THE EFFICIENCY OF RESOURCE REALLOCATION WITHIN FIRMS

by

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STATEMENT OF DISSERTATION APPROVAL

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ABSTRACT

This study examines the efficiency of resource reallocation within multisegment firms. A defining feature of multisegment firms is management's ability to transfer resources across divisions. Although the option to use the proceeds or cash flows from one division of the firm to finance operations in another division is valuable to a firm, a large stream of literature documents potentially value-destroying consequences when agency conflicts interfere with investment decisions. Research to date provides mixed results as to whether multisegment firms reallocate resources efficiently. The extent that managers' resource reallocation decisions reflect improvements in efficiency is relevant to firms' existing and potential stakeholders. The reallocation of resources within firms provides new information about factors that underlie firm value, such as growth opportunities and risk exposure. To assess the efficiency of firms' resource allocation decisions, I create two unique, composite measures of efficiency that combine the performance of each segment relative to a firm's other segments and the segment's industry lifecycle stage. I examine the association between these measures and changes in the assets allocated to each of the firm's segments. I also investigate the influence of corporate governance factors. When financing occurs in-house, the firm has greater incentives to monitor the use of funds. Therefore, the ability of a firm's corporate governance structure to alleviate agency problems should be related to the efficiency of management's resource allocation decisions. Additionally, the greater complexity

inherent in operating in multiple segments increases demands on firms' governance systems, making the efficiency of resource reallocation and the influence of related governance mechanisms important empirical questions.

Using segment data provided under SFAS No. 131, I find that firms reallocate resources to segments with the best comparative advantages within the firm, suggesting that multisegment firms, on average, reallocate resources efficiently. Additionally, I find that firms with more independent boards more quickly reallocate resources away from segments with lower within-firm comparative advantages than do firms with more affiliated or dependent boards.

This dissertation is dedicated to the memory of my mother, Marcia C. McMahon (1933-2005), who passed away during my first year in the PhD program.

I know you'd be proud.

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CHAPTER 1

INTRODUCTION

A defining feature of multisegment or conglomerate firms is management's ability to transfer resources across divisions. The option to redeploy or reallocate resources is valuable to firms as proceeds or cash flows from one division can finance investment opportunities of other, potentially cash-constrained divisions. At the same time, however, managers can abuse the option to cross-subsidize operations. A large literature documents adverse, value-destroying consequences when agency conflicts interfere with efficient investment strategies. For example, Jensen's free cash flow theory suggests that managers misappropriate excess cash through investments that are costly to shareholders yet lead to personal gain for managers (Jensen, 1986; and see Stein, 2003 for a survey).

Studies show that firms actively reallocate resources across divisions (e.g., Billett & Mauer, 2003); however, research to date provides mixed results as to whether multisegment firms do so efficiently. In this study, I examine two research questions using a unique approach to measure efficiency that rests on an evaluation of segments' comparative advantages within firms. My first research question is: Do firms reallocate resources across segments in a relatively efficient manner? My second research question asks: Does the efficiency of resource reallocation vary with firms' corporate governance?

The methodology I use to evaluate efficiency represents an important departure from prior literature that benchmarks the efficiency of multisegment firms relative to a set of arguably noncomparable, single-segment firms.

I find that firms reallocate resources to segments with the best within-firm comparative advantages, suggesting that, on average, multisegment firms reallocate resources efficiently.[1] Furthermore, I find that the presence of an independent board of directors is positively associated with efficiency in across-segment resource reallocation. Specifically, firms with a higher percentage of independent board members more quickly reallocate resources away from segments with lower within-firm comparative advantages than firms with more affiliated or dependent boards.

I define efficient resource reallocations as those giving priority to segments with the greatest within-firm comparative advantage. To proxy for this construct, I first compare the return on assets of the firm's segment(s) to the weighted average return on assets of the firm's remaining segment(s). To enrich my measures and account for situations where the economic environment might cause a segment's ROA to be a misleading signal of a relative comparative advantage (for example, in a rapidly growing industry, high start-up costs can lead to excessively low ROAs), I condition the ROA component of my measures on the industry lifecycle stage of each segment. I then examine whether changes in the resources allocated to segments vary with my ex ante predictions of efficient within-firm resource reallocation.

I use the Compustat segment file as a primary data source for information that reflects the resource reallocation processes within firms. Overall, a lack of publically

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[1]Throughout the text I use the term "reallocate" rather than "allocate" to be consistent with the changes specification in my regression models.

available data makes large-scale investigation of within-firm decisions problematic. However, U.S. companies are required to disclose information on segment assets, capital expenditures, and profit or loss and its significant components such as revenue and depreciation.[2]

In general, accounting provides information that guides capital investment (Zhang, 2000). Supporting this, an emerging literature addresses investment efficiency at a firm-level (e.g., Biddle & Hilary, 2006; Biddle, Hilary & Verdi, 2009; Bushman, Piotroski & Smith, 2009; Richardson, 2006). Furthermore, Chen and Zhang (2003) provide evidence of the incremental value relevance of segment data beyond firm-level data. This study fills a gap in the literature by examining the efficiency of within-firm or segment-level investment.

In summary, corporate investment decisions are described as the most important firm-specific decisions managers make (Harris & Raviv, 1996, among others). The reallocation of resources among divisions signals investment priorities and should reflect rational strategic adaptations to changes in firms' economic environments; however, intrafirm negotiations and other agency-driven conflicts can lead to suboptimal investment choices. Additionally, the greater complexity inherent in operating in multiple industries increases demands on firms' governance structures, making the efficiency of resource reallocation and the influence of governance mechanisms important empirical questions. Accordingly, my paper provides evidence that should be of interest to

[2]Specifically, SFAS No. 131 requires disclosure of "the divisions, departments, subsidiaries, or other internal units that the chief operating decision-maker uses to make operating decisions and to assess an enterprise's performance," and "specific amounts would be allocated to segments only if they were allocated in reports used by the chief operating decision-maker for the evaluation of segment performance" (FASB, 1997). However, segment data are not without limitations; foremost is the discretion allowed in determining reportable segments. These limitations and the implications for my study are discussed in Chapter 6.

managers and investors, as well as other academic researchers interested in assessing the relative efficiency of within-firm resource reallocation decisions.

The remainder of my dissertation is organized as follows. I review the related literature in Chapter 2 and develop my hypotheses in Chapter 3. I present my research design and empirical proxies in Chapter 4. I describe the sample used in this study in Chapter 5, report results in Chapter 6, and conclude the study in Chapter 7.

CHAPTER 2

LITERATURE REVIEW

Resource Reallocation and Efficiency

Prior literature addresses various aspects of efficient and inefficient resource reallocations at the firm and segment levels. In this section, I discuss this literature and its implications for my study.

Managers reallocate resources within their firms for a variety of economically rational reasons. First, firms shift resources among divisions to utilize excess capacity, reduce costs, or eliminate redundancies in hopes that more streamlined operations translate into greater profitability. Firms also reallocate resources to take advantage of opportunities, for example, to enter new markets. Matsusaka (2001) models value-maximizing firms as those that align managerial capabilities with available opportunities. Thus firms redistribute resources toward more promising activities or markets, particularly when a compatible within-firm skill set is also present.

Other theoretical work describes similar “synergistic” and positive impacts from firm diversification tactics which imply resource reallocations within firms. In Gomes and Livdan (2004), firms diversify to either take advantage of economies of scope as described above or to allow mature firms to seek new opportunities. The synergies create value as they represent benefits that are not easily replicated by shareholders' portfolio strategies.

Firms might also strategically reallocate resources to obstruct competition or otherwise maintain market power (Palepu, 1985). For example, when supply of an input is constrained, reciprocal buying and selling among the divisions of a firm can pressure rivals and strengthen barriers to entry. Strategic balancing of activities within a firm can also lessen risk and potentially reduce taxes when the income streams of divisions complement one another (Berger & Ofek, 1995). In addition, because internal funds are less costly to secure than outside debt or equity financing, and management is presumed to know more about investment opportunities within their firms than external sources of funds would, the reallocation of resources within a firm allows credit-constrained firms to cross-finance good projects (Stein, 1997).[3]

Despite the arguments for rational redistribution of resources, a large literature suggests that agency conflicts and capital market imperfections might motivate managers to reallocate resources for noneconomic reasons. Inefficient behaviors include empire-building, where CEOs have a preference for running large firms and garnering increased compensation (Jensen, 1986; Jensen & Murphy, 1990); and managerial entrenchment, where CEOs invest in projects that are costly to shareholders but further CEOs' job security (Shleifer & Vishny, 1997). Central to these conflicts is the notion that managers pursue selfish objectives at the expense of less-informed providers of capital (Jensen & Meckling, 1976). Thus, although in a frictionless environment capital flows to its best use, information asymmetry and agency costs can interfere with optimal capital

[3]Stein (1997) stresses that the informational advantage argument is more salient when diversification is into related businesses. Headquarters is then better able to judge the relative merits of competing projects, and resource allocation is less error-prone.

reallocation regardless of whether the provider of capital resides within or outside of the firm.

This dissertation focuses on resource reallocations across divisions of multisegment or conglomerate firms. In multisegment firms, divisional managers might be better informed than company headquarters about the prospects of their divisions but have incentives that are not aligned with those of top management. For example, divisional managers might provide imperfect information or simply not work as hard if they believe that profits from their division will be distributed to other divisions, as is possible with an active internal capital market (Rajan, Servaes & Zingales, 2000). Other evidence is consistent with divisional managers preferring control over larger operations and engaging in lobbying activities to secure additional resources (Meyer, Milgrom & Roberts, 1992; Wulf, 2009). The primary consequences of agency conflicts at a divisional level include inefficiencies due to information-sharing problems and wasted resources.

Ultimately, the CEO is responsible for overseeing the distribution of funds among the firm's competing investment opportunities, a task Stein (1997) calls "winner-picking."[4] However, as an agent of the shareholders, the CEO avoids bearing the full costs of inefficient resource reallocation. A large body of literature examines misaligned incentives between CEOs and shareholders. In the end, shareholders cannot "contractually protect the operating budget from abuse by the CEO" (Scharfstein & Stein, 2000). Consequently, inefficient resource reallocation within multisegment firms can occur as a result of agency conflicts at either the CEO or divisional manager level, or

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[4] A related stream of literature examines transfer pricing schemes, compensation contracts and other capital budgeting mechanisms that CEOs can rely on to address incentive and information-sharing problems within firms (e.g., Harris, Kriebel & Raviv, 1985). However, the responsibility for the implementation and execution of the mechanisms still lies with the CEO.

both. Scharfstein and Stein (2000) develop a two-tiered model illustrating how a CEO's ability to compensate divisional managers with cash and/or additional resources allocated to the division can lead to socialism (a familiar form of inefficiency where stronger segments cross-subsidize weaker segments).

Internal Capital Markets

The line of work most closely related to my dissertation investigates the efficiency of firms' internal capital markets. In an internal capital market, the proceeds or cash flows from one division of the firm can be used to finance other divisions. Unlike capital providers in an external capital market, the provider of capital within the firm (for simplicity, hereafter called headquarters or HQ) maintains complete control rights over the firm's assets. This has two implications for my study: First, HQ has greater monitoring incentives (Gertner, Scharfstein & Stein, 1994); and second, unlike external providers of capital such as a bank that would gain rights over the firm's assets only in the event of default, HQ has the authority and, in effect, the responsibility to exercise options to redeploy, adapt or abandon operations in efforts to meet strategic and operational goals.

My study differs from prior studies of efficiency in internal capital markets in the methodology and overall focus. The internal capital market studies of the past 2 decades typically contrast the investment efficiency of single versus multisegment firms with the aim of identifying potential sources of what is commonly referred to as the diversification discount. The diversification discount is an observed empirical regularity in which multisegment firms appear to be undervalued when matched against a like set of single-segment firms (Berger & Ofek, 1995; Lang & Stulz, 1994). Until recently, inefficient investment behavior within multisegment firms was thought to be a primary driver of the diversification discount. Empirical results consistently tied conglomerate firms' overinvestment in divisions with lower investment opportunities at the expense of investment in divisions with higher opportunities with lower firm value.

Recent literature argues against this conclusion, however, by demonstrating that unaccounted-for self-selection in the decision to diversify can erroneously produce the conclusion that operating in multiple industries destroys firm value (Campa & Kedia, 2002; Villalonga, 2004a). For example, a valuation discount might be due to underlying firm characteristics, and these same characteristics might lead the firm to diversify; however, it is incorrect to conclude that diversification is responsible for an observed discount. In Matsusaka's (2001) model, underperformance in existing activities causes firms to diversify in search of new, productive opportunities. Other studies provide alternative explanations for an observed valuation discount in multisegment firms. For example, firms might acquire already discounted divisions (Graham, Lemmon & Wolf, 2002).

While prior literature ultimately does not yield a resource reallocation-based explanation for the diversification discount, the literature provides evidence, albeit mixed, about the efficiency of firms' internal capital markets. Numerous studies illustrate potential inefficiencies in the functioning of internal capital markets. Empirical results often show that better performing divisions subsidize poorly performing divisions, thereby rejecting the null hypotheses that divisions with the best prospects receive priority in funding (Lamont, 1997; Rajan et al., 2000; Shin & Stulz, 1998).

Nonetheless, the conventional proxy used in these studies to measure the degree of a division's investment opportunities (an estimate of Tobin's *q*), has been illustrated to be subject to severe measurement error that directly impacts the results of studies investigating investment efficiency (Whited, 2001). Among other issues, concern revolves around estimates of Tobin's *q* calculated using single-segment firms that are then applied to multisegment firms (Chevalier, 2000). With endogeneity prevalent in the decision to diversify, it is unclear that the median *q* of single-segment firms adequately proxies for the growth opportunities of multisegment firms (Campa & Kedia, 2002, among others). Nevertheless, this proxy is common in the segment and firm diversification literature because market value, which is necessary to calculate Tobin's *q*, is not available at the segment level.

Importantly for my study, the *q*-based measures employed in prior research do not incorporate the interdependence or relative project selection that occurs in multisegment firms with limited resources (Stein, 1997). For example, studies that assign an industry *q* to firms' divisions assume that all firms in that industry have the same future prospects regardless of each firm's other operations and divisional prospects. Thus, two important features separate my study from much of the prior literature on the efficiency of internal capital markets. First, I use an approach to measuring efficiency that does not require an estimate of *q*.[5] Second, my measure takes the relative performance of firms' segments into consideration in assessing the efficiency of project selection.

Contrary to the arguments noted earlier that internal capital markets degrade efficiency, theory posits that internal capital markets should reallocate resources more

[5]Although my measures of efficiency do not call for estimates of *Q*, I include an estimate of segment *Q* (SEGQ) as a control variable in some model specifications.

efficiently because HQ holds an informational advantage over external capital markets regarding the firms' investment prospects (Stein, 1997; Williamson, 1975). More recently, Maksimovic and Phillips (2002) present a model and empirical evidence that optimal growth across industries in diversified manufacturing firms reflects efficient responses to changes in plant productivity. Khanna and Tice (2001) examine discount retailers' response to a negative shock (Walmart's entry into their market), and report that for related diversification, active internal markets appear to transfer resources away from divisions with worsening prospects, suggesting efficient investment decisions. Although illustrative, the Khanna and Tice study's results suffer from generalizability as well as doubt as to whether Walmart's entry into a market is exogenous and unanticipated, two key assumptions of the study's research design (Sapienza, 2001).

Corporate Governance

Firms use the mechanisms of a corporate governance system to restrain or discipline the managerial decision-making process. This section discusses the implications of prior corporate governance literature on within-firm investment decisions, including the efficiency of internal capital markets. Two key theoretical models—Rajan et al., 2000; Scharfstein and Stein, 2000—point to agency problems as the primary source of inefficient internal capital markets. Additionally, studies find that firms with characteristics indicative of relatively weaker governance structures tend to have greater agency problems (Core, Holthausen & Larker, 1999). Therefore, work in this area generally hypothesizes a positive association between governance mechanisms and the efficiency of firms' internal capital markets.

Indeed, studies have found that firms with more concentrated ownership have more efficient internal capital markets (Sautner & Villalonga, 2010); that suboptimal investment behavior is associated with low managerial ownership (Ozbas & Scharfstein, 2010), and finally, Datta, D'Mello and Iskandar-Datta (2009) find that managerial equity-based compensation is associated with more efficient internal capital markets. Overall these findings suggest that differences in the efficiency of firms' internal capital markets are associated with differences in managerial incentives, and that governance plays a moderating role.

Monitoring mechanisms help fill the gap left by incomplete contracting and therefore represent vital components of firms' governance systems. Multisegment firms can avoid some types of monitoring, such as external monitoring by debt holders or shareholders, with the use of an internal capital market. When financing occurs within the firm, HQ retains asset control rights and HQ has greater incentives to monitor the use of funds. Asset control rights represent the authority to redistribute assets among segments. Although powerful incentives are backed by the potential for real action by HQ, tensions specific to the conglomerate form suggest that a reliance on internal capital markets comes at a cost. Other tensions or agency costs include poor investment choices resulting from intrafirm bargaining. Even if such departmental bargaining for additional resources is unsuccessful, wasted time and effort represent a form of inefficiency (Scharfstein & Stein, 2000) Additionally, misaligned incentives among divisional managers exist when HQ cannot ensure that profits earned by one division will remain in that division (Rajan et al., 2000).

The composition of the board of directors is an important feature of effective corporate governance (Adams, Hermalin & Weisbach, 2010). Firms appoint outsiders to the board of directors to increase monitoring of the CEO (Fama & Jensen, 1983). Outside directors often bring specific expertise, and the lower allegiance of independent board members translates into a lower tolerance of managerial decisions that might signify misaligned incentives between the shareholders and the CEO. This can be valuable in situations where the potential for misaligned incentives is greater. Consistent with this, Brickley, Coles and Terry (1994), among others, provide evidence that the actions of outside directors are aligned with the interests of shareholders and therefore represent an effective monitoring mechanism.

Although outside directors might be less sympathetic to CEO incentives, questions arise as to whether they have adequate knowledge about the firm and its operating environment to both effectively monitor the CEO and have a positive impact on firm value. Studies find that outside directors are not at an information disadvantage regarding firm activities, despite their “outside” designation (Ravina & Sapienza, 2010). Similarly, Duchin, Matsusaka and Ozbas (2010) find that outside directorship has a significant impact on firm performance, although the impact is tempered by the complexity of firms’ information environments. Multisegment firms can create informational challenges, and a related stream of literature, discussed next, examines the relationship between firm diversification and corporate governance.

Overall, firms operating multiple segments exacerbate monitoring and information-sharing problems, which places greater demands on governance systems (Bushman, Chen, Engel & Smith, 2004). Consistent with this, prior literature finds that governance structures vary with the degree of firm diversification (Anderson, Bates, Bizjak & Lemmon, 2000). More specifically, the authors find CEO pay is less sensitive to performance in more complex or diversified firms, and these CEOs have lower stock ownership. Likewise, in linking agency costs to diversification strategies, Denis, Denis and Sarin (1997) find that higher managerial and block ownership are associated with lower levels of diversification. These studies imply that the importance of effective corporate governance mechanisms increases with firm diversification.

The law requires all publically traded firms in the U.S. to appoint a board of directors. Beyond an advisory role, the scope of the board's duties includes hiring, compensating and, if necessary, replacing the CEO. Therefore, monitoring by the board of directors is effective when the possibility of negative repercussions, such as loss of job or reputation, confines managers to act in accordance with shareholders' interests. In efforts to boost protection of shareholders' interests, recent NYSE and NASDAQ regulation changes tightened corporate governance requirements regarding board independence in order to enhance board effectiveness.[6]

Although I found no prior literature directly linking board independence to the efficiency of within-firm resource reallocation, prior studies point to implications of outside directorship on other aspects of business operations. Weisbach (1988) finds that for poorly performing firms, CEO turnover is more likely with a more independent board. Additionally, the probability of adding independent directors increases after poor performance (Hermalin & Weisbach, 1988). Byrd and Hickman (1992) find a positive impact of independent boards in a study on the market for corporate control. Specifically,

[6]See SEC ruling "NASD and NYSE Rulemaking: Relating to Corporate Governance," in http://www.sec.gov/rules/sro/34-48745.htm and http://www.sec.gov/rules/sro/nyse/34-50625.pdf.

they find the value loss of acquiring firms is significantly less when the board consists of a majority of outsiders. These studies point to board independence as an important feature of monitoring effectiveness. Monitoring effectiveness, in turn, implies more efficient capital investment choices within firms.

CHAPTER 3

HYPOTHESIS DEVELOPMENT

The goal of this study is to better understand one aspect of managers' investment decisions, namely the efficiency of resource reallocation across firms' divisions. The topic is economically relevant, as multisegment firms account for more than half of U.S. economic productivity (Maksimovic & Phillips, 2009). Additionally, approximately three-fourths of the financing for ongoing operations of multisegment firms is generated internally (MacKie-Mason, 1990). Casual observation that the multisegment organizational form continues to proliferate is consistent with the argument that conglomerate firms are not entirely inefficient. However, on the one hand, empirical and theoretical evidence suggests that the within-firm reallocation processes of multisegment firms are prone to inefficiencies due to agency costs. On the other hand, empirical and theoretical evidence also supports the opposite conclusion: that informational advantages within conglomerate firms, coupled with the availability of internally generated financing, can lead to more efficient resource reallocations. Therefore, I provide new evidence on the debate by testing the following hypothesis (stated in alternate form):

H1: Resource reallocation within firms is efficient.

As noted earlier, when financing occurs within the firm, HQ has greater incentive to monitor the use of funds than would an outside provider of funds, partly because HQ retains asset control rights and therefore the wherewithal to redistribute the assets. Additionally, operating in multiple industries can complicate the monitoring role relative to single-segment firms (Bushman et al., 2004). Thus, from a corporate governance standpoint, the more important task of monitoring (more important because funding takes place internally) is more demanding in a conglomerate setting.

A model by Scharfstein and Stein (2000) implies that inefficient resource reallocations are more likely to occur when managers have weaker incentives to maximize shareholder value. CEO self-interest, particularly protection of their reputation, the amount of resources they command, and their compensation, can contribute to a reluctance to efficiently alter the scope of operations within the firm. For example, CEOs of larger, more diversified organizations earn higher wages (Jensen & Murphy, 1990), creating disincentives to reduce firm size. Boot (1992) finds that bad managers fail to abandon losing projects in a timely manner, as this would expose their poor project selection, potentially damaging the manager's reputation. Likewise, in an examination of capital structure and financial distress, Ofek (1993) documents that entrenched managers avoid taking operational actions such as asset restructuring. More generally, prior literature finds that managers delay acknowledging bad news (Kothari, Shu & Wysocki, 2009). Under these circumstances, managerial action is likely inconsistent with shareholder value maximization.

The board of directors, an essential governance mechanism, has the primary responsibility for hiring and monitoring the CEO. The board has the ability to reduce assets under a manager's control, up to and including CEO dismissal. Turnover of top management is a pervasive response of financially distressed firms (Gilson, 1989), and prior literature finds CEO turnover is more sensitive to performance when the board of directors is more independent (Weisbach, 1988).

One goal of corporate governance is to alleviate agency problems. This, in turn should lead to more efficient resource reallocation decisions. This leads to my second hypothesis:

> **H2: The efficiency of within-firm resource reallocation varies with governance characteristics.**

CHAPTER 4

RESEARCH DESIGN

Hypothesis 1 predicts that on average, diversified firms efficiently reallocate resources across segments. In this study, I define efficiency in terms of giving priority to segments with the greatest within-firm comparative advantage. To proxy for this construct, I compare the industry-adjusted return on assets of each segment to the weighted average industry-adjusted return on assets of the firm's remaining segment(s), and evaluate the comparison conditional on the industry lifecycle stage of each segment.

I characterize efficient reallocation choices by the variables KEEP and DROP. KEEP is an indicator variable assigned a one when a segment's time *t*-1 industry-adjusted ROA is greater than the weighted average industry-adjusted ROA of the firms' remaining segments *and* the segment's industry lifecycle stage is classified as nondeclining (defined below), and a zero otherwise. When the KEEP indicator equals one, both the segment's within-firm profitability advantage and the segment's industry characteristics suggest that it is favorable (i.e., efficient) to preserve or increase resources to the segment. I provide a more in-depth discussion of KEEP in the next section of the paper.

The variable DROP identifies situations where an efficient resource reallocation relinquishes operations or reduces resources allocated to a given segment. The DROP indicator variable is assigned a one when a segment's time *t*-1 industry-adjusted ROA is less than the weighted average industry-adjusted ROA of the firms' remaining segments *and* the segment's industry lifecycle stage is classified as nongrowing (defined below), and a zero otherwise. Under the DROP scenario both the segment's within-firm profitability disadvantage and the segment's industry fundamentals suggest that it is unfavorable or inefficient to maintain operations in this segment. I provide a more in-depth discussion of DROP in the next section of the paper.

Efficiency of Resource Reallocation

I test whether segment-level resource reallocations vary with KEEP and DROP by estimating the following model:

$$\begin{aligned} INVEST = {} & \alpha_0 + \alpha_1\, KEEP_{ijt-1} + \alpha_2\, DROP_{ijt-1} + \alpha_3\, SEGLIQ_{ijt} + \alpha_4\, LEV_{jt-1} \\ & + \alpha_5 LN\,(MVE)_{jt} + \alpha_6 MB_{jt} + \alpha_7 FIRMCF_{jt} + \alpha_8 \Delta X\_FIN_{jt} + \alpha_9 SEGQ_{ijt} \\ & + \alpha_{10} SEGN_{jt} + \alpha_{11} SEGCF_{ijt} + \alpha_{12} DROP_{ijt-1} * LIQ_{ijt} + \alpha_{13}\, KEEP_{ijt-1} * LEV_{jt-1} \\ & + \alpha_{14}\, KEEP_{ijt-1} * FIRMCF_{jt} + \Sigma\, \textit{Year Indicator} + \Sigma\, \textit{Industry Indicator} + \varepsilon_{ijt} \qquad (1) \end{aligned}$$

Where INVEST is one of two dependent variables including:

$\%\Delta AT_{ijt}$ = the percentage change from year *t*-1 to year *t* in total assets allocated to segment *i* of firm *j*.

$\%\Delta RSS_{ijt}$ = the percentage change from year *t*-1 to year *t* in relative segment size of segment *i* of firm *j* where relative segment size equals total segment assets divided by total firm assets.

Independent Variables:

$KEEP_{ijt-1}$ = an indicator variable set to one when segment *i* of firm *j* has a high relative industry-adjusted ROA *and* is in a nondeclining industry, and zero otherwise. Segment ROA equals time *t*-1 segment operating profit scaled by segment assets. Industry adjusting subtracts the industry median from the segment value where industry medians are calculated using the contemporaneous Compustat population of pure play (i.e., single segment) firms in the same three-digit NAICS code. This variable is more fully described in the following section.

$DROP_{ijt-1}$ = an indicator variable set to one when segment *i* of firm *j* has a low relative industry-adjusted ROA *and* is in a nongrowth industry, and zero otherwise. Segment ROA is time *t*-1 segment operating profit scaled by segment assets. Industry adjusting subtracts the industry median from the segment value where industry medians are calculated using the contemporaneous Compustat population of pure play or single segment firms in the same three-digit NAICS code. This variable is more fully described in the following section.

I include the following firm- and segment-level control variables shown in prior research to influence firm investment behavior:

Firm-Level Controls:

LEV_{jt-1} = firm *j*'s one-year lagged debt-to-equity ratio (Compustat DLTT/CEQ).

$LN\ (MVE)_{jt}$ = the natural logarithm of the market value of equity of firm *j* at time *t*. The market value of equity is calculated as annual fiscal year-end closing price * common shares outstanding (Compustat PRCC_C * CSHO).

MB_{jt} = market-to-book equity ratio of firm *j* at time *t* (Compustat (PRCC_C * CSHO)/CEQ).

$FIRMCF_{jt}$ = cash flow of firm *j* at time *t* measured as operating activities-net cash flow less cash dividends scaled by average total assets (Compustat (OANCF – DV)/AT).

ΔX_FIN_{jt} = the net amount of cash flow from external financing sources of firm *j* at time *t* calculated as net change in equity plus the net change in debt, scaled by average assets. The change in equity is the net cash received from the sale (and/or purchase) of common and preferred stock less cash dividends paid (Compustat SSTK - PRSTKC - DV) and the net change in debt equals net cash received from the issuance (or reduction) of debt (Compustat DLTIS – DLTR + DLCCH).[7]

$SEGN_{jt}$ = the number of segments that firm *j* reports at time *t* as determined by unique segment identifiers (SID) in the Compustat segment files. The number is adjusted to reflect only economically meaningful segments as described in the sample selection detail of Chapter 5.

Segment-Level Controls:

$SEGLIQ_{ijt}$ = the liquidity or tangibility of segment *i* of firm *j* assets at time *t* measured as the industry median of current assets less current liabilities scaled by property, plant and equipment (Compustat (ACT – LCT) / PPENT). Industry medians are calculated using the contemporaneous Compustat population of single-segment firms in the same three-digit NAICS codes.

$SEGQ_{ijt}$ = estimate of segment *i* of firm *j* growth opportunities at time *t* calculated as the industry median market-to-book asset ratio (Compustat (AT - CEQ + (PRCC_F * CSHO))/AT). Industry medians are calculated using the contemporaneous Compustat population of single-segment firms in the same three-digit NAICS codes.

$SEGCF_{ijt}$ = an estimate of segment *i* of firm *j* cash flows at time *t* calculated as segment operating profit plus depreciation, all scaled by average segment assets.

KEEP and DROP[8] are the variables of interest. A positive coefficient on KEEP (α_1) provides support for H1 since an efficient resource reallocation would ramp up, preserve or "keep" operations in segments with the best comparative advantages within the firm after controlling for any mechanical effect on segment resources due to results of segment operations. A negative coefficient on DROP (α_2) also provides support for H1, since an efficient resource reallocation decision would be to reduce operations in segments with little within-firm comparative advantage; again, after controlling for any

[7]This measure follows Bradshaw, Richardson and Sloan (2006).
[8]For simplicity, I suppress variable subscripts hereafter.

mechanical effect on segment resources due to results of segment operations. I test these decisions separately because the efficiency of managers' decisions might differ between investment and disinvestment. Specifically, as discussed earlier, managers generally have personal incentives to grow, as opposed to shrink, their operations. Accordingly, I expect agency costs might play a greater role in the DROP decision. Next, I discuss the construction of KEEP and DROP in detail.

Empirical Proxies for Efficiency

Conceptually, efficient resource reallocation is a function of fundamental industry factors and resource reallocation that gives priority to segments with the greatest within-firm comparative advantage (Maksimovic & Phillips 2002). In this section I describe two measures, KEEP and DROP, which proxy for this construct. The measures capture the intersection between profitability and growth opportunities, which are widely understood to be two key determinants of investment decisions (Chen & Zhang, 2003).

As noted above, the first component of KEEP and DROP is the segment's within-firm comparative advantage. KEEP is the ex ante prediction that firms maintain or increase resources to a segment; and DROP is the ex ante prediction that firms drop or relinquish operations in a segment.

To determine the first component of KEEP and DROP, I follow Billett and Mauer (2003) and Berger and Hann (2007) in arguing that a segment that underperforms relative to the firm's remaining segments is likely an "inefficient" segment. I focus on firms' ROA because the appropriateness of investing or divesting operations is partially determined by the firm's ability to generate cash flows from its asset base (Zhang, 2000).

I calculate each segment's industry-adjusted return on assets less the weighted average industry-adjusted return on assets of the firm's remaining segments (Billett & Mauer, 2003). I designate an indicator variable for High Relative ROA (Low Relative ROA) equal to one if the segment's industry-adjusted ROA is greater (less) than the weighted average ROA of the firm's remaining segments, and zero otherwise.

While it might be intuitive to expect firms to keep (drop) segments with high (low) relative ROAs, it is easy to point to scenarios where this. as a one-dimensional measure of efficiency. is insufficient. Consider a firm with a high-tech division with significant growth opportunities but low earnings. Using relative ROA alone will incorrectly assess additional resources to this division as inefficient (that is, if the firm has division(s) with better ROA(s)). I incorporate industry fundamentals, as described next, to minimize this type of measurement error and enrich my efficiency measures.

The second component of KEEP and DROP is the segment's industry lifecycle stage. The benefits of internal capital markets have been shown to differ across lifecycle stages. For example, the value of reallocating resources is likely to be greatest for conglomerate firms with one or more high-growth, low-cash-generating divisions (Maksimovic & Phillips, 2008; Schoar, 2002). As noted earlier, the existence of an internal capital market allows conglomerate firms the option to use cash flows from one segment to more economically finance other, potentially cash-constrained segments.

Firm investment strategies also differ greatly across industry lifecycle stages. High-growth operations might require large, strategically preemptive capital expenditures; for operations in a declining stage, such expenditures can be inefficient.

Each segment is assigned one of four industry lifecycle stages: growth, technological change, consolidation or decline (Maksimovic & Phillips, 2008). The lifecycle stages are based on long-run changes in demand as proxied for by growth in sales and long-run changes in the number of producers in an industry.[9] I calculate a lifecycle stage for each three-digit NAICS industry, and assign each segment a lifecycle stage based on the segment's primary three-digit NAICS code. However, I allow for imprecision in the "technological change" and "consolidation" lifecycle stages, and instead use "nongrowth" to include the decline, technological change and consolidation lifecycle stages, and "nondecline" to refer to operations in growth, technological change and consolidation lifecycle stages. Because divisional ROAs are either greater than or less than the weighted average ROAs of the firm's remaining segments, this methodology does not result in nonuniqueness of the classification for divisions in the technological change and consolidation lifecycle stages.[10] Interestingly, and lessening any possible unintended impact of this research design choice, as reported in Appendix C, the majority of segment observations fall into the growth (39%) or decline (43%) stages.

KEEP (DROP) is designed to capture situations where combinations of a within-firm profitability advantage (disadvantage) and industry fundamentals unambiguously point toward keeping (dropping) operations in a segment. Consequently, a grey area exists when the two components together offer an ambiguous prediction. Under these scenarios, the segment's resource reallocation is not explicitly defined as efficient or inefficient. For example, under certain circumstances, it might be efficient to reduce

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[9]Appendix B provides additional detail on the calculation of industry lifecycle stages, and Appendix C presents the distribution of segments used in this study by industry lifecycle stage.
[10]The possible scenario of a segment's ROA equaling the weighted average ROA of the firm's remaining segments did not occur in my sample.

resources in a growth segment, but my measures never assert this. Instead, the measures remain neutral. The possible existence of such classification errors reduces the power of my analysis and works against my ability to document a statistically significant result.

Combining the lifecycle stage and relative performance indicator variables, the KEEP variable is set to equal one when a segment has a relatively high industry-adjusted ROA and the segment is in a nondeclining industry lifecycle stage. In segments with both of these characteristics, an efficient resource reallocation retains or increases resources allocated to the segment. Clearly, firms efficiently keep operations in other combinations of a relative ROA * industry lifecycle stage matrix. As described above, it may (or may not) be efficient to keep a segment with relatively poor performance in a growing industry. The intuition behind KEEP is that it is likely inefficient for a firm to dispose of segments that are outperforming the firm's other segment(s) when these segments are in an industry that is not declining. Thus, KEEP (DROP) is assigned a one in situations that explicitly point to growing (relinquishing) resources in these operations, and zero otherwise.

Overall, if managers' decisions are relatively efficient, I expect KEEP to be positively correlated with firm size, the percentage change in segment assets (%ΔAT) and the percentage change in relative segment size (%ΔRSS). If firms invest (versus divest), a positive correlation is consistent with firms directing resources toward efficient uses.

I assign the DROP variable a value of one when a segment has relatively low industry-adjusted ROA compared to the weighted average of the firm's remaining segments, and the segment is in a nongrowing industry. An efficient resource reallocation withdraws resources from these operations. It is likely inefficient for a firm to retain operations that are underperforming the firm's other operations in an industry that is nongrowing. In other words, DROP = 1 when it is proactively efficient to reduce resources directed toward these operations, and zero otherwise. Therefore, holding all else equal, I expect DROP to be negatively correlated with firm size, the percentage change in segment assets (%ΔAT) and the percent change in relative segment size (%ΔRSS). Finally, the construction of KEEP and DROP gives rise to an expected negative correlation between the two variables.

Empirical Proxies for the Degree of Resource Reallocation

I estimate changes in the resource allocation decisions of firms in two ways. First is the annual percentage change in total assets allocated to each segment (%ΔAT).

Second, to capture a different dimension of resource reallocations within firms, I incorporate a scaled version of the above variable, i.e., the annual percentage change in relative segment size (%ΔRSS). %ΔRSS captures changes in the importance of a segment to the firm, where importance is measured as the proportion of segment size to overall firm size. I calculate relative segment size as total segment assets divided by total firm assets.

Control Variables

I include a number of firm- and segment-level variables in my regression models to control for other factors that might explain resource reallocations. Prior research shows that firms are more willing to both invest and reverse investment when there is a liquid market for the firm's assets (Schlingemann, Stulz & Walkling, 2002). I control for the liquidity of segment assets (SEGLIQ) but do not make a prediction on the sign of the coefficient. I interact the liquidity term with DROP to control for the possibility that firms are less able to dispose of illiquid assets. I expect a positive coefficient on this interaction term.

Prior research shows that leverage is negatively related to growth at both a firm and segment level (Lang, Ofek & Stulz, 1996). This implies a negative relationship with KEEP as well as %ΔAT and %ΔRSS. For poorly performing firms, however, higher leverage increases the speed at which firms react to poor performance (Jensen, 1986). This suggests a positive relationship with DROP, as divisions assigned an affirmative DROP are, by definition, performing poorly relative to the firm's other divisions. I control for leverage via the LEV variable, but do not make a prediction for the sign of the coefficient.

Financing constraints play an important role in firm investment decisions (e.g., Baker, Stein & Wurgler, 2003; Billett & Mauer, 2003). In an insightful new working paper, Kuppuswarmy and Villalonga (2010) use the 2008-2009 financial crisis as a natural experiment to examine the impact that external financing constraints have on changes in the value of diversified versus single-segment firms. They find strong evidence of a positive effect of diversification on firm value during a period of financial constraints. The authors attribute the incremental increase in multisegment firm value to a greater ease of access to funds and, under the crisis circumstances, an increase in the efficiency of internal versus external capital markets.

I control for financing constraints with a measure of firm-level cash flow (FIRMCF). Greater cash flow implies fewer financial constraints; however, positive firm-level cash flow theoretically should not influence efficient segment-level investment. In addition, prior studies point to inefficient over-investment when firms have excess free cash flow (Jensen, 1986; Richardson, 2006). Accordingly, I do not make a prediction of the sign of the coefficient on FIRMCF.

Highly levered or severely cash constrained firms may be forced to dispose of assets in relatively profitable segments to meet debt obligations. To capture this possibility, I include two interaction terms: KEEP * LEV and KEEP * FIRMCF. I expect the coefficient on the interaction with leverage to be negative, and the coefficient on the interaction with firm cash flow to be positive.

I include a measure of the change in the level of firms' external financing (Δ_XFIN). Controlling for external financing allows the model specifications to better capture the degree of internal financing that occurs in multisegment firms, a major aspect of this study. As noted earlier, approximately 75% of funding for investment activity is generated within the firm (MacKie-Mason, 1990); nevertheless, changes in firms' external financing are expected to influence investment behavior. As described above with FIRMCF, the actual funds procured by the firm, regardless of their source, theoretically should not influence efficient segment-level investment. Therefore, I do not make a prediction on the sign of the coefficient of the change in the level of external financing variable.

The regression models include the natural logarithm of MVE (LN MVE) to control for firm size. I expect size to be positively related to the probability of an active internal capital market, or opportunities for cross-subsidization. I also include the number of operating segments (SEGN), which provides information on the firm's degree of diversification and complexity. Holding all else equal, an increase in the number of segments will necessarily change the proportion of assets allocated to each segment. Therefore, SEGN also controls for any mechanical influence when the dependent variable represents change in relative segment size (i.e., %ΔRSS).

I control for segment investment opportunities with an industry measure of Tobin's *q* calculated using single-segment firms and assigned to segments based on three-digit NAICS codes (SEGQ). In general, I expect investment to rise with growth opportunities. However, studies show that, compared to single-segment firms, *q* is less sensitive to investment in multisegment firms (Scharfstein & Stein, 2000). Prior studies have used this result as evidence of inefficient resource reallocation, although subsequent research questions the use of single-segment firms as an appropriate benchmark (Chevalier, 2000).[11] This study examines only multisegment firms, and without incorporating single-segment firms as a benchmark for efficiency, I expect a positive coefficient on SEGQ.

I include the market-to-book equity ratio (MB) as an estimate of firm-level growth opportunities. Like the expectations for segment-growth opportunities above, in general, I expect changes in investment to parallel growth opportunities and therefore predict a positive coefficient on MB. An estimate of segment cash flow (SEGCF) serves to control for mechanical changes in segment assets due to results of operations. SEGCF is calculated as segment operating profit plus segment depreciation, all scaled by segment assets.

[11]The use of single-segment firms as a benchmark for determining the efficiency of conglomerate firms has a theoretical basis described in Coase (1937). Whether a task is optimally organized as a solo venture or resides within a larger organization is a result of a cost-benefit analysis. Therefore, studies aggregate the results of single-segment, different-industries firms so as to mirror the operations of conglomerate firms. As noted previously, endogeneity in the decision to diversify reduces the validity of this benchmark.

Finally, the model includes fixed effects for year and industry due to the pooled, time-series, cross-sectional nature of the data. I report *t*-statistics based on robust standard errors clustered at the firm level following Petersen (2009).[12]

Corporate Governance and Efficiency

My second hypothesis predicts that the efficiency of resource reallocation varies with firms' governance characteristics. Boards of directors are an important governance mechanism for monitoring the decisions of CEOs. Weisbach (1988) finds that board independence is the primary factor influencing the degree of board effectiveness in representing shareholder interests. Additionally, the presence of an independent board has also been shown in prior literature to be negatively related to proxies for earnings management (Klein, 2002) and the probability of financial fraud (Beasley, 1996). The authors of both these studies attribute their results to improved monitoring when boards are more independent. Also, as noted previously, in 2002 the SEC initiated new rulings which tightened board independence requirements specifically in order to enhance board monitoring effectiveness.[13]

I expect additional monitoring, proxied for by a higher percentage of board of director independence, to accentuate the efficient reallocation of resources. To test this hypothesis, I examine firm responsiveness to the DROP classification. I assign a DROP variable equal to one when a segment's time *t*-1 ROA is less than the weighted average ROA of the firm's remaining segments and the segment is in a nongrowing industry. I

[12]Results and inferences do not change when standard errors are corrected for using two-way clustering.
[13]See SEC ruling "NASD and NYSE Rulemaking: Relating to Corporate Governance," in http://www.sec.gov/rules/sro/34-48745.htm and http://www.sec.gov/rules/sro/nyse/34-50625.pdf.

expect firms with more independent boards to act more quickly and divest or reduce resources to divisions where DROP = 1 than do boards with a greater percentage of affiliated members.

I partition my sample into increasing quintiles sorted by industry and year based on the percentage of the board of directors that, aside from holding a director role, is not affiliated with the firm. Employees, including the CEO, ex-employees and legal representation, are examples of firm affiliations that are not considered independent. Next, I identify the number of DROPs for each segment over a 4-year period, specifically, time *t*-3 through time *t*. Recurring DROPs suggest that the firm is maintaining operations in an inefficient segment. I anticipate that the monitoring activities of a more independent board result in the elimination of inefficient segments more quickly than the monitoring of a more dependent board which might be more aligned with the CEO.

To examine the impact of an independent board of directors on the firm's responsiveness in abandoning operations in inefficient segments, I estimate the following model:

$$DROPSUM_{ijt} = \gamma_0 + \gamma_1 INDEP_{jt} + \gamma_2 SEGLIQ_{ijt} + \gamma_3 LEV_{jt-1} + \gamma_4 LN\ (MVE)_{jt} + \gamma_5 MB_{jt} + \gamma_6 FIRMCF_{jt} + \gamma_7 \Delta X\_FIN_{jt} + \gamma_8 SEGQ_{ijt} + \gamma_9 SEGN_{jt} + \gamma_{10} SEGCF_{ijt} + \varepsilon_{ijt} \quad (2)$$

where:

$DROPSUM_{ijt}$ = the number of DROPs assigned to segment *i* of firm *j* over the four-year period *t*-3 through *t*. A DROP is assigned a value of one when a segment's time *t*-1 ROA is less than the weighted average

ROA of the firm's remaining segments and the segment is in a nongrowing industry, and zero otherwise.

$INDEP_{jt}$ = increasing quintiles of the variable PCT_IND sorted by industry and year where PCT_IND equals the percent of independent board of directors of firm *j* at time *t*. Therefore, firms with a greater percentage of board independence are assigned to higher quintiles.

The remaining variables are control variables previously defined with equation (1) and are also defined in Appendix A. I calculate robust standard errors clustered by firm.

$INDEP_{jt}$ is the variable of interest. An increase in the dependent variable implies less resource reallocation responsiveness, or that firms maintain inefficient segments for a longer time period. The governance variable quintiles are increasing in board independence; therefore, a negative and significant coefficient on $INDEP_{jt}$ (γ_1) supports the hypothesis that governance characteristics vary with efficient resource reallocation.

As the liquidity or the ability to dispose of segment assets increases, the incentives to retain resources in underperforming segments diminish. Therefore, I expect the sign on SEGLIQ to be negative.

CHAPTER 5

SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

I obtain segment-level and firm-level information from Compustat segment files and Compustat industry files for the years 1998 through 2008. A change in segment reporting regulation became effective for fiscal year-ends beginning after December 15, 1997. A line of research, discussed in greater detail in the limitations section, points to substantial improvements in numerous aspects of segment-reporting disclosure under the new regulation, SFAS No. 131 (e.g., Botosan, McMahon & Stanford, 2010; Botosan & Stanford, 2005). Additionally, Hyland and Diltz (2002) conclude that studies examining the impact of firms' internal capital markets using segment data under the prior regulation (i.e., SFAS No.14) are subject to potential reporting biases. Therefore, I use 1998 as a starting point to ensure that the sample observations are reported under the current segment-reporting regime.

I retain firms with sufficient data to calculate firm- and segment-level control variables that report at least two business segments after a screen for noneconomically meaningful segments. Noneconomically meaningful segments often represent intercompany transfers or corporate eliminations. These include segments with a Compustat segment identification number (SID) of 99, or a segment name of "Corporate," "No Operations," or "Eliminations." I review the segment descriptions of remaining observations and remove segment observations with unclassified operations and segments with negative sales or assets, as these also tend to represent intercompany transfers or eliminations. The above screening results in a preliminary sample of 6,138 multisegment firms.

Additionally, to ensure that the segments reported substantially reflect aggregate firm operations, I follow Berger and Ofek's (1995) convention and require the sum of the segment sales to be within 5% of total firm sales. This results in the elimination of 220 firms. I also require the sum of segment assets to be within 25% of total firm assets, resulting in the elimination of 418 firms from the sample. Consistent with related literature, I remove foreign firms (Compustat FIC not equal to USA), firms in regulated industries (SIC between 4900-4999), and financial industries (SIC between 6000-6999) due to the noncomparability of financial ratios for these industries.

Table 1 summarizes the sample selection criteria. The resulting sample consists of 15,031 segment observations and 5,698 firm-year observations from 1,454 unique multisegment firms covering the period 1998-2008.

Table 2 provides descriptive statistics for firm-year observations. Panel A reports firm-level summary statistics. The mean (median) number of segments is 2.91 (3.00). As expected, because all firms report multiple segments, sample firms are fairly large, with average sales just over $2,852M and average assets of $3,420M. Sample firms are profitable with a mean (median) operating income of $237M ($37) and ROA of 0.06 (0.08). Consistent with related studies covering a similar time period, the mean (median) percentage of independent board members is 69% (71%).

Panel B in Table 2 reports segment-level summary statistics. The mean (median) percent change in total assets allocated to segments, one proxy for resource reallocations, is 0.05 (0.02) while the mean (median) percent change in relative segment size is -0.01 (-0.01). Thirty-eight percent of the sample segments receive a KEEP designation (i.e., the segment's relative ROA is greater than the weighted average ROA of the firm's remaining segments, and the segment is in a nondeclining industry), while 23% of segments are designated as DROPs. The remaining 41% of the sample segments do not allow for an unambiguous KEEP or DROP designation. The mean (median) DROPSUM or number of DROPs assigned to a segment over a consecutive 4-year period is 2.40 (2.00).

Panel C in Table 2 provides a breakdown of the number of segments for firm-year observations. Approximately three-fourths of total firm-year observations report two or three segments, while 97% of the firm-year observations report less than six segments. Therefore the results of my analysis are unlikely to be driven by conglomerate firms with a large number of segments; rather, the sample appears to reflect firms reallocating resources across two to four segments. Table 3 presents Pearson and Spearman correlations for the primary variables used in regression models. As expected, KEEP and DROP are highly negatively and significantly correlated at -0.43. Also as anticipated, KEEP (DROP) is positively (negatively) and significantly associated with the proxies for firms' resource reallocations. Specifically, the association between KEEP (DROP) and the percentage change in segment assets (%ΔAT) is 0.09 (-0.10). For the percentage change in relative segment size (%ΔRSS), the correlation is slightly smaller at 0.05 (-0.06). The correlations between KEEP and DROP and the control variables are generally as expected. KEEP (DROP) is positively (negatively) and significantly associated with firm size at 0.05

(-0.06). KEEP (DROP) is negatively (positively) correlated with LEV (-0.04 and 0.06). LEV is negatively and significantly correlated with %ΔRSS, as expected (-0.02), but has no significant correlation with %ΔAT.

Leverage is positively and significantly correlated with the number of segments (SEGN) with a value of 0.13. This is consistent with Lewellen’s (1971) rationale that the conglomerate organization form increases firms’ debt capacity as the imperfect correlation of revenue streams within multisegment firms reduces risk to debt holders.

The change in external financing (Δ_XFIN) is negatively and significantly associated with firm size (-0.15) and firm cash flow (-0.32), suggesting, somewhat intuitively, that firms with greater size and cash flow may have greater opportunity to rely more on internal capital markets in place of external financing. Additionally, the negative and significant correlation between Δ_XFIN and SEGN, at -0.04, suggests that as the number of firms’ segments increases, the existence of an internal capital market allows for a reduction in the reliance on external financing.

Finally, a 0.11 positive and significant association between the percentage of independent board members (PCT_IND) and SEGN is consistent with prior literature that suggests increases in complexity are met with stronger corporate governance mechanisms (Bushman et al., 2004).

Table 4 reports a frequency matrix of DROPSUM and PCT_IND. These are the primary variables used to examine the impact of an independent board of directors on the firm’s responsiveness in dropping operations in inefficient segments. DROPSUM represents the number of consecutive DROPs assigned to a segment over a 4-year period. For example, a DROPSUM of 2 is assigned when my ex ante prediction of DROP is assigned to a particular segment in 2 consecutive years. A prediction of DROP is assigned when the segment fails to show a within-firm comparative advantage; therefore, consecutive DROPs indicate that the firm fails to act in accordance with my predictions of efficient resource reallocation. PCT_IND represents increasing quintiles of the percentage of independent boards of directors. I conjecture that the responsiveness of boards of directors to reducing resources to inefficient operations is increasing with board independence.

The general distribution appears symmetric, with no particular governance quintile overrepresented; the smallest percentage of observations is in quintile 2 with 18.2%, and the largest is quintile 4 with 24.15%. DROPSUMs of 1 and 4 are the most populated, with approximately 30% of observations in each category. DROPSUMs of 2 represent 23% of observations, and DROPSUMs equal to 3 account for 17% of observations. Table 2 reports an average DROPSUM of 2.49.

Firms in the lowest governance quintile, Q1, report the highest number of DROPSUMs equal to 4 (71 observations), while the Q1 firms drop segments designated inefficient within one year in 51 instances. Firms in the highest governance quintile, Q4, drop segments designated inefficient within one year in 71 instances, and report 69 instances of DROPSUM=4.

Table 1

Sample Selection Summary

	Firm-Year Observations	Unique Firms	Segment Observations
Initial segment file data collection			169,120
Less: Corporate eliminations			23,977
Segments with no operations			1,422
Segments with negative assets			194
Economically meaningful segments	81,918	15,930	143,527
Less: Single-segment firms	50,600	9,792	50,600
Multisegment firms	31,318	6,138	92,927
Less:			
Insufficient data	14,005	2,747	40,173
Financial industry firms	3,985	608	12,610
Regulated firms	1,706	201	5,502
Foreign firms	4,298	490	14,798
Less firms with total segment sales			
Outside 5% of firm sales	529	220	1,600
Outside 25% of firm assets	1,097	418	3,213
Sample Observations	5,698	1,454	15,031

This table summarizes the sample selection criteria for observations used in this study. Data are from Compustat segment and annual files. The sample includes the years 1998-2008.

Table 2

Descriptive Statistics for Multisegment Firm-Years

Panel A: Firm-Level Summary Statistics
N = 5,698

Variable	Mean	Median	Q1	Q3	Std Dev
SEGN	2.91	3.00	2.00	3.00	1.08
OIAD	237	37	2.75	154	660
SALES(MM)	2,852	569	120	1,993	8,620
ASSETS(MM)	3,420	557	116	1,876	19,689
ROA	0.06	0.08	0.03	0.12	0.12
LEV	0.58	0.38	0.05	0.83	1.39
MVE	3,060	408	64	1,561	13,785
MB	2.09	1.71	0.98	2.73	2.52
FIRMCF	0.06	0.07	0.02	0.11	0.09
ΔX_FIN	0.01	-0.01	-0.05	0.03	0.12
PCT_IND	0.69	0.71	0.58	0.83	0.17

Panel B: Segment-Level Summary Statistics
N=15,031

%ΔAT	0.05	0.02	-0.07	0.15	0.37
%ΔRSS	-0.01	-0.01	-0.12	0.09	0.28
KEEP	0.38	0.00	0.00	1.00	0.49
DROP	0.23	0.00	0.00	0.00	0.42
SEGASSETS	1,014	149	27.40	602	5,838
SEGLIQ	1.65	1.17	0.35	2.57	1.62
SEGQ	1.67	1.52	1.21	1.95	0.62
SEGCF	0.15	0.15	0.06	0.25	0.54
DROPSUM	2.49	2.00	1.00	4.00	1.21

Panel C: Segment Frequency

Firm-years with 2 segments	2,564
Firm-years with 3 segments	1,846
Firm-years with 4 segments	774
Firm-years with 5 segments	335
Firm-years with 6 or more	179
Total	5,698

This table provides descriptive statistics for multisegment firms over the period 1998-2008. Multisegment firms are those that report more than one segment in the Compustat segment file. Panel A presents firm-level summary statistics. SEGN is the number of segments reported based on unique segment identification numbers (SID) assigned by Compustat in the segment file. OIAD is operating income after depreciation. SALES equal total firm sales. ASSETS equal total firm assets. ROA is return on assets calculated

Table 2 continued

as income after depreciation, scaled by total assets. LEV is the debt-to-equity ratio computed as long-term debt, scaled by common equity. MVE is market value of equity, calculated as annual fiscal year-end closing price x common shares outstanding. MB is market-to-book equity ratio, calculated as MVE/common equity. FIRMCF is a measure of firms' cash flow measured as operating activities-net cash flow less cash dividends, scaled by average assets. ΔX_FIN represents the net amount of cash flow from external financing sources calculated as net change in equity plus the net change in debt, scaled by average assets. The change in equity is the net cash received form the sale (and/or purchase) of common and preferred stock less cash dividends paid (Compustat SSTK - PRSTKC - DV), and the net change in debt equals net cash received form the issuance (or reduction) of debt (Compustat DLTIS –DLTR + DLCCH). PCT_IND is an estimate of the percentage of the board of directors that is independent (i.e., not affiliated with the firm). Panel B presents summary statistics on a segment level. %ΔAT is the percentage change in segment assets calculated as the difference between current and lagged segment assets, divided by lagged assets. %ΔRSS is the percentage change from prior year in relative segment size where relative segment size is calculated as segment assets over firm assets. KEEP is an indicator variable set to one when a segment has a high relative ROA *and* is in a nondeclining industry, and zero otherwise. See Chapter 4 in the text for a more detailed description of the variable. DROP is an indicator variable set to one when a segment has a low relative ROA *and* is in a nongrowth industry, and zero otherwise. See Chapter 4 in the text for a more detailed description of the variable. SEGASSETS equals segment assets. SEGLIQ is a measure of asset liquidity measured as the industry median of the sum of total current assets less total current liabilities, all divided by property, plant and equipment. Industry is defined using three-digit NAICS. SEGQ is a measure of segment growth opportunities calculated as median industry *q* of single segment firms in the same three-digit NAICS code where *q* is calculated as the market-to-book assets ratio (Compustat (AT - CEQ + (PRCC_F *CSHO))/average assets). SEGCF is segment cash flow measured as segment operating profit plus depreciation, scaled by segment assets. DROPSUM is the number of DROPs assigned to a segment over the 4-year period *t*-3 through *t*. Variable definitions are also provided in Appendix A.

Table 3

Pearson and Spearman Correlations

	%ΔAT	% ΔRSS	KEEP	DROP	SEG LIQ	LEV	LN (MVE)	MB	FIRM CF	Δ _ XFIN	SEGQ	SEGN	SEG CF	PCT_ IND
% ΔAT		0.71	0.06	-0.08	0.02	0.01	0.13	0.09	0.07	0.25	0.06	-0.01	0.13	-0.02
		(.0001)	(.0001)	(.0001)	(.0169)	(.0707)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.2208)
%	0.67		0.05	-0.06	0.01	-.01	0.01	-0.01	-0.03	-0.12	0.01	-0.04	0.08	0.02
ΔRSS	(.0001)		(.0001)	(.0001)	(.4855)	(.0898)	(.8395)	(.3184)	(.0001)	(.0001)	(.1431)	(.0001)	(.0001)	(.1720)
KEEP	0.09	0.05		-0.43	0.22	-0.02	0.05	0.04	0.05	-0.01	0.27	-0.02	0.14	-0.01
	(.0001)	(.0001)		(.0001)	(.0001)	(.0142)	(.0001)	(.0001)	(.0001)	(.3314)	(.0001)	(.0565)	(.0001)	(.8842)
DROP	-0.10	-0.06	-0.43		-0.14	0.04	-0.06	-0.05	-0.05	0.00	-0.16	0.02	-0.17	-0.01
	(.0001)	(.0001)	(.0001)		(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.9640)	(.0001)	(.0169)	(.0001)	(.3796)
SEG	0.01	0.00	0.19	-0.14		-0.08	-0.02	0.06	-0.07	0.04	0.36	-0.07	-0.01	0.14
LIQ	(.3229)	(.9640)	(.0001)	(.0001)		(.0001)	(.0190)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.1177)	(.0001)
LEV	0.01	-0.02	-0.04	0.06	-0.20		0.05	0.34	-0.02	0.07	-0.03	0.04	-0.02	0.05
	(.2937)	(.0062)	(.0001)	(.0001)	(.0001)		(.0001)	(.0001)	(.0280)	(.0001)	(.0001)	(.0001)	(.0164)	(.0001)
LN	0.17	-0.01	0.05	-0.06	-0.03	0.19		0.32	0.29	-0.09	0.09	0.38	0.10	0.19
(MVE)	(.0001)	(.4735)	(.0001)	(.0001)	(.0001)	(.0001)		(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0126)
MB	0.20	-0.03	0.06	-0.08	0.08	0.13	0.52		0.15	-0.01	0.14	0.08	0.03	0.08
	(.0001)	(.0003)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)		(.0001)	(.1025)	(.0001)	(.0001)	(.0001)	(.0001)
FIRM	0.10	-0.05	0.04	-0.06	-0.07	-0.05	0.28	0.28		-0.29	-0.01	0.02	0.19	-0.05
CF	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)		(.0001)	(.5446)	(.0501)	(.0001)	(.0001)
Δ _	0.21	-0.11	0.01	0.00	0.02	0.09	-0.15	-0.06	-0.32		0.04	-0.02	-0.06	-0.06
XFIN	(.0001)	(.0001)	(.3751)	(.9582)	(.0045)	(.0001)	(.0001)	(.0001)	(.0001)		(.0001)	(.0047)	(.0001)	(.0001)
SEGQ	0.09	0.01	0.25	-0.15	0.31	-0.12	0.09	0.26	0.00	0.04		-0.03	0.04	0.10
	(.0001)	(.4796)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.9215)	(.0001)		(.0009)	(.0001)	(.0001)
SEGN	-0.01	-0.05	-0.02	0.02	-0.07	0.13	0.36	0.13	-0.01	-0.04	-0.02		0.01	0.11
	(.3324)	(.0001)	(.0134)	(.0142)	(.0001)	(.0001)	(.0001)	(.0001)	(.0688)	(.0001)	(.0038)		(.4207)	(.0001)
SEG	0.25	0.10	0.25	-0.35	0.01	-0.04	0.20	.24	.34	-.10	.08	.01		0.02
CF	(.0001)	(.0001)	(.0001)	(.0001)	(.2530)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0889)		(.1798)

Table 3 continued

	%ΔAT	% ΔRSS	KEEP	DROP	SEG LIQ	LEV	LN (MVE)	MB	FIRM CF	Δ _ XFIN	SEGQ	SEGN	SEG CF	PCT_ IND
PCT_ IND	-0.01 (.4360)	0.03 (.0336)	0.01 (.5544)	-0.01 (.2511)	0.15 (.0001)	0.10 (.0001)	0.21 (.0001)	0.12 (.0001)	-0.07 (.0001)	-0.07 (.0001)	0.11 (.0001)	0.10 (.0001)	0.01 (.3273)	

This table presents Pearson (above the diagonal) and Spearman (below the diagonal) correlations (*p*-values) for variables used in the regression analyses. There is a maximum of 15,031 segment firm-year observations over the period 1998-2008. See Table 2 or Appendix A for variable definitions.

Table 4

DROPSUM by Governance Quintile Matrix

	PCT_IND Quintiles						
DROPSUM	Q1 (Lo)	Q2	Q3	Q4	Q5 (Hi)	Total	Percent
1	51	87	74	64	71	347	29.51
2	60	63	51	40	52	266	22.62
3	38	46	31	43	43	201	17.09
4	71	88	67	67	69	362	30.78
Total	220	284	223	214	235	1,176	100.00
Percent	18.71	24.15	18.96	18.20	19.98	100.00	

This table presents frequency distributions of DROPSUM, using the observations used to estimate equation (2). DROPSUM is the number of consecutive DROPs assigned to a segment over the 4-year period *t*-3 through *t*. PCT_IND represents increasing quintiles of the percentage of independent boards of directors.

CHAPTER 6

EMPIRICAL ANALYSIS

Hypothesis 1 predicts that resource reallocation within firms is positively associated with efficiency. As discussed in Chapter 4, when a within-firm comparative advantage is detected for a segment, an efficient resource reallocation would add, or at least maintain (i.e., KEEP) the level of resources provided to that segment. Likewise, when a segment fails to exhibit a within-firm comparative advantage, an efficient reallocation reduces (i.e., DROPs) resources available to that segment.

Hypothesis 2 predicts that the association between efficiency and firms' resource reallocation varies with firms' governance characteristics. My analysis examines firm responsiveness, that is, how quickly the firm moves toward abandoning operations in inefficient segments. In this section, I describe the results of tests of these hypotheses.

Tests of Main Hypotheses

Table 5 reports regression results of equation (1) where I examine whether changes in segment-level resource reallocations vary as expected with KEEP and DROP.

In column 1, the dependent variable $\%\Delta AT$ captures the gross change in assets allocated to segments. In column 2, the dependent variable $\%\Delta RSS$ captures changes in the importance of a segment to the firm, where importance is measured as the proportion of segment size to overall firm size.

As expected, the estimates for the coefficients on the first of two variables of interest, KEEP, are positive and significant in both specifications. α_1 equals 0.023 with a *t*-statistic of 2.08 when the dependent variable is %ΔAT, and α_1 has a coefficient of 0.024 with a *t*-statistic of 2.66 with %ΔRSS as the dependent variable. These results suggest that firms tend to increase resources to segments with a within-firm comparative advantage.

Also as predicted, the coefficients on DROP, the second variable of interest, are negative and significant in both model specifications. With %ΔAT as the dependent variable, the coefficient on α_2 is -0.043 with a *t*-statistic of -4.04. With %ΔRSS as the dependent variable, the coefficient on α_2 is -0.028 with a *t*-statistic of -3.12. These suggest that firms reduce or abandon operations in divisions that lack a within-firm comparative advantage. The findings on KEEP and DROP provide support for H1 that, on average, firms efficiently reallocate resources across divisions.

The signs on statistically significant control variables are generally as expected. For example, the firm level proxy for size (LN(MVE)), and the proxy for segment-level performance (SEGCF) are positive under both specifications. Larger firms are expected to have more active internal capital markets and, holding all else equal, better performing segments mechanically receive additional resources.

For the dependent variable %ΔAT, the magnitude of the coefficient on DROP (-0.043) is almost twice that of KEEP (0.023), while both have reasonably important economic magnitudes. DROP’s influence on %ΔAT is 0.002. Multiplying this by mean assets suggests that dropping an inefficient segment reduces assets in that segment by an average of approximately $6M, while increases to efficient operations average approximately $3M.

Table 6 reports the results of regression equation (2) where I examine the impact of corporate governance on firms' responsiveness in abandoning operations in inefficient segments.

The dependent variable, DROPSUM, represents the number of a segment's DROPs over a 4-year period. Thus, the variable ranges from 1 to 4, with 4 representing firms with the least responsiveness or willingness to abandon operations in segments lacking a within-firm comparative advantage.

INDEP represents increasing quintiles of the percentage of independent board members. Therefore, the higher quintiles contain firms with more independent boards. The regression coefficient on INDEP is negative (-0.053) and statistically significant at the 5% level, using a two-tailed test. I interpret this finding as evidence that firms with more independent boards more quickly reallocate resources away from segments with lower within-firm comparative advantages than do firms with more affiliated or dependent boards. This result is consistent with H2, which predicts that the positive association between efficiency and firms' resource reallocation decisions varies with governance mechanisms.

Predicted signs for control variables are generally as expected. A highly statistically significant, negative coefficient of -3.73 on SEGCF (*t*-statistic of -16.79) indicates that the more cash-producing segments are not likely dropped. The positive and significant sign on the control variable SEGLIQ is counter-intuitive, as a segment with more liquid or marketable assets can be more readily dropped when the segment is underperforming relative to the firm's other operations.

Construct Validity Test: Future Performance Analysis

To test the validity of the KEEP and DROP variables, I examine the future earnings performance of sample firms. As previously described, KEEP is the ex ante prediction that firms maintain or increase resources to a segment. The counterpart to KEEP is DROP, the ex ante prediction that firms drop or reduce resources to a segment.

I assume that multisegment firms invest strategically across their divisions to enhance overall firm profitability. Therefore, if KEEP (DROP) adequately reflects situations where it is advantageous for the firm to add (relinquish) resources to (from) a segment, firms with managers that reallocate resources in accordance with the KEEP and DROP predictions should outperform firms where managers do not do so. To test this prediction, I partition my sample into firms whose subsequent resource reallocations are in accordance with my ex ante predictions and firms whose subsequent resource reallocations are not in accordance with my ex ante predictions. In stacked regression analyses, I then compare the future performance of the two sets of firms. Next, I describe the tests in more detail and provide descriptive statistics and test results.

In this analysis, I examine changes in resource allocation for time periods t+1 through t+3 and examine: first, whether the adjusted percentage of resources allocated to a particular segment increases (decreases) in the year subsequent to the KEEP (DROP) designation; and second, whether the relative segment size, calculated as total segment assets over total firm assets, increases (decreases) in the year subsequent to the KEEP (DROP) designation.

KEEP and DROP are assigned on a segment level; therefore, to examine firm-level performance measures I construct two variables that aggregate the amount of resources reallocated to segments in accordance with predictions. First, I assign a firm-level F_DOES indicator variable equal to one when at least half of firms' segment resource reallocation decisions agree with my ex ante predictions, and a zero otherwise. Next I use the continuous variable PCTGOOD to indicate the percentage of firm segments that received or were relieved of resources according to predictions. I estimate the following regression models:

$$EARN\_PERF_{jt+n} = \beta_0 + \beta_1 F\_DOES_{jt} + \beta_2 EARN\_PERF_{jt} + \beta_3 \, LN\,(MVE)_{jt} + \beta_3 \, OIAD\_LOSS_{jt} + \varepsilon_{jt} \tag{3}$$

$$EARN\_PERF_{jt+n} = \lambda_0 + \lambda_1 PCTGOOD_{jt} + \lambda_2 EARN\_PERF_{jt} + \lambda_3 \, LN\,(MVE)_{jt} + \lambda_3 \, OIAD\_LOSS_{jt} + \varepsilon_{jt} \tag{4}$$

Where: $EARN\_PERF_{jt+n}$ is one of five dependent variables representing future earnings performance of firm *j* measured at of one of the 3 subsequent years, including:

ROA_{jt+n}	= Return on Assets calculated as operating income scaled by total assets of firm *j* at time *t*+1, *t*+2 or *t*+3 (Compustat OIAD/AT).
ROE_{jt+n}	= Return on Equity calculated as income after depreciation, scaled by beginning-of-year common equity of firm *j* at time *t*+1, *t*+2 or *t*+3 (Compustat OIAD/CEQ_{t-1}).

NI_AT_{jt+n} = Net Income scaled by total assets of firm *j* at time *t+1*, *t*+2 or *t*+3 (Compustat NI/AT).

$OPEPS_{jt+n}$ = Earnings per Share from operations of firm *j* at time *t*+1, *t*+2 or *t*+3 (Compustat OPEPS).

EPS_{jt+n} = Earnings per Share (diluted) excluding extraordinary items of firm *j* at time *t*+1, *t*+2 or *t*+3 (Compustat EPSFX).

Independent Variables of Interest:

F_DOES_{jt} = an indicator variable assigned a one when at least half of firm *j*'s segment-level resource reallocation decisions in time *t*+1 agree with my ex ante predictions of KEEP or DROP in time *t*, and zero otherwise.

Or

$PCTGOOD_{jt}$ = the percent of a firm's segments where the resource reallocations in time *t*+1 agree with ex ante predictions of KEEP or DROP in time *t*.

Control Variables:

$EARN\_PERF_{jt}$ = the contemporaneous value of one of the five earnings performance measures described above.

$LN\ (MVE)_{jt}$ = the natural logarithm of the market value of equity of firm *j* at time *t*. The market value of equity is calculated as annual fiscal year-end closing price * common share outstanding (Compustat (PRCC_C * CSHO)/SEQ).

$OIAD\_LOSS_{jt}$ = an indicator variable set to one when firm-level operating income after depreciation (Compustat OIADP) is less than zero, and zero otherwise.

In equation (3), F_DOES[14] is the variable of interest, and in equation (4), PCTGOOD is the variable of interest. A positive and significant coefficient on β_1 in equation (3) and λ_1 in equation (4) indicates that firms making a majority of segment

[14] For simplicity, I suppress variable subscripts hereafter.

resource reallocation decisions that agree with predictions experience significant improvements in future firm-level profitability relative to firms where the majority of resource reallocation decisions did not agree with predictions.

Table 7 reports annual observations of firms where resource reallocations match (do not match) the predictions of KEEP (DROP). Panel A presents observations when the match (fail to match) determination is made using the adjusted percentage of resources reallocated to a segment (%ΔADJAT). In this analysis, the annual percentage change in assets of a segment (%ΔAT) is adjusted by removing the impact of the segment's results of operations. Panel B contains observations using the previously defined percent change in relative segment size (%ΔRSS).

In Panel A, of the total of 7,786 firm-year observations, 66% (5,138) of firms' actions match the KEEP (DROP) prediction, while 34% (2,648) of firms' resource reallocations do not match predictions. In general, the percentage of matches tends to increase slightly each year over the 10-year period, with 2006 showing the highest percentage of predictions matching actual (73%). In the sample, the fewest matches occur during 1999, where 477 (52%) firm-years were correctly predicted and 439 (48%) of firm-year observations did not match predictions. This is potentially due to the change in segment-reporting regulation which took effect for year-ends after December 15, 1997. If firms were slow to adopt SFAS No. 131, lower-quality segment-reporting might impact the early years of this analysis.

Panel B reports a tighter range of predictions, matching actual actions over the sample years. The matching rate falls between 62% and 67% in all years. Additionally, there is a gradual increase in firm actions matching predictions over the sample years, although the trend is not as evident as that seen in Panel A. Overall, Panel B results parallel those of Panel A, with an average of 64% of firm resource reallocations matching predictions.

To add insight on the types of firms or industries where resource reallocations match predictions, and to ensure that no one industry is driving results, Table 8 presents firms' resource reallocation decisions by industry sector (Panel A) and industry lifecycle stage (Panel B).

Panel A illustrates that my predictions are most accurate in the insurance sector, where 90% of firm resource reallocations match predictions using %ΔADJAT. However, the number of industry observations, 21, is small. Resource reallocations in the construction sector also reflect a high degree of predictability. The percentage of matches totals 71% (72%) using %ΔADJAT (%ΔRSS). Although no sectors fall below a 50% matching rate, my methodology generates the lowest percentage of matches in the real estate (50%), other services (52%), and educational (59%) sectors using %ΔADJAT.

Overall, Panel A depicts a reasonable distribution among industry sectors. One or two sectors do not appear to be responsible for an overwhelming percentage of matches between actual firm resource reallocations and my ex ante predictions thereof.

Panel C presents the breakdown of successful and unsuccessful predictions into the industry lifecycle stages used in this study (Growth, Technological Change, Consolidation and Decline).[15] The percentage of matching predictions varies little across the four lifecycle stages (between a 64% and 68% matching percentage using %ΔADJAT

[15] See Appendix B for more detail on the measurement of industry lifecycle stages.

and between 64% and 66% using %ΔRSS). It does not appear that matching predictions of resource reallocations are clustered in any one industry lifecycle stage.

Table 9 presents the results of a univariate comparison of firm characteristics and future performance measures for firms where resource reallocation decisions match actual predictions (F_DOES = 1) to firms where the predictions do not match firm decisions (F_DOES = 0).

Panel A presents mean and median firm characteristics. The mean values for the number of segments, firm size, market-to-book ratio, firm leverage, and external financing constraints are not statistically different between firms where resource reallocations match and do not match predictions. At the median, firms that match predictions are significantly larger (*z*-statistic of 5.29) and have a higher market-to-book ratio (*z*-statistic of 2.19).

Panels B through D show five different future performance measures: ROA, ROE, NI_AT, OPEPS, and EPS. Panel B presents these measures in time t+1 where time t represents the KEEP or DROP designation. Both the mean and median performance measures are significantly different between the two subsamples. In all instances, the firm-years where firm resource reallocations match predictions significantly outperform firms whose actions do not match predictions.

Panel C reports results at the time period t+2. Firms reallocating resources according to predictions continue to outperform firms that do not, although the strength of the differences deteriorates relative to time t+1 (i.e., the test statistics drop in magnitude for each performance measure in time t+2). Additionally, the mean ROE is no longer statistically different between the two groups.

Panel D again shows weakening of the differences in performance measures between the two groups at time period *t*+3. Tests statistics drop again in magnitude for all but one performance measure; however, the raw performance measures do not necessarily decline between the time periods. Mean values continue to show significant differences for four of the five performance measures (as above, mean ROE is not statistically different between the two groups), while median values of performance measures are significantly greater for three of the five performance measures for firms that reallocated resources according to predictions of KEEP and DROP.

Overall, if efficient resource reallocations are rewarded with improved future performance, the univariate results are consistent with the KEEP and DROP designations reflecting efficiency. This provides support for the validity of my KEEP and DROP constructs. The subsample of firms whose actions match the predictions of KEEP and DROP post-earnings performance measures significantly larger than firms whose resource reallocations do not match the predictions. The multivariate tests described next supplement these results.

Table 10 reports the results of estimating regression equation (3). The dependent variable is one of five firm-level earnings performance variables, each calculated over three time periods, *t*+1, *t*+2 and *t*+3, where time *t* reflects the designation of KEEP or DROP to a segment. The five performance variables are ROA, ROE, NI_AT, OPEPS and EPS. The variable of interest is the indicator variable, F_DOES (β_2). F_DOES is set to one when at least half of the firm's segment resource reallocation decisions agree with my ex ante predictions, and a zero otherwise. I calculate F_DOES in two ways: first. using the percentage change in adjusted assets allocated to segments (%ΔADJAT); and second, using the percentage change of relative segment size (%ΔRSS). A positive and significant coefficient on β_2 provides evidence consistent with efficient resource reallocation decisions positively contributing to firm-level future earnings performance.

In time period *t*+1, F_DOES calculated using %ΔADJAT is statistically significant in three of the five future performance specifications. In time period *t*+2, F_DOES is positive and significant in two of five specifications. When I calculate F_DOES using the %ΔRSS, results are positive and significant for four of the five performance measures in time period *t*+2. For time period *t*+3, F_DOES is significant at the 10% level for only operating earnings per share (OPEPS).

F_DOES is not significant in any of the model specifications using EPS as a dependent variable (Panel E). Among the dependent variables, EPS might have the lowest ability to reflect efficiency, as this variable incorporates one-time gains and losses and other special items potentially far removed from firms' resource reallocation decisions. However, poor results might be more due to scaling, as net income scaled by total assets (NI_AT), likely a better indicator of efficiency, is statistically significant in three-fourths of time *t*+1 and *t*+2 model specifications.

Table 11 presents the results of estimating regression equation (4). As in Table 10, the dependent variable is one of five firm-level earnings performance variables, each calculated over three time periods, *t*+1, *t*+2 and *t*+3, where time *t* reflects the designation of a KEEP or DROP to a segment. The variable of interest is PCTGOOD (λ_2). PCTGOOD reflects the percentage of a firm's segment resource reallocation decisions that agree with my ex ante predictions of KEEP or DROP. I expect that increases in

PCTGOOD will positively contribute to future earnings performance; I therefore expect positive and significant coefficients on λ_2.

Although slightly weaker, results in Table 11 mirror those of Table 10. When PCTGOOD is calculated using %ΔADJAT, three of the five model specifications in time period *t*+1 report a positive and statistically significant coefficient on λ_2. Results are insignificant under time periods *t*+2 and *t*+3.

In both Tables 10 and 11, when the variable of interest is calculated using %ΔRSS, results are strongest under time *t*+2. A delay in experiencing positive returns to investment is not unexpected, and more future time periods (i.e., *t*+3 and beyond) might be impacted by other events or circumstances. As in Table 10, Table 11 reports statistically significant coefficients at least at the 10% level, on the variable of interest in four of the five model specifications in time *t*+2.

In general, I expect increases in the efficiency of resource reallocation within firms to manifest in improved future earnings performance. Although the evidence in the multivariate tests are not entirely uniform across all future performance measures tested, the combined results of this section's analysis are consistent with more improved future earnings performance for firms that reallocate resources in accordance with KEEP and DROP predictions, relative to firms that do not reallocate resources according to KEEP and DROP predictions, thus lending construct validity to the primary measure used in this study.

Tests Using Only Segments in Growth and Decline Industries

In this section, I report results from estimating equations (1) and (2), using only observations with segments in the growth and decline industry lifecycle stages. Industry lifecycle stages are a component of KEEP and DROP, my proxies for efficient resource reallocation. Eliminating segments in the arguably indistinct ‘technological change’ and ‘consolidation’ lifecycles stages reduces the sample by 2,239 observations or approximately 15%.

In the main regression analysis previously reported, I use the technological change and consolidation industry lifecycle stage categories to arrive at “nongrowth” and “nondecline” classifications as one of two components of KEEP and DROP. The second component, the segments’ relative ROA, remains the same in this alternate analysis. To summarize, in this analysis, only segments in a growing industry with an industry-adjusted ROA greater than the weighted average ROA of the firm’s remaining segments receive a KEEP designation. KEEP is an ex ante prediction that firms maintain or increase resources to the segment. DROP requires a segment to have an industry-adjusted ROA less than the weighted average ROA of the firm’s remaining segments and be in a declining industry.[16] DROP is the ex ante prediction that firms reduce resources to a segment.

Table 12 reports results from estimating regression equation (1), where I examine whether changes in segment-level resource reallocations vary as expected with KEEP and DROP. The predicted signs on all coefficient estimates remain the same as shown in the original estimation reported in Table 5.

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[16] See Appendix B for additional detail on the calculation of industry lifecycle stages. Appendix C presents a distribution of ample observations by industry lifecycle stage.

The coefficients on KEEP and DROP, α_1 and α_2, maintain the predicted signs, although under the model specification using %ΔAT as the dependent variable, KEEP is no longer statistically significant. The statistical significance for DROP, on the other hand, shows a slight improvement under both model specifications.

Overall explanatory power of the model decreases slightly when the dependent variable is %ΔAT; adjusted R^2 in Table 12 is 11%, whereas Table 5 reports an adjusted R^2 of 13%. Both Tables 5 and 12 report a 3% adjusted R^2 when the dependent variable is measured using %ΔRSS.

Taken as a whole, the results of this analysis using a "cleaner" KEEP and DROP, which examines segments only in declining or growing industries, are consistent with results of Table 5 and provide additional support for H1. The significant and negative coefficients on DROP suggest that firms reduce resources to segments that lack a within-firm comparative advantage. The results are mixed for the coefficient on KEEP, although they do suggest that firms increase, or at least maintain, resources provided to operations with a within-firm comparative advantage.

Table 13 presents regression results from estimating equation (2) using the "cleaner" versions of KEEP and DROP described above. Equation (2) examines the impact of corporate governance on firms' responsiveness in reducing resources to inefficient segments.

The variable of interest, INDEP, represents increasing quintiles of the percentage of independent board members. DROPSUM, the dependent variable, represents the number of a segment's consecutive DROP designations. The larger DROPSUM is, the less responsive management is in reducing resources to consistently underperforming segments. A negative and significant coefficient on INDEP would suggest that firms with more independent boards move more quickly to reallocate resources away from divisions that do not display a within-firm comparative advantage.

The elimination of segments in the technological change and consolidation industry lifecycles stages reduces the sample size by 814 observations or 31%. The smaller sample size reduces the power of the test and is potentially responsible for the loss of significant results. The coefficient on INDEP, although negative as predicted, lacks statistical significance, with a *t*-statistic of -1.50. The results of this test fail to provide additional support for H2, which examines whether the efficiency of within-firm resource reallocation varies with firms' governance mechanisms.

Tests Using Alternative Measures of Efficiency

This section examines the sensitivity of my results to alternative measures of internal capital market efficiency found in related literature. As noted in Chapter 2, the internal capital market efficiency literature generally investigates whether inefficiencies in internal capital markets of multisegment firms are at least partially responsible for differences in value between single and multisegment firms. For example, Billet and Mauer (2003; BM03) conclude that the existence of an internal capital market adds to firm value only when segments with good investment opportunities are unable to fund their own investments, that is, the authors identify financing constraints as a key determinant of the impact of an internal capital market on firm value. BM03 first estimate whether or not each segment within a firm provides funding to, or receives funding from, peer segments. Given this, the segment's relative segment-operating performance then determines whether or not the transfer (when a segment provides resources to a peer segment) or subsidy (when the segment receives resources from another segment) is efficient.

In this section, I follow BM03 and calculate the efficiency of both segment transfers and subsidies. Initially, I calculate the difference between a segment's CAPX expenditures and its free cash flow[17] to determine each segment's ability to fund its own investment. When a segment's capital expenditures exceed its free cash flow, segment operations alone do not sufficiently fund the segment's CAPX, and the segment is determined to have received a subsidy.

I calculate Excess CAPX = max [CAPX – (operating profits + depreciation), 0] for each segment. The purpose of the measure is to isolate contemporaneous across-segment resource reallocations. To control for the possibility that CAPX funding arises from other sources, such as prior years' retained cash flow or external funding, I follow BM03 and subtract a firm-level subsidy value from the segment-level subsidy; thus Subsidy = max [(Segment Excess CAPX – Firm Excess CAPX), 0].

Like the segment-level subsidy, the firm-level subsidy is measured by the shortfall between firm free cash flow and firm-level capital expenditures. This shortfall represents the portion of firm investment spending requiring one of the following: external funding, prior year's retained cash flow, or the depletion of existing assets. The difference between the segment subsidy and the firm subsidy isolates the extent of transfers across segments within the firm. For example, when the segment subsidy is less than the firm subsidy, the entire segment subsidy could have come from the external

[17]Free cash flow is equal to the segment's operating profit plus depreciation. Following Berger and Hann (2007), if segment depreciation is missing in Compustat segment files, it is set to equal zero. If segment CAPX is missing, but firm level CAPX is equal to zero (not missing), segment CAPX is set to zero.

sources of the firm subsidy. Alternatively, when the segment subsidy is greater that the firm subsidy, the difference is likely due to a transfer within the firm, that is, a resource reallocation among segments.

Next, I define a segment's potential transfer (*p*_transfer) as the excess of free cash flow less the segment's CAPX. However, the amount of resources transferred to peer segments is limited to the sum of segment subsidies. Therefore, each segment's transfer is calculated as the minimum of the potential transfer and the segment's weighted share of total firm subsidies. That is, Transfer = min [p_transfer,((p_transfer/Σ p_transfer)*Σ Subsidy)] where the summations are over all segments for each firm.

BM03 define efficiency using relative ROA. In this study, BM03_EFFSUB (BM03_INEFFSUB) is an indicator variable set to one if the segment receiving the subsidy has a larger (smaller) ROA than the weighted average ROA of the firm's remaining segments, and zero otherwise. Likewise, BM03_EFFTRF (BM03_INEFFTRF) is an indicator variable set to one if the segment providing the transfer has a smaller (larger) ROA than the weighted average ROA of the firm's remaining segments. This methodology fails to consider segments in industries that might have superior growth opportunities but currently do not have superior returns, thereby potentially prematurely casting an "inefficient" designation on certain segment subsidies. Maksimovic and Phillips (2002) add another criticism of the measure by documenting that most of the growth in multisegment firms happens via acquisitions and not CAPX.

Berger and Hann (2007; BH07) also follow the methodology of BM03 in a study that seeks to identify firms making inefficient cross-segment transfers of resources. BH07 classify a firm as inefficient when one underperforming segment receives a subsidy from another segment. Unlike BM03's use of relative ROA to determine efficiency, BH07 define efficiency using relative return on sales (ROS). That is, segment subsidies are inefficient when the ROS of the segment receiving the subsidy is less than the weighted average ROS of the firm's remaining segments. BH07 argue that sales are more likely than assets to be fully allocated to segments, and therefore ROS represents a better measure of relative segment performance than ROA. In this analysis, BH07_EFFSUB (BH07_INEFFSUB) is a segment-level indicator variable set to one if a segment receiving a subsidy has a ROS greater than (less than) the weighted average ROS of the firm's remaining segments. BH07 do not evaluate transfers or situations where a segment's free cash flow exceeds its CAPX and the segment can then act as a provider of funds to peer segments.

Table 14 reports descriptive statistics on the alternative measures of efficiency. Panel A presents comparative measures for KEEP and DROP. By design, KEEP and DROP are measures of efficiency. This study classifies 10,673 KEEP segments and 4,712 DROP segments. Panel B reports descriptive statistics for the sample using the BM03 measures. BM03 classifies a total of 11,767 segments as follows: 1,007 segments as efficient subsidies, 4,814 segments as inefficient subsidies, 668 segments as efficient transfers and 5,278 segments as inefficient transfers. Under the BM03 and BH07 methodologies, segments classified as having neither a subsidy nor a transfer result receive efficiency classification for the segment.

Efficient subsidies indicate segments worthy of additional resources; therefore, the KEEP and efficient subsidies measures are aligned. There are reasons to argue that the variable KEEP is akin to the inefficient transfer measure as well as the efficient subsidy measures. Transfers indicate that the segment is a provider of resources to peer segments. When a transfer is deemed inefficient, the efficient action would have been to refrain from transferring resources to peer segments; in other words, to keep the resources in the original segment. Panel B reflects this alignment as 61% of the BM03 efficient subsidies are also classified as KEEP segments and 61% of the BM03 inefficient transfers are assigned a KEEP designation.

DROP is comparable to the efficient transfer measures (i.e., both suggest a reduction of resources) and the inefficient subsidy measures. Like DROP, an inefficient subsidy segment is not deemed worthy of receiving additional resources. Panel B reports that 66% of BM03 efficient transfers receive a DROP designation and 55% of the BM03 inefficient subsidies receive a DROP designation. Additionally, Panel B shows that no segments are inconsistently categorized between KEEP, DROP and the BM03 measures. Specifically, no segments receive a DROP designation as well as an efficient subsidy or an inefficient transfer designation. Likewise, no segments simultaneously receive a KEEP designation as well as an efficient transfer or an inefficient subsidy designation.

Panel C reports descriptive statistics for the sample using the BH07 measures. Using the BH07 methodology, 606 segments are classified as efficient subsidies and 4,177 segments are classified as inefficient subsidies. The intent behind the development of the BH07 measures helps explain the disproportionate number of inefficient classifications. For example, to suit their research design, BH07 aim to identify a subsample of inefficient firms and calculate only inefficient actions by firms. Although this study does not presume that noninefficient actions are, in fact, efficient, the calculation of efficient subsidies is implied based on the methodology for the computation of inefficient subsidies. Therefore, as shown in Panel C, the disproportionate percentage of inefficient subsidies (34% inefficient subsidies as compared to 6% efficient subsidies) is not surprising.

BM03, on the other hand, separately calculate inefficient and efficient subsidies and transfers. Yet inefficient actions seem disproportionately represented here as well. As reported in Panel B, approximately 43% of sample firms classify at least one segment as inefficient while only 10% of sample firms have at least one segment classified as efficient.

Under the BH07 methodology, a small percentage of segments are inconsistently categorized relative to KEEP and DROP. For example, in Panel C, 34 segments, or 5% of the 606 segments, reported as efficient subsidy segments receive a DROP designation, and 16 segments, or 0.4% of the 4,177 inefficient subsidy segments, receive a KEEP designation. This inconsistency was not evident between the BM03 measures and KEEP and DROP, and is likely due to differences in the criteria used to determine efficiency. As noted previously, BH07 use segment ROS, while BM03, as well as KEEP and DROP, use segment ROA when determining efficiency.

Table 15 presents Pearson correlation coefficients for the various efficiency measures used in this study. As noted above, KEEP reflects situations when it is efficient to retain or increase resources in a segment, and is comparable to the efficient subsidy measures BM03_EFFSUB and BH07_EFFSUB, and the inefficient transfer measure, BM03_INEFFTRF. The efficient subsidy variables reflect when it is efficient for a segment to receive subsidies from other segments or, in the case of the inefficient transfer, when it is inefficient to dispose of resources.

Even as these measures consider growth in a segment as efficient, the correlations between KEEP and the efficient subsidy measures are relatively low although statistically significant (0.09 between KEEP and BM03_EFFSUB, and 0.02 between KEEP and BH07_EFFSUB). The correlation between KEEP and BM03_INEFFTRF is 0.22 and statistically significant.

Interestingly, a much stronger negative relationship exists between KEEP, the inverse of the two efficient subsidy measures. BM03_INEFFSUB and BH07_INEFFSUB are indicator variables set to one when it is inefficient to provide subsidies to a segment. The correlation between KEEP and BM03_INEFFSUB is -0.41, and the correlation between KEEP and BH07_INEFFSUB is -0.31; both are statistically significant.

DROP, an indicator variable set to one when it is efficient to relinquish resources in a segment, might initially seem most aligned with the efficient transfer measure (BM03_EFFTRF). Again, transfer segments are providers of resources to peer segments. The significant correlation coefficient of 0.21 is, therefore, expected. However, the much larger correlation between DROP and the two inefficient subsidy measures (0.49 with BM03_INEFFSUB, and 0.41 with BH07_INEFFSUB) supports the argument that inefficient subsidy segments reflect situations where an efficient move would have been to refrain from or not provide additional resources to a segment, thus paralleling the intuition behind the DROP variable.

The superior strength of the relationships of KEEP and DROP with the inefficient proxies, as opposed to the more straightforward interpretation of the efficiency proxies, likely reflects the disproportionate number of BM03 and BH07 inefficient segments relative to efficient segments discussed above.

I expect a high correlation between the BH07 and BM03 measures, as the BH07 proxies closely follow the BM03 computations. The primary difference between the two is the use of relative ROS (BH07) versus relative ROA (BM03) when determining if a segment is outperforming other segments in the firm. The correlation between efficient subsidies per BM03 and BH07 is 0.59, and the correlation between inefficient subsidies is 0.77; both are statistically significant.

Table 16 reports regressions results of equation (1) where I examine whether changes in segment-level resource reallocations vary with the alternative measures of efficiency developed in this section. I substitute BM03_EFFSUB for KEEP and BM03_EFFTRF for DROP. In column 1, the dependent variable %ΔAT captures the gross change in assets allocated to segments. In column 2, the dependent variable %ΔRSS captures changes in the importance of a segment to the firm, where importance is measured as the proportion of segment size (i.e., segment assets) to overall firm size.

Consistent with the results of Table 5, the estimates for the coefficients on BM03_EFFSUB, the substitute for KEEP in this analysis, are positive and significant in both specifications. α_1 equals 0.133 with a *t*-statistic of 2.74 when the dependent variable is %ΔAT, and α_1 has a coefficient of 0.108 with a *t*-statistic of 3.11 with %ΔRSS as the dependent variable. These results suggest that firms tend to increase resources to segments with a within-firm comparative advantage. Although the statistical significance is slightly stronger for the alternative measure than that reported for KEEP in Table 5, the overall explanatory power of the models decreases using the alternative BM03 measures. For example, Table 16 reports adjusted R^2s of 0.074 (0.014) for dependent variables

%ΔAT (%ΔRSS), while Table 5, using KEEP and DROP, reports adjusted R^2s of 0.134 (0.033).

Results for the second variable of interest, BM03_EFFTRF, the substitute for DROP in this analysis, are also as predicted in both model specifications. With %ΔAT as the dependent variable, the coefficient on α_2 is -0.061 with a *t*-statistic of -2.48. With %ΔRSS as the dependent variable, the coefficient on α_2 is -0.054 with a *t*-statistic of -5.01, suggesting that firms reduce or abandon operations in divisions that lack a within-firm comparative advantage. The findings using these alternative measures provide support for H1 that, on average, firms efficiently reallocate resources across divisions. Although inferences do not change, the statistical significance is slightly stronger for the alternative measure in one of the two model specifications than that reported for DROP in Table 5.

With the exception of negative and significant coefficients for SEGCF in both model specifications, coefficients on control variables are consistent with Table 5 results. The primary difference between KEEP and DROP, the variables of interest in Table 5, and the corresponding BM03 measures reported in Table 16, is that KEEP and DROP incorporate industry lifecycle when determining efficiency. I use this difference to explain the unexpected change in sign on the coefficients for SEGCF in Table 16. Although the magnitude of the coefficient is small (-0.001 for both model specifications), the statistically significant *t*-statistics suggest that a decrease in segment cash flow is associated with an increase in resources allocated to that segment. This is a plausible outcome for a segment in a growing industry that has yet to achieve its profit potential.

The results also provide construct validity for the KEEP and DROP variables, as results using the BM03 alternative measures of efficiency provide consistent inferences on whether firms efficiently reallocate resources across divisions.

Table 17 presents the regressions results of equation (1), where I examine whether changes in segment-level resource reallocations vary with the alternative measures of efficiency developed in this section. I substitute BH07_EFFSUB in place of KEEP, and BH07_INEFFSUB in place of DROP. In column 1, the dependent variable %ΔAT captures the gross change in assets allocated to segments. In column 2, the dependent variable %ΔRSS captures changes in the importance of a segment to the firm, where importance is measured as the proportion of segment size to overall firm size.

Consistent with the results of Table 5, the estimates for the coefficients on BH07_EFFSUB, the substitute for KEEP in this analysis, are positive and significant in both specifications. α_1 equals 0.037 with a *t*-statistic of 4.14 when the dependent variable is %ΔAT, and α_1 has a coefficient of 0.022 with a *t*-statistic of 4.68 with %ΔRSS as the dependent variable. These results suggest that firms tend to increase resources to segments with a within-firm comparative advantage. The statistical significance is again slightly stronger for the alternative measure than that reported for KEEP in Table 5.

Results for the second variable of interest, BH07_INEFFSUB, the substitute for DROP in this analysis, are not consistent with my prediction in either model specification. With %ΔAT as the dependent variable, the coefficient on α_2 is 0.00 with a *t*-statistic of 0.07, and with %ΔRSS as the dependent variable, the coefficient on α_2 is 0.017 with a *t*-statistic of 0.96.

Untabulated results using a third combination of alternative variables, BM03_EFFSUB for KEEP and BM03_INEFFSUB for DROP, generate results similar to those reported in Table 17. Results are as expected for the KEEP alternative (BM03_EFFSUB) but insignificant for the DROP alternative (BM03_INEFFSUB) for both model specifications.

Limitations and Alternative Explanations

Types of Inefficiencies

The goal of this paper is to examine one aspect of managers' investment decisions: the efficiency of resource reallocation across segments. Therefore, my research design might fail to detect other types of inefficiencies in investment decisions. For example, I do not test whether firms fund all and/or only projects with positive net present values. Additionally, my tests do not detect potential over-investment in divisions with the greatest within-firm comparative advantage. Prior studies examine this specific issue at the firm level. For example, Richardson (2006) finds a positive association between firm-level over-investment and firms' free cash flow.

Finally, the within-firm nature of my study precludes me from commenting on the efficiency of managers' resource reallocation decisions in the context of the entirety of the investment opportunity set available to managers or investors, which could include unobservable opportunities that dominate those that exist within the firm.

Governance Structures

I examine the impact of one relevant corporate governance mechanism on the efficiency of within-firm resource reallocation. Corporate governance can be viewed more broadly and as consisting of a governance structure where numerous governance mechanisms act in an interdependent manner.

Use of Segment Data

The managerial discretion permitted in segment reporting potentially leads to reporting biases. On the one hand, permitted discretion is necessary as segment reporting under the managerial approach strives to provide users of financial information insight into how management delineates activities for purposes such as reviewing earnings and making resource reallocation decisions. On the other hand, disclosure costs can provide incentives for managers to underreport, or otherwise obscure the scope of operations presented in the segment footnote (Berger & Hann, 2007; Botosan & Stanford, 2005; Harris, 1998). Although the potential to distort segment reporting is problematic, a 1997 change in segment-reporting regulation has implications for my study. As described below, the regulation change improved the quality of segment data. This improvement lessens the potential impact of a bias relative to studies undertaken using segment data under the previous regulation, while at the same time reduces comparability to similar studies.

Prior studies examining the efficiency of internal capital markets (e.g., Rajan et al., 2000; Shin & Stulz, 1998) use segment data prepared under the prior regulation, SFAS No. 14.[18] Hyland and Diltz (2002) document that only 72% of reported segment changes under SFAS No. 14 reflected actual changes in the composition of firms' operations, as documented in the management discussion and analysis. These and other concerns about the reliability of segment data under SFAS No. 14 led to the improved segment-reporting requirements of SFAS No. 131.[19] Subsequent research concludes that the quality and quantity of information contained in segment disclosures is markedly improved under SFAS No. 131. Firms report more segments and more relevant information about each segment under the new regulation (Berger & Hann, 2003; Herrmann & Thomas, 2000; Street, Nichols & Gray, 2000). Under SFAS No. 131, firms also report segment information that more closely reflects their internal organizational design (Botosan et al., 2010), and provide more information about data used to guide managers' investment decisions, specifically, divisional profitability and growth opportunities (Chen & Zhang, 2003; Ettredge, Kwon, Smith & Stone, 2006). As noted earlier, my efficiency measures incorporate these two segment characteristics.

Even so, it may not be the case that managerial incentives changed with the segment-reporting requirements. Therefore, that firms are now required to disclose more detailed segment information in no way guarantees that managers completely and adequately allocate firm assets, revenues and expenses to individual segments, or refrain from engaging in strategic transfer pricing on within-firm transactions. If managers have incentives to use such latitude to hide poorly performing segments (due to agency costs) or segments with superior performance (due to proprietary costs), I expect this constrains

[18]A small number of related studies use alternative datasets, such as plant-level data for manufacturing firms that are subject to their own limitations, including data availability and generalizability (e.g., Maksimovic & Phillips, 2002; Schoar, 2002; Villalonga, 2004b).
[19] SFAS No. 131 is effective for fiscal year-ends beginning after December 15, 1997.

my ability to properly categorize such firms, thereby working against my ability to document statistically significant results. Nonetheless, my results and inferences reflect both managerial action and, to a degree, potential bias in segment reporting.

Alternative Explanations

For a number of reasons, firms might change the degree of investment in segments that are not accounted for in this study. Compensation and other CEO characteristics likely play a role in within-firm investment decisions (Stein, 2003). Additionally, external influences such as regulation or taxes can influence a firm's scope of operations (Brickley & Van Drunen, 1990). Firms might divest operations if they believe that they are undervalued because shareholders are unable to decipher an overly complex organizational design. A refocusing of operations can reduce the opaqueness and information asymmetry associated with operating a conglomerate firm (Bushman et al., 2004; Chen & Zhang, 2007). Nevertheless, such divestiture decisions likely consider the relative efficiency of the firm's operations.

Certain firm strategies might lead to resource reallocation decisions inconsistent with relative efficiency as defined in this study. For example, long–run acquisition programs can impact the resources reallocated to segments, regardless of the relative performance of the firm's divisions. Finally, as discussed above, managers might opportunistically use the discretion allowed under segment-reporting regulations to disclose results of segment operations in a manner that appears efficient.

Table 5

Resource Reallocation Regression Results

$$INVEST = \alpha_0 + \alpha_1 KEEP + \alpha_2 DROP + \alpha_3 SEGLIQ + \alpha_4 LEV + \alpha_5 LN(MVE) + \alpha_6 MB + \alpha_7 FIRMCF + \alpha_8 \Delta X\_FIN + \alpha_9 SEGQ + \alpha_{10} SEGN + \alpha_{11} SEGCF + \alpha_{12} DROP*SEGLIQ + \alpha_{12} KEEP*LEV + \alpha_{14} KEEP*FIRMCF + \Sigma \text{ Year Indicator} + \Sigma \text{ Industry Indicator} + \varepsilon \quad (1)$$

Dependent Variable		%ΔAT	%ΔRSS
Independent Variables	Predicted Sign	(1)	(2)
Intercept	?	-0.117 (-5.60)	0.023 (1.38)
KEEP	+	0.023 (2.08)	0.024 (2.66)
DROP	-	-0.043 (-4.04)	-0.028 (-3.12)
SEGLIQ	?	-0.004 (-1.58)	-0.003 (-1.69)
LEV	?	-0.003 (-0.83)	0.000 (0.14)
LN(MVE)	+	0.019 (10.33)	0.002 (1.58)
MB	+	0.005 (3.12)	-0.000 (-0.21)
FIRMCF	?	0.445 (6.96)	-0.299 (-6.57)
ΔX_FIN	?	0.997 (18.18)	-0.347 (-12.33)
SEGQ	+	0.002 (0.31)	0.000 (0.01)
SEGN	-	-0.015 (-5.28)	-0.011 (-5.44)
SEGCF	+	0.066 (6.54)	0.042 (4.86)
DROP * LIQ	+	0.005 (1.05)	0.001 (0.41)
KEEP * LEV	-	-0.006 (-1.35)	-0.001 (-0.27)
KEEP * FIRMCF	+	-0.087 (-0.92)	-0.067 (-0.88)
Adj. R^2		0.134	0.033
Observations Used		15,031	15,031

This table reports the results of estimating equation (1). Regression coefficient estimates are shown with *t*-statistics in parentheses. Variable subscripts are suppressed. See Table 2 or Appendix A for variable definitions.

Table 6

Corporate Governance Regression Results

$$DROPSUM = \gamma_0 + \gamma_1 INDEP + \gamma_2 SEGLIQ + \gamma_3 LEV + \gamma_4 LN(MVE) + \gamma_5 MB + \gamma_6 FIRMCF + \gamma_7 \Delta X\_FIN + \gamma_8 SEGQ + \gamma_9 SEGN + \gamma_{10} SEGCF + \varepsilon \quad (2)$$

Independent Variables	Predicted Sign	DROPSUM
Intercept	?	2.015
		(9.68)
INDEP	-	-0.053
		(-2.28)
SEGLIQ	-	0.078
		(3.33)
LEV	+	0.052
		(1.15)
LN(MVE)	+	0.082
		(3.05)
MB	+	0.009
		(0.40)
FIRMCF	?	1.879
		(3.26)
ΔX_FIN	?	-0.658
		(-1.49)
SEGQ	-	0.015
		(0.18)
SEGN	-	-0.002
		(-0.06)
SEGCF	-	-3.73
		(-16.79)
Adj. R^2		0.202
Observations Used		1,176

This table reports the results of estimating equation (2). Regression coefficient estimates are shown with *t*-statistics in parentheses. Variable subscripts are suppressed. DROPSUM is the number of DROPs assigned to a segment over the four-year period *t*-3 through *t*. INDEP represents increasing quintiles of the percentage of independent boards of directors. See Table 2 or Appendix A for additional variable definitions.

Table 7

Firm Resource Reallocation Decisions: Predicted Versus Actual

Year	Prediction matches Actual F_DOES =1	%	Prediction does not match Actual F_DOES = 0	%	Total Firm-Years
Panel A: %ΔADJAT					
1999	477	52 %	439	48 %	916
2000	572	64 %	325	36 %	897
2001	541	65 %	288	35 %	829
2002	523	66 %	272	34 %	795
2003	517	68 %	246	32 %	763
2004	534	69 %	239	31 %	773
2005	550	70 %	240	30 %	790
2006	535	73 %	199	27 %	734
2007	474	70 %	201	30 %	675
2008	415	68 %	199	32 %	614
Total	5,138		2,648		7,786
	66%		34%		100%
Panel B: %ΔRSS					
1999	564	62%	352	38%	916
2000	553	62%	344	38%	897
2001	551	66%	278	34%	829
2002	498	63%	297	37%	795
2003	482	63%	281	37%	763
2004	516	67%	257	33%	773
2005	516	65%	274	35%	790
2006	491	67%	243	33%	734
2007	451	67%	224	33%	675
2008	390	64%	224	36%	614
Total	5,012		2,774		7,786
	64%		36%		100%

This table presents annual firm-year observations partitioned by whether the firm's actual resource reallocation decisions in year *t*+1 match ex ante predictions of year *t*. F_DOES is an indicator variable set to one when at least half of firms' segment resource reallocations match predictions, and zero otherwise. %ΔADJAT is the percentage change in assets of a segment adjusted to remove the segment's results of operations. %ΔRSS is the percent change from the prior year in relative segment size, where relative segment size is calculated as segment assets over firm assets. Panel A shows the results when the determination of whether a firm's actions agree with predictions is based on the percentage change of assets allocated to segments (after removing the impact of segment results of operations). Panel B presents firm-year observations where the determination of whether a firm's resource reallocation decisions agree with predictions is based on a percentage change in relative segment size.

Table 8

Firm Resource Reallocation Decisions: Predicted Versus Actual Industry Distribution

	%ΔADJAT				%ΔRSS			
	Prediction matches F_DOES=1	%	Prediction does not match F_DOES=0	%	Prediction matches F_DOES=1	%	Prediction does not match F_DOES=0	%
Panel A: NAICS sector								
Accommod, Food Svc	146	69%	67	31%	145	68%	68	32%
Admin, Support	157	69%	72	31%	153	67%	76	33%
Agriculture, Forestry	35	69%	16	31%	36	71%	15	29%
Art, Entertainment	59	72%	23	28%	52	63%	30	37%
Construction	112	71%	45	29%	113	72%	44	28%
Educational Services	23	59%	16	41%	24	62%	15	38%
Insurance	19	90%	2	10%	14	81%	4	19%
Health Care, Soc. Asst.	75	60%	49	40%	75	60%	49	40%
Information	454	64%	255	36%	442	62%	267	38%
Manufacturing	2,805	66%	1,460	34%	2,743	64%	1,522	36%
Mining	185	63%	110	37%	180	61%	115	39%
Other Services	13	52%	12	48%	17	68%	8	32%
Prof, Scientific, Tech	267	65%	145	35%	260	63%	152	37%
Real Estate, Rental	23	50%	23	50%	31	67%	15	33%
Retail Trade	208	69%	95	31%	193	64%	110	36%
Transportation, Warehousing.	194	70%	85	30%	187	67%	92	33%
Unclassified	28	61%	18	39%	31	67%	15	33%
Wholesale Trade	335	68%	155	32%	313	64%	177	36%
Total	5,138 66%		2,648 34%		5,012 64%		2,774 36%	
Panel B: Industry Lifecycle Stage								
Growth	2,309	66%	1,179	34%	2,258	64%	1,287	36%
Tech. Change	789	68%	364	32%	758	64%	429	36%
Consolidation	635	67%	309	33%	602	64%	334	36%
Decline	1,405	64%	796	36%	1,394	66%	724	34%
Total	5,138 66%		2,648 34%		5,012 64%		2,774 36%	

This table reports the industry distribution of firm-year observations partitioned by whether a firm's segment-level resource reallocation decisions match ex ante predictions of KEEP and DROP. Panel B shows the same breakdown by industry lifecycles stage. F_DOES is an indicator variable set to one when at least half of firms'

Table 8 continued

segment resource reallocations match predictions, and zero otherwise. %ΔADJAT is the percentage of change in assets of a segment adjusted to remove the segment's results of operations. %ΔRSS is the percentage of change from the prior year in relative segment size where relative segment size is calculated as segment assets over firm assets. Appendix B provides a detailed description of the industry lifecycle stage calculations. Sixty-five industries are condensed into 18 NAICS sectors.

Table 9

Firm Resource Reallocation Decisions: Predicted Versus Actual
Univariate Analysis of Firm Characteristics and Future Performance Measures

Variable	Mean: Prediction matches F_DOES=1	Mean: Prediction does not match F_DOES=0	Test of Difference (*t*-stat)	Median: Prediction matches F_DOES=1	Median: Prediction does not match F_DOES=0	Test of Difference (*z*-stat)
Panel A: Firm Characteristics at time t						
	N = 5,138	*N = 2,648*		*N = 5,138*	*N = 2,648*	
SEGN	2.91	2.95	-1.67	3.00	3.00	1.49
MVE	3,252.22	3,512.55	-0.60	395.91	256.45	5.29***
MB	2.29	2.46	-1.61	1.75	1.67	2.19**
LEV	0.63	0.72	-1.29	0.36	0.35	0.22
ΔX_FIN	0.01	0.02	-1.37	-0.01	-0.01	0.71
Panel B: Performance Measures at time *t*+1						
	N = 5,138	*N = 2,648*		*N = 5,138*	*N = 2,648*	
ROA	0.05	0.02	5.34***	0.07	0.06	4.66***
ROE	0.16	0.11	3.05***	0.18	0.16	3.41***
NI_AT	-0.01	-0.04	4.66***	0.03	0.03	4.68***
OPEPS	0.96	0.79	3.66***	0.74	0.58	4.24***
EPS	0.69	0.49	3.59***	0.64	0.45	4.36***
Panel C: Performance Measures at time t+2						
	N = 4,138	*N = 2,130*		*N = 4,138*	*N = 2,130*	
ROA	0.05	0.03	3.94***	0.07	0.07	3.24***
ROE	0.16	0.14	0.62	0.18	0.17	1.73*
NI_AT	-0.01	-0.03	3.22***	0.03	0.03	2.75***
OPEPS	1.04	0.88	3.20***	0.81	0.64	3.72***
EPS	0.75	0.56	2.78***	0.68	0.52	3.47***
Panel D: Performance Measures at time t+3						
	N = 3,279	*N = 1,732*		*N = 3,279*	*N = 1,732*	
ROA	0.06	0.04	2.47***	0.07	0.07	1.86*
ROE	0.18	0.17	0.08	0.19	0.18	0.84
NI_AT	0.00	-0.01	1.98**	0.04	0.03	1.38
OPEPS	1.14	0.94	3.51***	0.90	0.73	3.69***
EPS	0.83	0.66	2.36**	0.74	0.62	3.08***

This table reports a univariate analysis contrasting firm-years where segment-level resource reallocation decisions match ex ante predictions of KEEP and DROP against firm-years where resource reallocations do not match predictions. *, **, *** indicate significance levels at 10%, 5% and 1%, respectively. F_DOES is an indicator variable set to one when at least half of firms' segment resource reallocations match predictions, and zero otherwise. Panel A presents firm characteristics, and Panels B through D present performance measures at times *t*+1 through *t*+3. F _DOES = 1 uses %ΔADJAT to measure resource reallocations; inferences do not change in untabulated results using %ΔRSS. See Appendix A for variable definitions.

Table 10

Firm Resource Reallocation Decisions: Predicted Versus Actual
Regression Analysis of Future Performance Variables

$EARN\_PERF_{jt+n} = \beta_0 + \beta_1\ EARN\_PERF_{jt} + \beta_2\ F\_DOES_{jt} + \beta_3\ LN\ (MVE)_{jt} + \beta_4\ OIAD\_LOSS_{jt} + \varepsilon_{jt}$ (3)

Independent Variables	F_DOES per %ΔADJAT			F_DOES per %ΔRSS		
	DV t+1	DV t+2	DV t+3	DV t+1	DV t+2	DV t+3
Panel A: Dependent Variable: ROA						
N	7,244	5,891	4,710	7,244	5,891	4,710
Intercept	0.017***	-0.013***	-0.005	0.195***	-0.15***	-0.005
F_DOES	0.006**	0.005*	-0.001	0.001	0.006**	-0.001
Adj. R^2	0.70	0.64	0.45	0.69	0.64	0.45
Panel B: Dependent Variable: ROE						
Intercept	0.072***	0.030	0.050*	0.078***	-0.002	0.027
F_DOES	0.028*	-0.018	-0.010	0.017	0.032*	0.026
Adj. R^2	0.17	0.14	0.06	0.17	0.14	0.07
Panel C: Dependent Variable: NI_AT						
Intercept	-0.047***	-0.042***	-0.021**	-0.034***	-0.042***	-0.023***
F_DOES	0.015***	0.011**	0.002	-0.006	0.010**	0.004
Adj. R^2	0.43	0.37	0.24	0.43	0.37	0.24
Panel D: Dependent Variable: OPEPS						
Intercept	-0.108**	-0.292***	-0.332***	-0.086*	-0.315***	-0.262***
F_DOES	-0.007	0.050	0.086*	-0.027	0.083**	-0.029
Adj. R^2	0.60	0.54	0.37	0.59	0.54	0.37
Panel E: Dependent Variable: EPS						
Intercept	-0.426***	-0.404***	-0.359***	-0.349***	-0.417***	-0.311***
F_DOES	0.066	0.069	0.072	-0.057	0.085	-0.007
Adj. R^2	0.38	0.31	0.17	0.38	0.31	0.17

This table reports regression results of equation (3) where F_DOES is the variable of interest. Regression coefficients estimates are shown, and *, **, *** indicate significance levels at 10%, 5% and 1%, respectively. Results for control variables are suppressed. See Appendix A for variable definitions.

Table 11

Firm Resource Reallocation Decisions: Predicted Versus Actual
Regression Analysis of Future Performance Variables

$$EARN\_PERF_{jt+n} = \lambda_0 + \lambda_1 EARN\_PERF_{jt} + \lambda_2 PCTGOOD_{jt} + \lambda_3 LN\,(MVE)_{jt} + \lambda_4 OIAD\_LOSS_{jt} + \varepsilon_{jt} \quad (4)$$

Independent Variables	PCTGOOD per %ΔADJAT			PCTGOOD per %ΔRSS		
	DV t+1	DV t+2	DV t+3	DV t+1	DV t+2	DV t+3
Panel A: Dependent Variable: ROA						
N	7,244	5,891	4,710	7,244	5,891	4,710
Intercept	0.017***	-0.012***	-0.005	0.019***	-0.015***	-0.004
PCTGOOD	0.006**	0.003	-0.002	0.002	0.008**	-0.003
Adj. R^2	0.70	0.64	0.45	0.70	0.64	0.45
Panel B: Dependent Variable: ROE						
Intercept	0.071***	0.029	0.05*	0.073***	0.001	0.030
PCTGOOD	0.034*	-0.021	-0.018	0.029	0.034*	0.027
Adj. R^2	0.17	0.14	0.05	0.17	0.14	0.06
Panel C: Dependent Variable: NI_AT						
Intercept	-0.045***	-0.038***	-0.019**	-0.033	-0.041***	-0.021**
PCTGOOD	0.013***	0.006	-0.002	-0.008*	0.011*	0.00
Adj. R^2	0.43	0.37	0.24	0.43	0.37	0.24
Panel D: Dependent Variable: OPEPS						
Intercept	-0.100**	-0.277***	-0.310***	-0.080*	-0.312***	-0.256***
PCTGOOD	-0.006	0.029	0.058	-0.04	.0094**	-0.047
Adj. R^2	0.60	0.54	0.37	0.60	0.54	0.37
Panel E: Dependent Variable: EPS						
Intercept	-0.412***	-0.389***	-0.329***	-0.349***	-0.413***	-0.29***
PCTGOOD	0.048	0.052	0.026	-0.069	0.096	-0.031
Adj. R^2	0.38	0.31	0.17	0.38	0.31	0.17

This table reports regression results of equation 4 where PCTGOOD is the variable of interest. Regression coefficients estimates are shown, and *, **, *** indicate significance levels at 10%, 5% and 1%, respectively. Results for control variables are suppressed. See Appendix A for variable definitions.

Table 12

Resource Reallocation Regression Results: "Cleaner" KEEP and DROP

$$INVEST = \alpha_0 + \alpha_1 KEEP + \alpha_2 DROP + \alpha_3 SEGLIQ + \alpha_4 LEV + \alpha_5 LN(MVE) + \alpha_6 MB + \alpha_7 FIRMCF + \alpha_8 \Delta X\_FIN + \alpha_9 SEGQ + \alpha_{10} SEGN + \alpha_{11} SEGCF + \alpha_{12} DROP*SEGLIQ + \alpha_{12} KEEP*LEV + \alpha_{14} KEEP*FIRMCF + \Sigma \text{ Year Indicator} + \Sigma \text{ Industry Indicator} + \varepsilon \quad (1)$$

Dependent Variable Independent Variables	Predicted Sign	%ΔAT	%ΔRSS
Intercept	?	-0.086	0.028
		(-3.99)	(1.63)
KEEP	+	0.012	0.016
		(1.23)	(1.80)
DROP	-	-0.054	-0.045
		(-4.57)	(-4.44)
SEGLIQ	?	-0.005	-0.004
		(-1.77)	(-2.26)
LEV	?	-0.003	-0.001
		(-1.54)	(-0.67)
LN(MVE)	+	0.018	0.003
		(10.16)	(2.49)
MB	+	0.004	-0.000
		(2.86)	(-0.07)
FIRMCF	?	0.302	-0.028
		(4.68)	(-5.89)
ΔX_FIN	?	0.659	-0.346
		(16.03)	(-11.57)
SEGQ	+	-0.003	-0.001
		(-0.51)	(-0.10)
SEGN	-	-0.015	-0.014
		(-5.20)	(-5.24)
SEGCF	+	0.022	0.014
		(3.82)	(3.16)
DROP * LIQ	+	0.011	0.006
		(2.10)	(1.43)
KEEP * LEV	-	-0.002	0.002
		(-0.88)	(0.83)
KEEP * FIRMCF	+	0.151	0.016
		(1.88)	(0.21)
Adj. R^2		0.114	0.035
Observations Used		12,792	12,792

This table reports the results of estimating equation (1). Regression coefficient estimates are shown with *t*-statistics in parentheses. Variable subscripts are suppressed. See Table 2 or Appendix A for variable definitions.

Table 13

Corporate Governance Regression Results: "Cleaner" KEEP and DROP

$$DROPSUM = \gamma_0 + \gamma_1 INDEP + \gamma_2 SEGLIQ + \gamma_3 LEV + \gamma_4 LN(MVE) + \gamma_5 MB + \gamma_6 FIRMCF + \gamma_7 \Delta X\_FIN + \gamma_8 SEGQ + \gamma_9 SEGN + \gamma_{10} SEGCF + \varepsilon \quad (2)$$

Independent Variables	Predicted Sign	DROPSUM
Intercept	?	2.013
		(7.55)
INDEP	-	-0.043
		(-1.50)
SEGLIQ	-	0.084
		(2.98)
LEV	+	-1.044
		(-0.73)
LN(MVE)	+	0.069
		(2.09)
MB	+	0.046
		(1.59)
FIRMCF	?	1.731
		(2.23)
ΔX_FIN	?	-0.077
		(-0.13)
SEGQ	-	-0.02
		(-0.23)
SEGN	-	0.028
		(0.82)
SEGCF	-	-3.82
		(-12.46)
Adj. R^2		0.168
Observations Used		814

This table reports the results of estimating equation (2). Regression coefficient estimates are shown with *t*-statistics in parentheses. Variable subscripts are suppressed. DROPSUM is the number of DROPs assigned to a segment over the 4-year period *t*-3 through *t*. INDEP represents increasing quintiles of the percentage of independent boards of directors. See Appendix A for additional variable definitions.

Table 14

Descriptive Statistics of Alternative Measures of Efficiency

Panel A: KEEP & DROP	KEEP	DROP			TOTAL
No. of segments classified	10,673	4,712			15,031

Panel B: Billet & Mauer 2003 (BM03)

	Efficient Subsidy	Inefficient Subsidy	Efficient Transfer	Inefficient Transfer	
No. of segments classified	1,007	4,814	668	5,278	11,767
Percent of sample firms with at least one segment classified as	10%	43%	9%	42%	
Mean (Median) dollar value of subsidy or transfer	118.37 (4.52)	66.61 (4.67)	11.36 (0.68)	26.32 (2.75)	
Mean (Median) percent of subsidy or transfer of end-of-period segment assets	0.14 (0.06)	1.15 (0.18)	0.17 (0.01)	0.17 (0.03)	
Segments assigned KEEP = 1	612	0	0	3,196	
Segments assigned DROP = 1	0	2,670	439	0	
Percent of segments assigned KEEP	61%	0%	0%	61%	
Percent of segments assigned DROP	0%	55%	66%	0%	

Panel C: Berger & Hann 2007 (BH07)

	Efficient Subsidy	Inefficient Subsidy	
No. of segments classified	606	4,177	4,783
Percent of sample firms with at least one segment classified as	6%	34%	
Mean (Median) dollar value of subsidy	175.14 (8.15)	74.23 (4.69)	
Mean (Median) percent of subsidy of end-of-period segment assets	0.10 (0.04)	0.43 (0.11)	
Segments assigned KEEP = 1	225	16	
Segments assigned DROP = 1	34	1,756	
Percent of segments assigned KEEP	37%	0.4%	
Percent of segments assigned DROP	5%	42%	

This table reports descriptive information of alternative measures of efficiency identified in prior literature. See Appendix A for variable definitions.

Table 15

Pearson Correlations of Efficiency Variables

	KEEP	DROP	BM03_ EFF SUB	BM03_ EFF TRF	BM03_ INEFF SUB	BM03_ INEFF TRF	BH07_ EFF SUB	BH07_ INEFF SUB
KEEP	1.00							
DROP	-0.38	1.00						
BM03_EFF SUB	0.09	-0.10	1.00					
BM03_EFF TRF	-0.14	0.21	-0.04	1.00				
BM03_INEFF SUB	-0.41	0.49	-0.11	-0.09	1.00			
BM03_INEFF TRF	0.22	-0.25	-0.11	-0.09	-0.27	1.00		
BH07_EFF SUB	0.02	-0.04	0.59	-0.02	-0.02	-0.08	1.00	
BH07_INEFF SUB	-0.31	0.41	-0.06	-0.07	0.77	-0.21	-0.06	1.00

This table presents Pearson correlations for various proxies of the efficiency of cross-segment subsidies and transfers. Subsidies occur when a segment receives resources from a peer segment. Transfers represent resources provided to a peer segment. KEEP is an indicator variable set to one when a segment has a high relative ROA *and* is in a nondeclining industry, and zero otherwise. DROP is an indicator variable set to one when a segment has a low relative ROA *and* is in a nongrowth industry, and zero otherwise. BM03_EFF SUB (BM03_INEFF SUB) is an indicator variable set to one to represent an efficient (inefficient) subsidy following Billet and Mauer (2003; BM03). BM03 consider a subsidy efficient if the segment receiving the subsidy has a ROA greater than the weighted average ROA of the firm's other segments. BM03_EFF TRF (BM03_INEFF TRF) is an indicator variable set to one to represent an efficient (inefficient) transfer. BM03 consider a transfer efficient if the segment providing the resources has a ROA less than the weighted average ROA of the firm's other segments. BH07_EFF SUB (BH07_INEFF SUB) is an indicator variable set to one to represent an efficient (inefficient) subsidy measure following Berger and Hann (2007; BH07). BH07 consider a subsidy inefficient when the segment receiving the subsidy has a ROS less than the weighted average ROS of the remaining segments. All correlations are significant at the 1% level. Spearman correlation results were no different.

Table 16

Resource Reallocation Regression Results: Alternative Efficiency Measures #1

$INVEST = \alpha_0 + \alpha_1 BM03\_EFFSUB + \alpha_2\ BM03\_EFFTRF + \alpha_3 SEGLIQ + \alpha_4 LEV + \alpha_5 LN(MVE) + \alpha_6 MB + \alpha_7 FIRMCF + \alpha_8 \Delta X\_FIN + \alpha_9 SEGQ + \alpha_{10} SEGN + \alpha_{11} SEGCF + \alpha_{12}\ BM03\_EFFTRF *SEGLIQ + \alpha_{12}\ BM03\_EFFSUB *LEV + \alpha_{14}\ BM03\_EFFSUB *FIRMCF + \Sigma\ Year\ Indicator + \Sigma\ Industry\ Indicator + \varepsilon$ (1)

Dependent Variable		%ΔAT	%ΔRSS
Independent Variables	Predicted Sign		
Intercept	?	-0.068	0.036
		(-1.73)	(2.19)
BM03_EFFSUB	+	0.133	0.108
		(2.74)	(3.11)
BM03_EFFTRF	-	-0.061	-0.054
		(-2.48)	(-5.01)
SEGLIQ	?	0.006	0.002
		(1.33)	(0.95)
LEV	?	-0.004	-0.003
		(-1.35)	(-1.79)
LN(MVE)	+	0.015	-0.002
		(5.18)	(-1.98)
MB	+	0.007	0.003
		(3.58)	(2.34)
FIRMCF	?	0.437	-0.358
		(6.26)	(-7.61)
ΔX_FIN	?	1.151	-0.235
		(11.59)	(-4.81)
SEGQ	+	0.040	0.024
		(2.77)	(2.71)
SEGN	-	-0.006	-0.003
		(-2.26)	(-1.19)
SEGCF	+	-0.001	-0.001
		(-7.27)	(-12.79)
BM03_EFFTRF * LIQ	+	0.017	0.022
		(0.83)	(1.39)
BM03_EFFSUB * LEV	-	-0.024	-0.024
		(-1.55)	(-1.85)
BM03_EFFSUB * FIRMCF	+	0.936	0.700
		(5.45)	(5.26)
Adj. R^2		0.074	0.014
Observations Used		11,553	11,553

This table reports the results of estimating equation (1) with BM03_EFFSUB substituting for KEEP, and BM03_EFFTRF substituting for DROP. Regression coefficient estimates are shown with *t*-statistics in parentheses. Variable subscripts are suppressed. See Appendix A for variable definitions.

Table 17

Resource Reallocation Regression Results: Alternative Efficiency Measures #2

INVEST = α_0 + α_1 BH07_EFFSUB + α_2 BH07_INEFFSUB + α_3SEGLIQ + α_4LEV + α_5LN(MVE) + α_6MB + α_7FIRMCF + α_8ΔX_FIN + α_9SEGQ + α_{10}SEGN + α_{11}SEGCF + α_{12} BH07_INEFFSUB *SEGLIQ + α_{12} BH07_EFFSUB *LEV + α_{14} BH07_EFFSUB *FIRMCF + Σ Year Indicator + Σ Industry Indicator + ε (1)

Dependent Variable		%ΔAT	%ΔRSS
Independent Variables	Predicted Sign		
Intercept	?	-0.069	0.037
		(-1.89)	(2.14)
BH07_EFFSUB	+	0.037	0.022
		(4.14)	(4.68)
BH07_INEFFSUB	-	0.000	0.017
		(0.07)	(0.96)
SEGLIQ	?	0.009	0.006
		(2.37)	(2.15)
LEV	?	-0.004	-0.003
		(-1.28)	(-1.78)
LN(MVE)	+	0.015	-0.001
		(4.71)	(-1.54)
MB	+	0.006	0.002
		(3.28)	(1.76)
FIRMCF	?	0.484	-0.334
		(6.81)	(-5.79)
ΔX_FIN	?	1.125	-0.261
		(12.27)	(-5.62)
SEGQ	+	0.038	0.019
		(2.52)	(2.07)
SEGN	-	-0.007	-0.003
		(-2.48)	(-1.36)
SEGCF	+	-0.001	-0.000
		(-1.59)	(-2.49)
BH07_INEFFSUB * LIQ	+	-0.019	-0.020
		(-2.19)	(-3.28)
BH07_EFFSUB * LEV	-	-0.006	-0.012
		(-0.43)	(-1.23)
BH07_EFFSUB * FIRMCF	+	-0.844	-0.334
		(-1.08)	(-0.98)
Adj. R^2		0.072	0.014
Observations Used			

This table reports the results of estimating equation (1). Regression coefficient estimates are shown with *t*-statistics in parentheses. Variable subscripts are suppressed. See Appendix A for variable definitions.

CHAPTER 7

CONCLUSION

Diversified, multisegment or conglomerate firms, typically defined as those engaging in more than one line of business or one geographical area, account for more than half of US economic productivity (Maksimovic & Phillips, 2009). Yet whether these firms, on average, reallocate resources within the firm efficiently is a matter of debate. In this study, I introduce a set of efficiency measures that rely on an assessment of within-firm comparative advantages, thereby avoiding two shortcomings of prior research: the evaluation of efficiency relative to potentially noncomparable single-segment firms, and the incorporation of error-prone proxies for growth opportunities using estimates of Tobin's *q*.

I find evidence consistent with firms' reallocating resources across their divisions in a manner that reflects priority given to segments with the greatest within-firm comparative advantages conditional on the segment's industry lifecycle stage. My results corroborate those of Maksimovic and Phillips (2002), who provide evidence suggesting that manufacturing firms grow across their industry segments efficiently based on plant productivity, and are in contrast to a line of studies documenting the cross-subsidization of underperforming divisions in multisegment firms (Rajan et al., 2000; Shin & Stulz, 1998, among others). I conclude that, on average, multisegment firms efficiently reallocate resources across their divisions. I also document that the efficiency of within-firm resource reallocations varies with firms' governance characteristics.

There is significant potential for interesting future work on multisegment investment decisions. For example, the impact of vertical and horizontal relatedness of operations on within-firm investment efficiency has not been fully examined.

APPENDIX A

VARIABLE DEFINITIONS

SEGN	The number of segments reported based on unique segment identification numbers (SID) assigned by Compustat in the segment file. The number of SIDs is adjusted to reflect only economically meaningful segments.
OIAD	Operating income after depreciation (Compustat OIADP).
SALES	Total firm sales (Compustat SALE).
ASSETS	Total firm assets (Compustat AT).
ROA	Return on assets, calculated as OIAD, scaled by ASSETS.
LEV	Debt-to-equity ratio calculated as long-term debt, scaled by common equity (Compustat DLTT/CEQ).
LIQ	Asset tangibility measured as the sum of total current assets less total current liabilities divided by property, plant and equipment (Compustat (ACT – LCT) /PPE).
MVE	Market value of equity calculated as annual fiscal year-end closing price x common shares outstanding (Compustat PRCC_C x CSHO).
MB	Market-to-book equity ratio calculated as MVE, scaled by common equity (Compustat (PRCC_C x CSHO)/CEQ).
FIRMCF	Firm cash flow measured as operating activities-net cash flow less cash dividends over average assets (Compustat (OANCF-DV)), scaled by average assets.
ΔX_FIN	Net amount of cash flow from external financing sources calculated as net change in equity plus the net change in debt, scaled by average assets. The change in equity is the net cash

	received from the sale (and/or purchase) of common and preferred stock less cash dividends paid (Compustat SSTK - PRSTKC - DV) and the net change in debt equals net cash received from the issuance (or reduction) of debt (Compustat DLTIS –DLTR + DLCCH). This measure follows Bradshaw, Richardson and Sloan (2006).
PCT_IND	An estimate of the percentage of the board of directors that is independent or not affiliated with the firm. Employees, ex-employees and individuals with legal or other affiliations with the firm are not considered to be independent.
%ΔAT	Percentage change in segment assets calculated as the difference between current and lagged segment assets divided by lagged assets.
%ΔRSS	Percentage change from the prior year in relative segment size where relative segment size is calculated as segment assets over firm assets.
KEEP	Indicator variable set to one when a segment has a high relative industry-adjusted ROA *and* is in a nondeclining industry, and zero otherwise. Segment ROA is *t*-1 segment operating profit, scaled by segment assets. Industry adjusting subtracts the industry median from the segment value where industry medians are calculated using the contemporaneous Compustat population of single-segment firms in the same three-digit NAICS code. Chapter 4 in the text provides a more detailed description of the variable.
DROP	Indicator variable set to one when a segment has a low relative industry-adjusted ROA *and* is in a nongrowth industry, and zero otherwise. Segment ROA is *t*-1 segment operating profit scaled by segment assets. Industry adjusting subtracts the industry median from the segment value where industry medians are calculated using the contemporaneous Compustat population of single-segment firms in the same three-digit NAICS code. Chapter 4 in the text provides a more detailed description of the variable.
SEGASSETS	Total segment assets (Compustat segment files AT).
SEGLIQ	The liquidity or tangibility of segment assets measured as the industry median of current assets less current liabilities, all over property, plant and equipment (Compustat (ACT – LCT)/PPENT). The measure is calculated using single-segment firms and assigned to segments using three-digit NAICS codes.

SEGQ	An estimate of segment-growth opportunities calculated as the industry median market-to-book asset ratio (Compustat (AT - CEQ + (PRCC_F *CSHO))/average assets). The measure is calculated using single-segment firms and assigned to segments using three-digit NAICS codes.
SEGCF	Segment cash flow is measured as segment operating profit plus depreciation, scaled by segment assets (Compustat segment files (OPS + DP)/AT).
DROPSUM	The number of DROPs assigned to a segment over the four-year period from time *t*-3 through time *t*.
INDEP	Increasing quintiles of PCT_IND, sorted by industry and year.
ROE	Return on equity calculated as income after depreciation, scaled by beginning-of-year common equity (Compustat OIAD/CEQ_{t-1}).
NI_AT	Net income, scaled by total assets (Compustat NI/AT).
OPEPS	Earnings per share from operations (Compustat OPEPS).
EPS	Earnings per share (diluted) excluding extraordinary items (Compustat EPSFX).
F_DOES	An indicator variable assigned a one when at least half of the firms' segment-level resource reallocation decisions in time *t*+1 agree with my ex ante predictions of KEEP or DROP in time *t*, and zero otherwise.
PCTGOOD	The percentage of a firm's segments where the resource reallocations agree with ex ante predictions.
OIAD_LOSS	An indicator variable set to one when firm-level operating income after depreciation (Compustat OIADP) is less than zero, and zero otherwise.
BM03_EFF SUB	An indicator variable set to one to represent an efficient subsidy following Billet and Mauer (2003; BM03). BM03 consider a subsidy efficient if the segment receiving the subsidy has a ROA greater than the weighted average ROA of the firm's other segments.
BM03_INEFF SUB	An indicator variable set to one to represent an inefficient subsidy

	following Billet and Mauer (2003; BM03). BM03 consider a subsidy inefficient if the segment receiving the subsidy has a ROA less than the weighted average ROA of the firm's other segments.
BM03_EFF TRF	An indicator variable set to one to represent an efficient transfer following Billet and Mauer (2003; BM03). BM03 consider a transfer efficient if the segment providing the resources has a ROA less than the weighted average ROA of the firm's other segments.
BM03_INEFF TRF	An indicator variable set to one to represent an inefficient transfer following Billet and Mauer (2003; BM03). BM03 consider a transfer inefficient if the segment providing the resources has a ROA greater than the weighted average ROA of the firm's other segments.
BH07_EFF SUB	An indicator variable set to one to represent an efficient subsidy measure following Berger and Hann (2007, BH07). BH07 consider a subsidy inefficient when the segment receiving the subsidy has a ROS less than the weighted average ROS of the remaining segments.
BH07_INEFF SUB	An indicator variable set to one to represent an inefficient subsidy measure following Berger and Hann (2007, BH07). BH07 consider a subsidy inefficient when the segment receiving the subsidy has a ROS less than the weighted average ROS of the remaining segments.

APPENDIX B

INDUSTRY LIFECYCLE STAGE CALCULATION

Following Maksimovic and Phillips (2008), industry lifecycle stages are identified using the long-run change in the number of firms in an industry and the long-run change in sales growth. As an alternative measure I also calculate changes in growth using the Bureau of Economic Analysis (BEA) industry accounts of industry gross output (this is equivalent to the market value of industries' production).

Growth industries are defined as those where the long-run number of firms and long-run sales growth (or production based on BEA data) are increasing such that both are above the industry median. Consolidating industries are those where the change in long-run production is above the economy-wide median, and the change in the number of firms falls below the economy-wide median. Technological Change industries include those where the change in long-run demand is below the economy-wide median, yet the change in the number of firms in the industry is increasing. Finally, industries in Decline are those where the change in the long-run demand and the change in the number of firms both fall below the economy-wide medians. The 2x2 matrix illustrates the relation between the four lifecycle categories.

Long-run change in number of firms

Long-run change in sales growth	below median	above median	
	Consolidating	Growth	above median
	Decline	Tech Change	below median

Long-run changes are calculated using the Compustat population of firms over two windows: 23-year, long-run change, and a 10-year, rolling window.[20]

To allow for the possibility of industry lifecycle stages shifting during the sample period, I calculate the stages using 10-year, sequential, rolling windows. That is, I estimate a stage quadrant for each two-digit sector annually, using the current year and the prior 9 years. For example, to calculate industry lifecycle stages for the year 2000, I classify sales growth and the number of firms participating in sectors as above or below median values, based on data from 1991 (*t*-10) to 2000. I repeat this procedure for each sample year (1998 through 2007) dropping the earliest year and adding a new year.

[20]Data for NAICS codes are available beginning in 1985, allowing for only a 23-year window. Prior research uses other classification systems and a 25-year, long-run period.

APPENDIX C

SEGMENT DISTRIBUTION BY INDUSTRY LIFECYCLE STAGE

Table 18

	Growth		Tech Change		Consol		Decline		Total	
NAICS Sectors	Freq	%	Freq	%	Freq	%	Freq	%		%
Accommod, Food Svc	30	0.5	186	12.0	98	8.0	81	1.3	395	2.6
Admin, Support	180	3.1	243	15.7	10	0.8	33	0.5	466	3.1
Agriculture, Forestry	92	1.6	0	0.0	4	0.3	15	0.2	111	0.7
Art, Entertainmt	28	0.5	37	2.4	26	2.1	7	0.1	98	0.7
Construction	233	4.0	17	1.1	9	0.7	37	0.6	296	2.0
Educational Services	59	1.0	0	0.0	1	0.1	4	0.1	64	0.4
Health Care, Soc Asst	150	2.6	13	0.8	6	0.5	83	1.3	252	1.7
Information	417	7.2	7	0.5	38	3.1	941	14.6	1,403	9.3
Manuf.	3,040	52.3	671	43.4	885	72.7	4,076	63.2	8,672	57.7
Mining	168	2.9	198	12.8	13	1.1	210	3.3	589	3.9
Other Svcs	29	0.5	0	0.0	4	0.3	8	0.1	41	0.3
Prof, Tech. Scientific	489	8.4	22	1.4	12	1.0	47	0.7	570	3.8
Real Estate, Rental	13	0.2	2	0.1	7	0.6	76	1.2	98	0.7
Retail Trade	205	3.5	0	0.0	0	0.0	57	0.9	262	1.7
Transport, Warehousing	237	4.1	79	5.1	62	5.1	304	4.7	682	4.5
Utilities	8	0.1	4	0.3	0	0.0	0	0.0	12	0.1
Wholesale Trade	436	7.5	68	4.4	43	3.6	473	7.2	1,020	6.8
		100.0		100.0		100.0		100.0		
Total Segments	5,814	38.7	1,547	10.3	1,218	8.1	6,452	42.9	15,031	100.0

This table reports segment distribution by industry lifecycle stage. NAICS sectors are based on two-digit NAICS. Industry lifecycle stages are calculated based on a long-run (1985-2008) median change in aggregate industry sales and change in number of firms in the industry. Appendix B provides a detailed

Table 18 continued

description of the industry lifecycle stage calculation. A total of 205,069 firm-year observations were used to calculate the lifecycle stages. Lifecycle stages are then assigned to sample-firm segments based on three-digit NAICS codes. Sixty-five industries are condensed into 17 sectors above.

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