doing so. While the sample mean of CEO age is not significantly different for underinvesting or overinvesting firms, we do find that the sample mean of CEO age for overinvesting firms with increasing ROA is significantly higher than the benchmark group.

Our previous results show that optimistic CEOs tend to overinvest; in Panel B of Table 6 we see that this result holds for firms that experience both decreasing and increasing ROA in t+3. However, the difference between the sample means of the decreasing and increasing groups is not significant. For overinvesting firms that experience declining ROA, the sample mean of CEO optimism is also significantly larger than both sub-groups of underinvesting firms.

In the broader sample from section 4.3.1, we find that underinvesting firms are significantly more likely to have multiple business units. In Panel B of Table 6, we see that the underinvesting firms with declining ROA have the largest sample mean, and this difference is significant larger than both sub-groups of overinvesting firms. The sample mean of underinvesting firms with increasing ROA is also significantly larger than that of overinvesting firms with decreasing ROA.

We also find further evidence for a cash flow effect on investing in these results. Overinvesting firms that experience decreasing ROA have a significantly larger sample mean of cash flow than both underinvesting sub-groups and the benchmark group. More important, the sample mean of cash flow for overinvesting firms that experience declining ROA is significantly larger than the sample mean of overinvesting firms that experience increasing ROA. Not only does more cash flow lead to overinvesting, it tends to lead to overinvesting and underperformance.

5. Multinomial Logit Results

The summary statistics in Section 4 provide an interesting background on the nature of firms that underinvest and overinvest relative to a market-model benchmark. In this section, we extend the analysis to examine the likelihood of managerial foresight using a set of multinomial logit models. Essentially, the multinomial logit model estimates separate binary logit models for each pair of outcome categories separately. We use multinomial logit models because the outcomes are assumed to be nominal, i.e., unordered.

In the first test (see Table 7), we examine the likelihood that firms will either underinvest or overinvest, relative to the benchmark group. Similarly, the second test (see Table 8) examines the likelihood that firms will either underinvest or overinvest, while also examining the sub-groups based on ROA performance in *t*+3.

Insert Table 7 & Table 8 About Here

We will confine our discussion of the results to two of the control variables, CEO Optimism and Cash Flow, because they provide the clearest indication of results that are consistent with expectations from prior literature. We find that optimistic CEOs are significantly more likely to overinvest and that the overinvesting will lead to declining ROA in the future.

Similarly, we find that firms with more cash flow are significantly more likely to overinvest; these firms are also significantly more likely to overinvest and experience declining ROA.

6. Robustness Checks

As I discuss in the next section under limitations, one of the important factors in our empirical analysis of foresight in this paper is the performance window. The main results examine the difference in performance between times *t* and *t*+3, because foresight will typically precede rent generation (Ahuja, Coff, and Lee 2005). While three years may be appropriate for some types of capital investments, different performance horizons may impact our analysis of managerial foresight. This section provides a robustness check by presenting results from a two-year horizon, i.e., where above-normal returns are measured in *t*+2 after the investment decision.

Insert Table 9 About Here

Table 9 presents the results analogous to Panel B and Panel C of Table 2. Here, the sample size for data in *t*+2 if 59,980 firm-year observations, meaning that we increase the sample size by 5,407 observations by decreasing the performance window. Panel A of Table 9 shows that 23.7% of firms are underinvesting, 50.8% of firms invest at the benchmark, and 25.5% of firms are overinvesting. These results for the *t*+2 sample are nearly identical to those from the *t*+3 sample. Panel B of Table 9 also shows that the *t*+2 sample is very similar to that from *t*+3. The main difference, as expected because we are working with a shorter performance horizon, is that the *t*+2 sample contains fewer firms that exit. These similar results suggest that modifying the performance horizon by a single year should not significantly alter the managerial and firm-level characteristics that are associated with foresight. In untabulated results, we further show that the tenor of the relationship between underinvesting and overinvesting and the characteristics variables also remains the same within the *t*+2 sample.

7. Conclusion

The main objectives of this paper are to define a theory of managerial foresight and to introduce a new measure that captures foresight. We also highlight the characteristics of managers and firms that appear to exhibit foresight.

We say that managers exhibit foresight when they make unique investment decisions today that deliver above-normal returns in the future. The context of our analysis is the level of firm investment, where unique investments deviate from the expected investment level of the external capital market. We define underinvestment as investing less than an expected level, while overinvestment is investing more, and we estimate these expected levels using a market-model. By utilizing their proprietary information within imperfect strategic factor markets, some managers will deliver above-normal returns, either by underinvesting or overinvesting.

Within our full sample, we find that approximately 22.4% of underinvesting firms exhibit foresight and 25.0% of overinvesting firms exhibit foresight. Overall, about 8.4% of firms are considered to be investing with foresight: about 3.8% of firms underinvest with foresight and 4.6% of firms overinvest with foresight. We also use one-way analysis of variance tests to examine the managerial and firm-level characteristics of investment deviation (i.e., underinvestment and overinvestment) and managerial foresight. We present evidence that the performance of overinvesting firms may actually be higher, on average, than that of a benchmark category, and that the performance of underinvesting firms is not significantly worse. We also show that overinvesting firms tend to have more optimistic CEOs, who appear to face weaker governance controls on their board of directors. Further, both overinvesting in general and overinvesting with no foresight are strongly associated with cash flow.

7.1 Limitations

While the preliminary results in this paper suggest one potential theory and empirical examination of managerial foresight, several limitations of the analysis are important to recognize.

As mentioned in the discussion of this paper's setting, luck almost certainly plays some role in the ability of firms to exhibit above-normal returns. This paper makes no attempt to distinguish between luck and foresight, although we recognize that it is an important limitation to drawing conclusions about managerial foresight.

Even absent luck, the measurement of managerial foresight must confront several limitations related to measurement concerns. By estimating an investment expectation model using residual analysis, we are essentially assuming that the average deviation from expected investment across industry-years is equal to zero. In this case, the definition of industry classifications, a problem faced in many research settings, is a particularly important aspect of the expectations model. Further, the explanatory variable in our market-based model of expectations is the firm's market-to-book ratio, which is also subject to mismeasurement. The MTB ratio is a measurement, at best, of the firm's average set of investment opportunities. For our purposes, though, the ratio delivers something of an advantage, in that it is the precisely market's expectations of growth that we want to measure.

An important aspect of the empirical approach in this paper is the use of industry-adjusted ROA as the measure for above-normal returns. Recall that firms must exhibit positive and increasing ROA to be classified as having foresight. An alternative measure of performance might be the firm's cumulative abnormal returns based on stock price. Assuming a semi-strong efficiency of the stock market implies that these returns should reflect all publicly available information about the performance prospects of the firm. One aspect of this information is of course the firm's level of investment, as well as its deviation from market expectations. We opt for ROA in our preliminary analysis because it most closely captures the effectiveness of the investment decision alone. While ROA can be subject to earnings and asset management practices, these types of manipulations would also likely impact market value. Further, if managers use foresight to appropriate rents for themselves, as they appear to do in Ahuja et al. (2005), the stock price of the firm may actually be depressed as a consequence of greater managerial foresight (Castanias and Helfat 1992; Coff 1999).

Determining the window to evaluate above-normal returns (whether using industry-adjusted ROA or cumulative abnormal stock returns) is also a complicating factor of the analysis in this paper. We opt for measuring the change in industry-adjusted ROA from year t to $t+3$, because it likely takes at least a few years for rents to accrue from the capital expenditures studied in this analysis. In a robustness check detailed in the previous section, we demonstrate that shortening the performance window by one year does not appear to affect the empirical conclusions in this paper.

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Table 1: Summary statistics for various samples in this paper. The Full Sample consists of firms from 1996 to 2006 that are used to compute the first-stage regression estimates of industry-year levels of investment. The *t*+3 Sample consists of firms for which we have ROA information in *t*+3; some firms "exit" the sample because they are no longer listed in Compustat, either for positive or negative reasons. Sample summary statistics are also provided for individual years (1996 and 2006) and for the retail industry (Fama-French industry 42) in those years.

	Full Sample	*t*+3 Sample	*t* = 1996	*t* = 2006	Retail (1996)	Retail (2006)
Observations	75163	54573	6758	6769	355	271
Mean	0.000	-0.001	0.000	0.000	0.000	0.000
Std Dev	0.666	0.667	0.231	0.247	0.292	0.049
Percentiles						
1%	-0.315	-0.317	-0.280	-0.374	-0.280	-0.091
10%	-0.078	-0.075	-0.110	-0.074	-0.083	-0.049
25%	-0.040	-0.038	-0.053	-0.035	-0.041	-0.035
50%	-0.017	-0.015	-0.022	-0.011	-0.018	-0.006
75%	0.012	0.017	0.016	0.008	0.022	0.022
90%	0.075	0.089	0.077	0.064	0.074	0.061
99%	0.548	0.617	0.700	0.541	0.208	0.153

Table 2: Basic descriptive statistics

Panel A: Full data sample used to calculate investment deviation levels based on industry-year regressions of firm-level investment on the firm's market-to-book ratio. Firms in the bottom (top) quartile are classified as underinvesting (overinvesting). Firms in the middle two quartiles are the benchmark, considered to be investing according to market expectations.

	Obs	%
Underinvesting	18798	25.0
Benchmark	37581	50.0
Overinvesting	18784	25.0
Total	75163	100.0

Panel B: Data sample for firms that contain ROA data in *t*+3 in order to calculate whether firm-level industry-adjusted ROA increases or decreases

	Obs	%
Underinvesting	12820	23.5
Benchmark	27793	50.9
Overinvesting	13960	25.6
Total	54573	100.0

Panel C: Data sample breakdown based on underinvesting/overinvesting and whether the firm exhibits foresight from time *t* to *t*+3

	Obs	%
Underinvesting		
No Foresight	9943	13.2
Foresight	2877	3.8
Exit	5978	8.0
Benchmark	27793	37.0
Exit	9788	13.0
Overinvesting		
No Foresight	10469	13.9
Foresight	3491	4.6
Exit	4824	6.4
Total	75163	100.0

Table 3: One-way analysis of variance using the Bonferroni multiple-comparison test. Compares the sample means of the residual across the three main categories of underinvesting, benchmark, and overinvesting. Significantly different sample means are highlighted in bold.

Deviation from Expected Investment (Residual)

	Obs	Mean	Std Dev	Underinvesting	Benchmark	Overinvesting
				x		
Underinvesting	18798	-0.13	0.76	x		
				0.112	x	
Benchmark	37581	-0.02	0.02	**0.000**	x	
				0.292	**0.180**	x
Overinvesting	18784	0.16	1.08	**0.000**	**0.000**	x
Total	75163	0.00	0.67			

Table 4: One-way analysis of variance using the Bonferroni multiple-comparison test for mean ROA change between year *t* and *t*+3 across the underinvesting, benchmark, and overinvesting groups. Significant differences in sample means are highlighted in bold.

Panel A: Full sample of 54,573 firm-year observations

Change in industry-adjusted ROA between *t* and *t*+3

	Underinvesting	Benchmark	Overinvesting
Underinvesting	x		
	x		
Benchmark	-0.023	x	
	1.000	x	
Overinvesting	0.314	**0.338**	x
	0.129	**0.031**	x

Table 5: Summary statistics for investment deviation from benchmark within the smaller characteristics sample

Panel A: Number and percentage of firm-year observations in each group

	Obs	%
Underinvesting	827	16.1
Benchmark	3012	58.8
Overinvesting	1286	25.1
Total	5125	100.0

Panel B: Mean and standard deviations for characteristics of each group

	CEO Age		CEO Tenure		CEO Optimism		% Indep. Dirs.		Multi. Firm		Cash Flow	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Underinvesting	55.54	7.82	8.34	7.75	0.41	0.49	0.66	0.17	0.41	0.49	**0.11**	0.11
Benchmark	55.21	7.52	7.92	7.79	0.38	0.49	0.67	0.17	0.34	0.47	0.09	0.10
Overinvesting	55.42	7.66	**8.78**	8.31	**0.51**	0.50	**0.65**	0.18	**0.25**	0.43	**0.15**	0.11
Total	55.31	7.61	8.20	7.92	0.42	0.49	0.66	0.17	0.33	0.47	0.11	0.11

Table 6: Summary statistics for investment foresight within the smaller characteristics sample

Panel A: Number and percentage of firm-year observations in each group

	Obs	%
Underinvesting		
No Foresight	548	10.7
Foresight	279	5.4
Benchmark	3012	58.8
Overinvesting		
No Foresight	884	17.2
Foresight	402	7.8
Total	5125	100.0

Panel B: Mean and standard deviations for characteristics of each group

	CEO Age		CEO Tenure		CEO Optimism		% Indep. Dirs.		Multi. Firm		Cash Flow	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Underinvesting with Declining ROA	55.42	7.57	**10.01**	8.31	0.37	0.48	**0.60**	0.17	0.43	0.50	**0.13**	0.11
Underinvesting with Increasing ROA	55.30	7.18	7.88	5.73	0.39	0.49	0.64	0.17	0.39	0.49	0.09	0.10
Benchmark	55.48	7.40	8.13	7.71	0.37	0.48	0.68	0.17	0.34	0.47	0.10	0.10
Overinvesting with Declining ROA	55.51	7.84	**9.34**	8.48	**0.57**	0.50	**0.63**	0.18	**0.24**	0.42	**0.17**	0.14
Overinvesting with Increasing ROA	54.12	7.40	8.30	7.21	**0.47**	0.50	**0.61**	0.18	0.28	0.45	0.11	0.11
Total	55.39	7.45	8.33	7.73	0.40	0.49	0.66	0.17	0.33	0.47	0.11	0.11

Table 7: Multinomial logit model of underinvesting and overinvesting

Benchmark Group:	Baseline Investment	
	Underinvesting	Overinvesting
	[1]	[2]
CEO Optimism	0.091	0.348***
	(0.188)	(0.132)
Cash Flow	-0.218	4.008***
	(0.886)	(0.923)
CEO is not Chair (0,1)	-0.761***	-0.140
	(0.210)	(0.144)
Independent Directors (%)	-1.940***	-1.519***
	(0.439)	(0.384)
CEO Tenure (log)	0.056	0.013
	(0.087)	(0.067)
CEO Long-term Incentives (%)	0.053	0.165
	(0.318)	(0.226)
Guidance (0,1)	-0.543***	0.023
	(0.153)	(0.121)
No. Segments	0.021	-0.098*
	(0.057)	(0.056)
Total Assets (log)	0.125*	-0.007
	(0.072)	(0.051)
Constant	-2.015**	-1.191*
	(0.944)	(0.703)
Observations	3,765	3,765
Pseudo R-squared	0.0482	0.0482
Log likelihood	-2531	-2531

Robust standard errors in parentheses, clustered at the firm level
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Multinomial logit model of underinvesting and overinvesting with sub-groups for ROA performance in *t*+3

Benchmark Group:	Baseline Investment			
	Underinvesting ROA Declines [1]	Underinvesting ROA Increases [2]	Overinvesting ROA Declines [3]	Overinvesting ROA Increases [4]
CEO Optimism	-0.151	0.286	0.385***	0.268
	(0.229)	(0.228)	(0.148)	(0.195)
Cash Flow	2.852*	-2.052***	6.055***	0.751
	(1.483)	(0.722)	(1.095)	(0.979)
CEO is not Chair (0,1)	-0.673**	-0.834***	-0.291*	0.082
	(0.269)	(0.287)	(0.174)	(0.189)
Independent Directors (%)	-2.449***	-1.324**	-1.187***	-2.022***
	(0.510)	(0.554)	(0.426)	(0.549)
CEO Tenure (log)	0.125	-0.008	0.029	-0.002
	(0.113)	(0.111)	(0.079)	(0.092)
CEO Long-term Incentives (%)	0.126	-0.018	0.100	0.219
	(0.410)	(0.378)	(0.254)	(0.346)
Guidance (0,1)	-0.246	-0.826***	0.124	-0.122
	(0.207)	(0.201)	(0.136)	(0.180)
No. Segments	0.059	-0.016	-0.080	-0.119
	(0.065)	(0.081)	(0.064)	(0.080)
Total Assets (log)	0.032	0.219**	-0.009	0.010
	(0.084)	(0.092)	(0.056)	(0.070)
Constant	-2.727**	-2.974**	-2.329***	-1.394
	(1.222)	(1.233)	(0.840)	(0.908)
Observations	3,765	3,765	3,765	3,765
Pseudo R-squared	0.0524	0.0524	0.0524	0.0524
Log likelihood	-3098	-3098	-3098	-3098

Robust standard errors in parentheses, clustered at the firm level
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Basic descriptive statistics for performance window *t*+2

Panel A: Data sample for firms that contain ROA data in *t*+2 in order to calculate whether firm-level industry-adjusted ROA increases or decreases

	Obs	%
Underinvesting	14209	23.7
Benchmark	30473	50.8
Overinvesting	15298	25.5
Total	59980	100.0

Panel C: Data sample breakdown based on underinvesting/overinvesting and whether the firm exhibits foresight from time *t* to *t*+2

	Obs	%
Underinvesting		
No Foresight	11171	14.9
Foresight	3038	4.0
Exit	4589	6.1
Benchmark	30473	40.5
Exit	7108	9.5
Overinvesting		
No Foresight	11426	15.2
Foresight	3872	5.2
Exit	3486	4.6
Total	75163	100.0

Figure 1: Histograms of residuals for various samples.

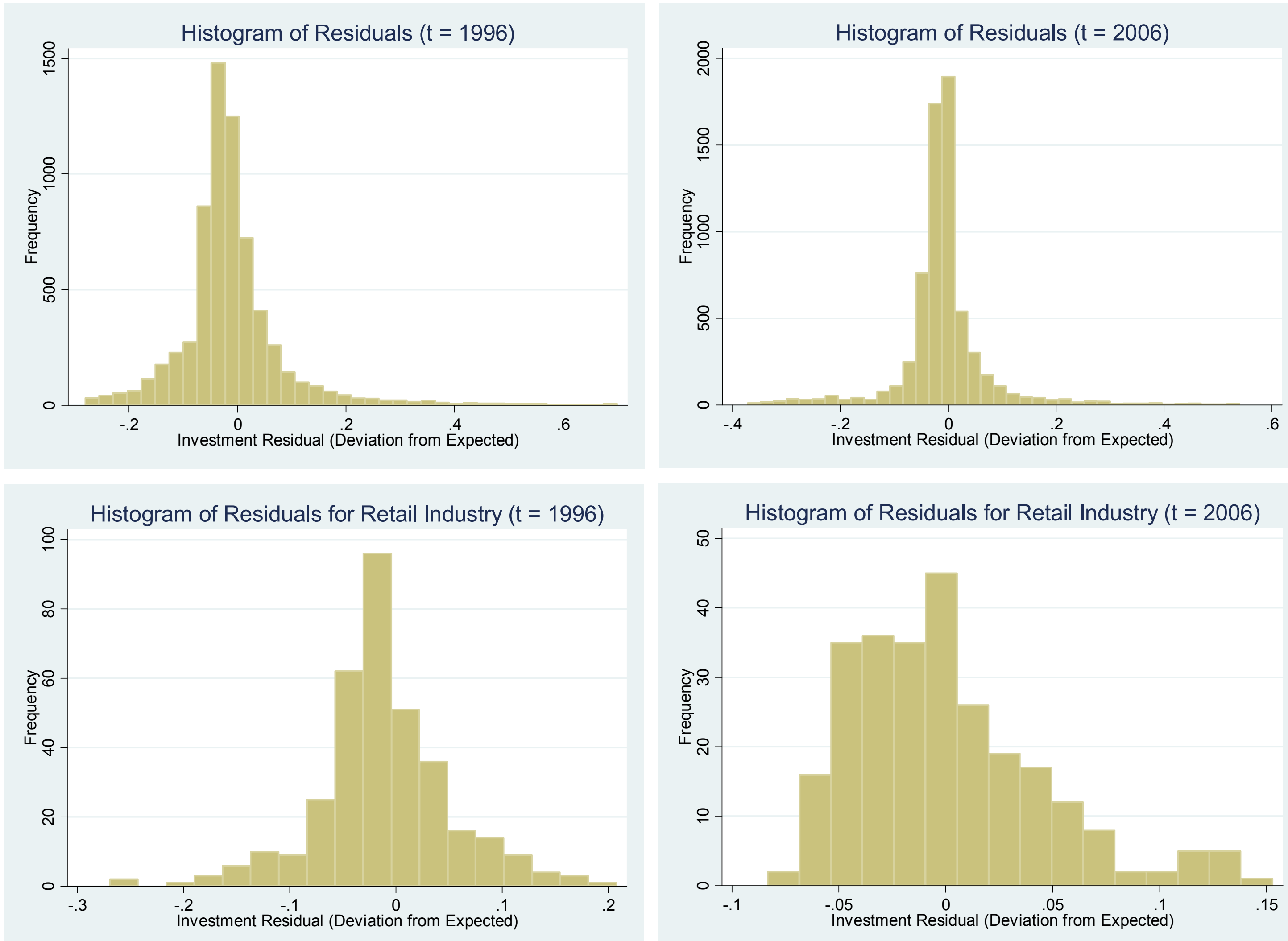


Figure 2: Median firm-level ROA for firms in categories based on whether they underinvest and overinvest relative to a benchmark, and whether the firm survives to period *t*+3 in the analysis or exits the sample.

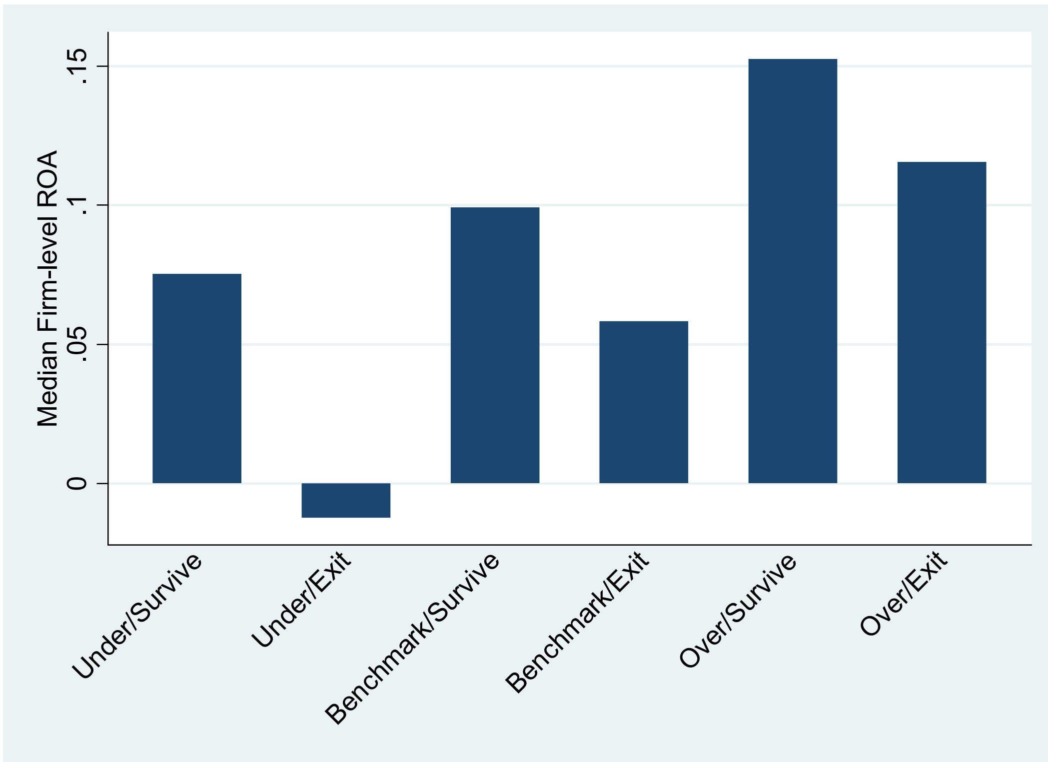


Figure 3: Median ROA at times *t* and *t*+3, for the groups underinvesting, benchmark, and overinvesting.

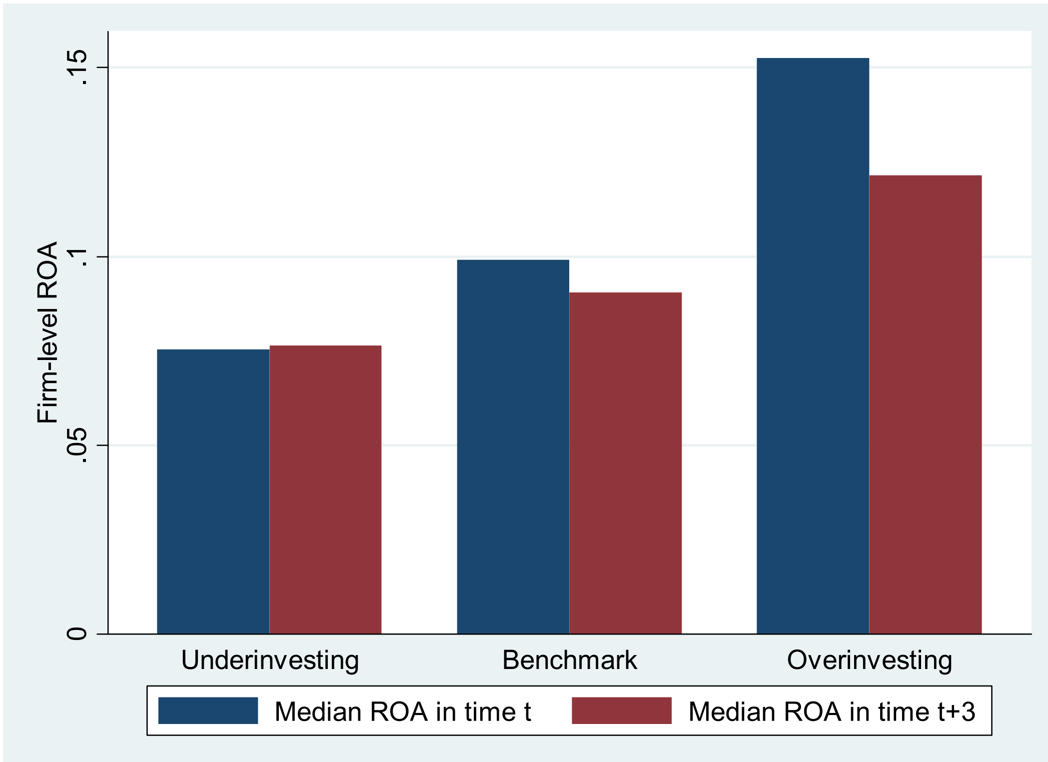
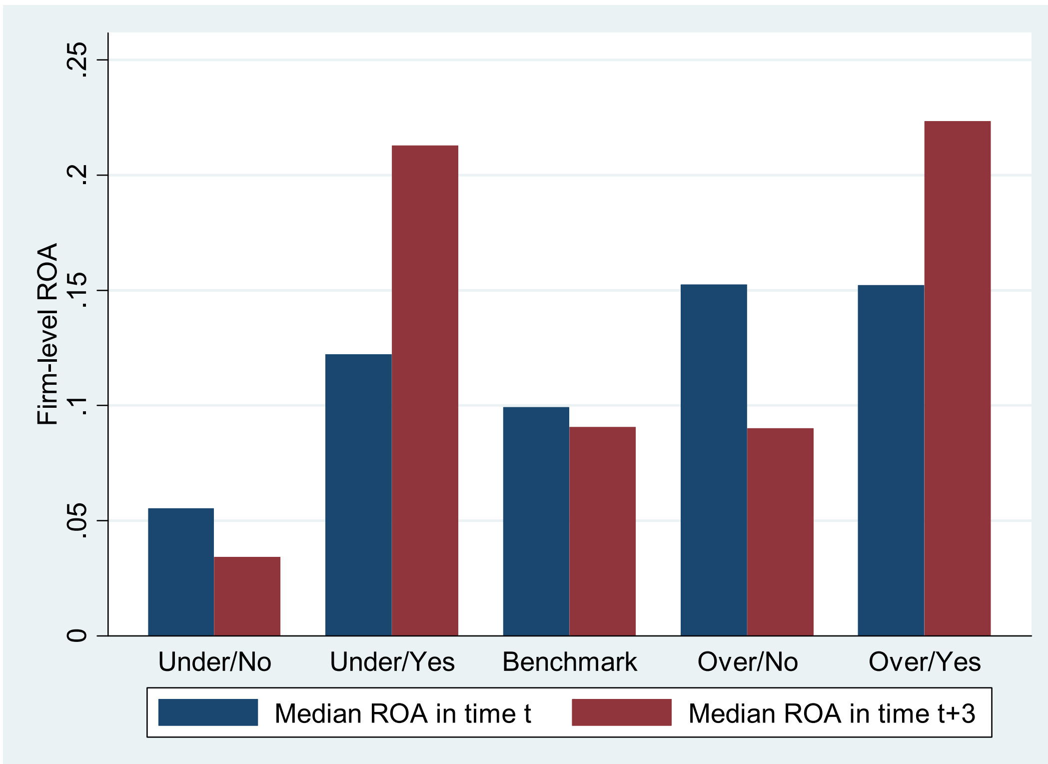


Figure 4: Median ROA at times *t* and *t*+3, for the groups underinvesting, benchmark, and overinvesting, also split out based on foresight: Under/No=Underinvesting with no foresight; Under/Yes=Underinvesting with foresight; Benchmark=Investing according to market expectations; Over/No=Overinvesting with no foresight; Over/Yes=Overinvesting with foresight.



Appendix A: A Short Analysis of the Retail Industry in 1996

In order to provide some context to the measure of foresight developed in this paper, we explore some of the firms from in sample from the retail industry (Fama-French industry 42) starting in 1996. Note that this analysis is preliminary and is only meant at this stage to suggest the type of investigation that can be carried out using our approach to managerial foresight. Summary statistics for the retail industry in 1996 are presented in Table 1, and a histogram of the residuals for this industry-year is depicted in Figure 1.

One example of a firm that overinvested with foresight in 1996 was Costco Wholesale. Following on the heels of its unsuccessful merger with PriceClub, Costco began a rapid period of expansion through the U.S. and the world. At the close of 2005 (the beginning period of the analysis in this paper), Costco traded for $15.25 per share. According to our analysis, Costco overinvested with foresight during both 2006 and 2007, when its capital expenditures were $507 million and $553 million. By the end of period *t*+3 in 1998, the stock price had climbed to $72.19. It was $91.25 at the end of 1999.

Our analysis next suggests that Costco continued to overinvest but with no foresight during the four years from 1999 to 2002. By the end of 2002, three years after the first year of overinvesting with no foresight, the stock price had fallen to $56.12 (note that price is adjusted for a 2:1 split in January 2000). From there, the stock did begin to climb again, reaching $74.36 by 2003, $96.82 by 2004, and $98.94 by 2005, but it was only just returning to the highs originally reached at the end of 1999.

Rite-Aid represents a firm in our sample that overinvested with no foresight in 1996. Its stock price closed 1995 at $31.56 and hit $97.14 (adjusted for 2:1 split in February 1998) by the end of 1998. These gains were illusory, though. By 2002, the Chairman/CEO and other senior executives were indicted (and later found guilty) of fraud.[68] The overinvestment in expansion carried out by Rite-Aid required accounting fraud to prop up the firm. It was forced to restate its earnings over this period by $1.6 billion, the most-ever for a public company at that time. Its stock plunged in March 1999 and has never fully recovered.[69]

Some of the retail firms that made corporate investments in line with market expectations during this period include Albertson's, Safeway, Wal-Mart, Walgreen, Dollar General Corp, and Family Dollar Stores.

Intimate Brands, spun off from The Limited, Inc., in 1995, underinvested with foresight in 1996. The company consisted primarily of the Victoria's Secret catalog and stores and Bath & Body Works stores. By the end of 1999 (t+3 following the underinvestment with foresight), the stock price had climbed from $14.75 (prior to the underinvestment) to $30.38. Intimate Brands was re-integrated into The Limited as Limited Brands in 2002.[70]

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68 http://articles.baltimoresun.com/2002-06-22/business/0206220004_1_rite-aid-grass-aid-corp
69 http://articles.baltimoresun.com/1999-03-19/business/9903190179_1_rite-aid-aid-corp-ziegler
70 http://www.limitedbrands.com/our_company/about_us/timeline.aspx

Appendix B: One-way analysis of variance using the Bonferroni multiple-comparison test for sample means across groups

CEO Age

	Underinvesting	Benchmark	Overinvesting
Underinvesting	x x		
Benchmark	-0.337 0.779	x x	
Overinvesting	-0.118 1.000	0.219 1.000	x x

CEO Tenure

	Underinvesting	Benchmark	Overinvesting
Underinvesting	x x		
Benchmark	-0.420 0.529	x x	
Overinvesting	0.436 0.650	**0.856** **0.004**	x x

CEO Optimism

	Underinvesting	Benchmark	Overinvesting
Underinvesting	x x		
Benchmark	-0.029 0.450	x x	
Overinvesting	**0.102** **0.000**	**0.131** **0.000**	x x

% Independent Directors

	Underinvesting	Benchmark	Overinvesting
Underinvesting	x x		
Benchmark	0.012 0.237	x x	
Overinvesting	-0.008 0.972	**-0.020** **0.002**	x x

Multisegment Firm

	Underinvesting	Benchmark	Overinvesting
Underinvesting	x x		
Benchmark	-0.029 0.336	x x	
Overinvesting	**-0.078** **0.001**	**-0.049** **0.005**	x x

Cash Flow

	Underinvesting	Benchmark	Overinvesting
Underinvesting	x x		
Benchmark	**-0.024** **0.000**	x x	
Overinvesting	**0.032** **0.000**	**0.055** **0.000**	x x

Appendix C: One-way analysis of variance using the Bonferroni multiple-comparison test for sample means across groups

CEO Age

	Underinvesting ROA Declines	Underinvesting ROA Increases	Benchmark	Overinvesting ROA Declines	Overinvesting ROA Increases
Underinvesting ROA Declines	x x				
Underinvesting ROA Increases	-0.115 1.000	x x			
Benchmark	0.065 1.000	0.180 1.000	x x		
Overinvesting ROA Declines	0.094 1.000	0.209 1.000	0.029 1.000	x x	
Overinvesting ROA Increases	-1.296 1.000	-1.180 1.000	**-1.360** **0.087**	-1.390 0.272	x x

CEO Tenure

	Underinvesting ROA Declines	Underinvesting ROA Increases	Benchmark	Overinvesting ROA Declines	Overinvesting ROA Increases
Underinvesting ROA Declines	x x				
Underinvesting ROA Increases	-2.135 0.171	x x			
Benchmark	**-1.880** **0.040**	0.255 1.000	x x		
Overinvesting ROA Declines	-0.673 1.000	1.462 0.485	**1.207** **0.039**	x x	
Overinvesting ROA Increases	-1.715 0.361	0.420 1.000	0.165 1.000	-1.042 1.000	x x

Appendix C (cont'd): One-way analysis of variance using the Bonferroni multiple-comparison test for sample means across groups

CEO Optimism

	Underinvesting ROA Declines	Underinvesting ROA Increases	Benchmark	Overinvesting ROA Declines	Overinvesting ROA Increases
Underinvesting ROA Declines	x x				
Underinvesting ROA Increases	0.023 1.000	x x			
Benchmark	0.005 1.000	-0.019 1.000	x x		
Overinvesting ROA Declines	**0.199** **0.000**	**0.175** **0.002**	**0.194** **0.000**	x x	
Overinvesting ROA Increases	0.102 0.484	0.078 1.000	**0.097** **0.039**	-0.097 0.173	x x

% Independent Directors

	Underinvesting ROA Declines	Underinvesting ROA Increases	Benchmark	Overinvesting ROA Declines	Overinvesting ROA Increases
Underinvesting ROA Declines	x x				
Underinvesting ROA Increases	0.044 0.274	x x			
Benchmark	**0.079** **0.000**	0.036 0.129	x x		
Overinvesting ROA Declines	0.037 0.254	-0.007 1.000	**-0.042** **0.000**	x x	
Overinvesting ROA Increases	0.012 1.000	-0.032 0.751	**-0.068** **0.000**	-0.025 0.768	x x

Appendix C (cont'd): One-way analysis of variance using the Bonferroni multiple-comparison test for sample means across groups

Multisegment Firm

	Underinvesting ROA Declines	Underinvesting ROA Increases	Benchmark	Overinvesting ROA Declines	Overinvesting ROA Increases
Underinvesting ROA Declines	x x				
Underinvesting ROA Increases	-0.038 1.000	x x			
Benchmark	-0.087 0.280	-0.049 1.000	x x		
Overinvesting ROA Declines	**-0.193** **0.000**	**-0.156** **0.006**	**-0.106** **0.000**	x x	
Overinvesting ROA Increases	**-0.150** **0.026**	-0.112 0.233	-0.063 0.540	0.044 1.000	x x

Cash Flow

	Underinvesting ROA Declines	Underinvesting ROA Increases	Benchmark Benchmark	Overinvesting ROA Declines	Overinvesting ROA Increases
Underinvesting ROA Declines	x x				
Underinvesting ROA Increases	**-0.041** **0.008**	x x			
Benchmark	**-0.025** **0.057**	0.016 0.628	x x		
Overinvesting ROA Declines	**0.041** **0.000**	**0.082** **0.000**	**0.066** **0.000**	x x	
Overinvesting ROA Increases	-0.015 1.000	0.026 0.203	0.009 1.000	**-0.057** **0.000**	x x