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## Refocusing Through Discontinued Operations in Response to Acquisitions and Diversification

Richard Lord

*Montclair State University*, lordr@mail.montclair.edu

Yoshie Saito

*City University of New York*

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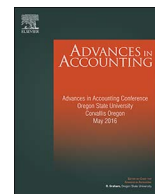
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# Refocusing through discontinued operations in response to acquisitions and diversification

Richard A. Lord<sup>a</sup>, Yoshie Saito<sup>b,\*</sup><sup>a</sup> Department of Accounting & Finance, Feliciano School of Business, Montclair State University, Upper Montclair, NJ 07043, United States<sup>b</sup> School of Accountancy, Strome College of Business, Old Dominion University, Norfolk, VA 23529, United States

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## ABSTRACT

We examine how prior acquisitions and the extent of corporate diversification affect decisions to discontinue operations. These choices comprise a very important class of publicly announced disposal decisions, and analyzing them allows us to utilize a much larger sample than most prior studies of divestitures. We employ a multinomial logistic regression setting to test our three hypotheses; this framework allows us to assess the difference in choices regarding positive- and negative-valued announcements of discontinued operations. We find that firms are less likely to report negative-valued divestitures in the year of an acquisition, and are more likely to discontinue operations, especially with negative values, two and three years after. The effects of the size of an acquisition on disposal decisions differ sharply between large and small firms. The magnitude of an acquisition has little influence on subsequent divestiture choices by smaller enterprises. However, large companies are more likely to make positive-valued discontinuations in the year of and year following a major acquisition, which is consistent with the view that valuable but unwanted units are often shed soon after large complex acquisitions. We find strong support for the Corporate Focus Hypothesis, positing that highly diverse firms are more likely to divest assets. We also show that when a company announces its first discontinued operation, this normally follows a period of increasing corporate diversification, and the majority of subsequent disposals take place as intermediate steps in a down-sizing process.

## 1. Introduction

Dranikoff, Koller, and Schneider (2002) and Brauer (2006) note that divestitures are among the most important business decisions; however, they have received far less attention in the literature than acquisitions. We aim to contribute to the understanding of why, when and how managers choose to divest. While most prior empirical studies are based on small samples because they rely on public announcements of asset sales, which are rare, we focus on discontinued operations, which provide a much larger sample and represent clearly identifiable strategic choices, encompassing various kinds of disposal decisions. These occurrences are also particularly interesting as they can take either positive or negative values, which reveal some information on whether the disposal is a strongly or poorly performing unit.

We examine three aspects of divestiture decision-making. First, we provide a detailed analysis of the interrelationship between acquisitions and subsequent announcements of discontinued operations. Second, we ask whether the extent of corporate diversification drives the choice to downsize. This question is directly related to the focus hypothesis,

which posits that a major reason for firms to divest operations is overly-wide corporate diversification. Third, we examine whether announcements of discontinued operations represent the beginning of a process of sharpening corporate focus, or the culmination of actions leading to less diversified and more manageable operations. We employ a series of multinomial logistic regression models to test our hypotheses. The dependent variable is arranged into three discrete classes so that we may assess differences between firms that announce positive- or negative-valued discontinued operations.

Porter (1987) and Ravenscraft and Scherer (1987) show that corporate acquisitions are often followed by divestitures. There has been a good deal of research indicating that the disposal of these assets is the result of misguided investments (Bergh, 1997; Capron, Mitchell, & Swaminathan, 2001; Hoskisson, Johnson, & Moesel, 1994; Kaplan & Weisbach, 1992; Kruse, 2002). In contrast, Weston (1989) and Bergh (1997) note that a significant number of divestitures feature the disposal of valuable but unwanted operating units following a large acquisition. Hamilton and Chow (1993) and Dranikoff et al. (2002) note that most managers view disposals as important strategic choices about

\* Corresponding author.

E-mail addresses: [lorder@mail.montclair.edu](mailto:lorder@mail.montclair.edu) (R.A. Lord), [y lord@odu.edu](mailto:y lord@odu.edu) (Y. Saito).

the optimal use of resources. The complexity of the interrelationship between acquisitions and divestitures is underscored by anecdotal evidence from recent choices by Motorola, Google and Lenovo. They represent the sale of an unwanted but valuable unit soon after an acquisition, for a gain, and the subsequent divestiture of another unit for a loss after it was deemed unsuccessful.

In January 2011, Motorola spun-off its mobile device and set-top box division as Motorola Mobility. In August of the same year, Google purchased the new entity for \$12.5 billion. Google's main interest was to acquire Motorola Mobility's portfolio of patents, which were related to Android devices. Google was not interested in the set-top box operation, and so quickly arranged to sell that division to Arris Group for \$2.35 billion (Savitz, 2012). The total reported value of discontinued operations from the gain on the sale of the unit was \$757 million. Within one year, Google sold the mobile phone assets to Lenovo after disappointing sales of the Motorola Moto X-Phone, but retained the vast bulk of the patents (Miller & Gelles, 2014). This example clearly demonstrates that acquisitions and disposals often go hand-in-hand, which motivates our investigation of whether divestitures tend to follow acquisitions.

There is earlier empirical evidence that disposal decisions are often the result of earlier over-diversification. As a firm's operations become more diverse, it can be progressively more difficult for the management team to oversee the disparate units. Inefficient and nonproductive segments can also siphon resources away from profitable or strategically important core assets. In early work on the subject, Comment & Jarrell (1995) and John and Ofek (1995) find that widely diversified firms, tend to perform poorly and are more likely to divest operations. Daley, Mehrotra, and Sivakumar (1997) dub this proposition the Corporate Focus Hypothesis. Therefore, our second question is whether the extent of corporate diversification drives the choice to downsize through discontinued operations.

Our third question concerns management's response to the recognition that diversification has become untenable. In some cases, a divestiture might be the first sign of such realization or, if corporate focus were already narrowing, the action might be one in a chain. While firms may engage in gradual restructuring activities to improve performance (Atiase, Platt, & Tse, 2004), discontinuing an operating unit requires a more substantial and unwavering commitment to a strategy. Once a unit is sold or abandoned, it is much more difficult to rebuild an operation. We examine how recent changes in diversification may affect managers' decisions to discontinue operations.

With regard to our first hypothesis, concerning the interrelationship between acquisitions and subsequent announcements of discontinued operations, we find that, in the year of an acquisition, companies are generally less likely to discontinue negative-valued operations. Firms that make large acquisitions are more liable to announce positive-valued discontinued operations in that same year. However, both positive and negative-valued divestitures are most common two or three years following an acquisition.

There are interesting differences between large and small companies. For small firms, the size of an acquisition has little effect on contemporaneous or subsequent divestitures, while large entities are far more likely to divest positive-valued operations in the years of and after an acquisition. Larger firms are also less prone to dispose of negative-valued assets two or three years after an acquisition. Overall, our findings support the proposition of Weston (1989) and Bergh (1997) that firms quickly divest unwanted divisions in acquisitions of large complex organizations, and later dispose of acquired assets that they have come to view as unsuccessful investments. This is also consistent with the anecdotal evidence from Google's sequence of divestitures of the assets of Motorola Mobility.

We find that more widely diversified organizations are far more likely to discontinue operations. This supports the Corporate Focus Hypothesis that decreasing company diversification is a powerful

motivation to dispose of ancillary units. We also find that firms with high leverage, low profitability and Tobin's Q, and that are in danger of bankruptcy are more likely to engage in discontinued operations. In addition, smaller firms are more likely to dispose of operations. Collectively, these results suggest that when the extent of diversification becomes unmanageable or firms cannot exploit the economies of scale of diversification, managers tend to divest marginal assets to focus on core operations.

For our third hypothesis, we examine the relationship between recent changes in corporate focus and decisions to discontinue operations. There is clear evidence that firms are more likely to divest an operation if they have altered their strategic focus within the previous three-year period. Our base model shows that firms that discontinue operations are more likely to have been sharpening their corporate focus in the recent past. However, when we examine a smaller sample of companies, that have made only a single divestiture, we find that a greater proportion of these have expanded diversification in the previous three years. The findings suggest that a first divestiture is generally a response to perceived over-diversification, while subsequent disposals represent continued progress toward a more optimal corporate structure.

We contribute to the prior literature in the following ways. First, earlier research on the focus hypothesis uses small samples based on publicly announced asset sales (Comment & Jarrell, 1995; John & Ofek, 1995). We show that reports of discontinued operations are associated with more general corporate focus decisions. This is an important extension of the prior literature because the broader category will allow future researchers to collect much larger samples to conduct empirical analyses of managers' down-sizing decisions.

Second, we provide empirical evidence on the relationship between acquisitions and disposal decisions that helps to clarify some of the motives for positive-valued divestitures (Kaplan & Weisbach, 1992; Mulherin & Boone, 2000; Porter, 1987; Ravenscraft & Scherer, 1987). Our findings show that (a) positive-valued disposals often follow acquisitions, because acquirers are often seeking very specific technologies, and that (b) large firms are more likely to report positive-valued disposals immediately following major acquisitions.

Third, we are the first to show that the typical announcement of a discontinued operation occurs in the middle of the restructuring process. Entities that engage in discontinued operations have often decreased their diversification in recent years. However, firms that report discontinued operations for the first time generally have been increasing diversification in the recent past. This seems to suggest that there may be an optimal level of complexity and scope of operations that managers are seeking to achieve and maintain. We believe our study is the first to document this type of ongoing quest for the correct level of diversification.

Lastly, our evidence clearly indicates that information contained in discontinued operations captures important changes in corporate strategy, such as increased focus on core operations, and the acquisition or abandonment of specific technologies. This supports the contentions of Dranikoff et al. (2002) and Brauer (2006), and provides a managerial decision perspective to existing accounting research on discontinued operations that focuses more on reporting mechanisms (Barua, Lin, & Sbnaraglia, 2010; Curtis, McVay, & Wolfe, 2014).

The remainder of the paper is arranged as follows. In the next section, we provide some background information on discontinued operations. Then, we examine the historical relationship between acquisitions and discontinued operations using aggregate data, discuss the background literature and develop our hypotheses. In the fifth section, we define our explanatory variables, and then describe the data and present univariate statistics. In the seventh section, we describe our multinomial logistic regression specification, and discuss the parameter estimates and some sensitivity analyses to test the robustness of our results. Finally, we conclude and summarize our findings.

## 2. Discontinued operations

Discontinued operations are disposals of specific assets or operations that represent an important reallocation of resources within a firm (Collins & Henning, 2004). When a company divests an operation, it must report income or loss from the unit on its income statement below income from continuing operations, to indicate that these activities differ from those generated by ongoing operations. The reported value consists of three basic components: (1) the profits or losses generated by the unit in the operating year, (2) the capital gain or loss on the sales or disposal of the unit, and (3) the tax effects.

A discontinued operation must be a separate major line or geographical segment that can be clearly distinguished operationally and for financial reporting purposes. It can be a (1) reportable or operating segment, (2) reporting unit, (3) subsidiary, or (4) asset group (Henry & Holzmann, 2010). The parent firm cannot maintain any significant ongoing involvement in the divested unit, and it may be divested entirely or in a piecemeal fashion.<sup>1</sup> Generally, activities such as closing facilities, abandoning products or even product lines, and changing the size of the work force in response to market forces should not be reported as discontinued operations (there are tests to allow these if their impacts are significant).<sup>2</sup> Furthermore, when a firm decides to discontinue a component, but the operation has not yet been sold, the company must estimate its value, and it is then recorded as “held for sale”. If the book value is more than market value, an impairment loss is booked. As a result, reports of discontinued operations often give slightly imprecise information on the value of the divested asset or its sale price. It is likely because of their aggregated nature and the perception that they represent transitory earnings that discontinued operations have been largely overlooked in the prior literature.

Two recent studies investigate whether executives use this item to manage earnings. Barua et al. (2010) find that companies shift operating expenses to discontinued operations to meet analysts' benchmarks. However, Curtis et al. (2014) find no compelling evidence of discontinued operations being used as vehicles for earnings management. They show that recent changes in the regulatory definition (SFAS No. 144) have affected the persistence of earnings; however, why and how managers make this type of disposal decisions remains largely unknown.

We feel that, despite the inexact nature of the reports of discontinued operations, it is safe to assume that positive-valued divestiture announcements represent units that are profitable and/or are sold for significant capital gain. We also believe that the opposite holds true for negative-valued reports. At the extreme, most abandonments will have negative values; the jettisoned unit is probably unprofitable, and there is also a loss on any book value of the assets. Jensen (1993) and Brauer (2006) suggest that decisions about diversification strategies and divestitures are important corporate commitments, and asset dispositions can provide valuable insight on managerial past and forward looking resource allocation choices. However, current accounting research on discontinued operations mainly focuses on how investors perceive the announcements or whether managers manipulate earnings through reporting rather than on the kinds of strategic changes that are reflected in the decisions.

<sup>1</sup> The reporting is more complex if the firm decides to dispose of the asset in the next operating period (or periods), or if the divestiture will occur over several years. In these circumstances, there will be reports during a number of accounting cycles. In addition, firms often make revisions to the original amount reported in later years. For a reasonably clear practical example, see the discussion in the 2012 Annual Report by Becton, Dickinson and Company on the sale of its Biosciences Division.

<sup>2</sup> This is the definition under SFAS No. 144 that was in place from 2002 until 2014, which represents most of our study period. It was supplanted by a new standard in 2014 (FASB, 2014, p. 1). But, the basic framework of the definition is similar.

## 3. Economy-wide trends in acquisitions and discontinued operations

Mitchell and Mulherin (1996), Mulherin and Boone (2000), Andrade, Mitchell, and Stafford (2001) and Brealey and Myers (2003, pp. 953–954) provide evidence of historical waves in mergers and acquisition activities. Because many argue that divestitures follow acquisitions, we are interested in whether asset disposals track these same patterns. Fig. 1 shows the evolution in the portion of all firms in the North American Compustat sample from 1971 to 2012 that make an acquisition or discontinue an operation. Acquisitions rise more dramatically over the forty-year horizon, but the figure provides visual evidence that the two activities are related: the correlation between the two is over 63%. We also estimate the correlations between discontinued operations and three years of lags in acquisitions. All have correlation values well over 60%, providing strong circumstantial evidence at the macro-level that decisions to discontinue operations follow waves in acquisitions.

In Fig. 2, we examine the magnitude of the acquisitions and discontinued operations between 1971 and 2012. The values presented are the median of the ratio of reported acquisition or divestiture activity to revenues for all firms that take one of the actions during the fiscal year.<sup>3</sup> The sample of acquisitions contains only the enterprises that make such a purchase in the year. Including only firms that undertake a specific action allows us to calculate averages and compare differences in the magnitudes of the reports. For graphical purposes, we take the absolute value of the ratio of acquisition/divestiture activity to revenues for enterprises reporting negative-valued operations.

Clearly, large acquisitions are clustered into distinct periods in the mid-1980s, late 1990s and, to a lesser extent, before the severe market contraction in 2007. This clustering is consistent with time frames for merger waves found in the earlier literature. The visual evidence in Fig. 2 suggests the magnitude of aggregate positive and negative-valued discontinued operations follow these waves, especially for the first two cycles. There are strong and significant correlations between the magnitudes of discontinued operations and current and prior levels of acquisitions. Although untabulated, the correlation between the magnitudes of negative-valued divestitures and contemporaneous acquisitions is over 46%, and well over 50% for acquisitions in prior years, particularly in the case of divestitures occurring two and three years after acquisitions.<sup>4</sup> The relationship between the magnitude of positive-valued discontinued operations and acquisitions is even stronger. The correlation is about 73% in the year of the divestiture and two years prior, over 78% for the year before, and 65% three years after the disposal. These results lend credence to the conviction of Weston (1989) and Bergh (1997) that divestitures of valuable, but unwanted units follow soon after an acquisition, and then those of assets that do not meet expectations come years later.

## 4. Development of the hypotheses and background literature

In this section, we develop three sets of hypotheses on the factors that lead to decisions to discontinue operations. The first concerns whether these choices are related to recent acquisitions. The others involve the extent of corporate diversification and timing of changes in this diversity. All three propositions are derived from streams of literature in finance, economics, accounting, and management.

<sup>3</sup> Including the non-reporting firms, which have values of zero, will lower the median and mean statistics significantly.

<sup>4</sup> We did not include the correlation estimates in a table because later we present results for logit regression specifications that provide more information about the relationship of discontinued operations with current and prior acquisitions.

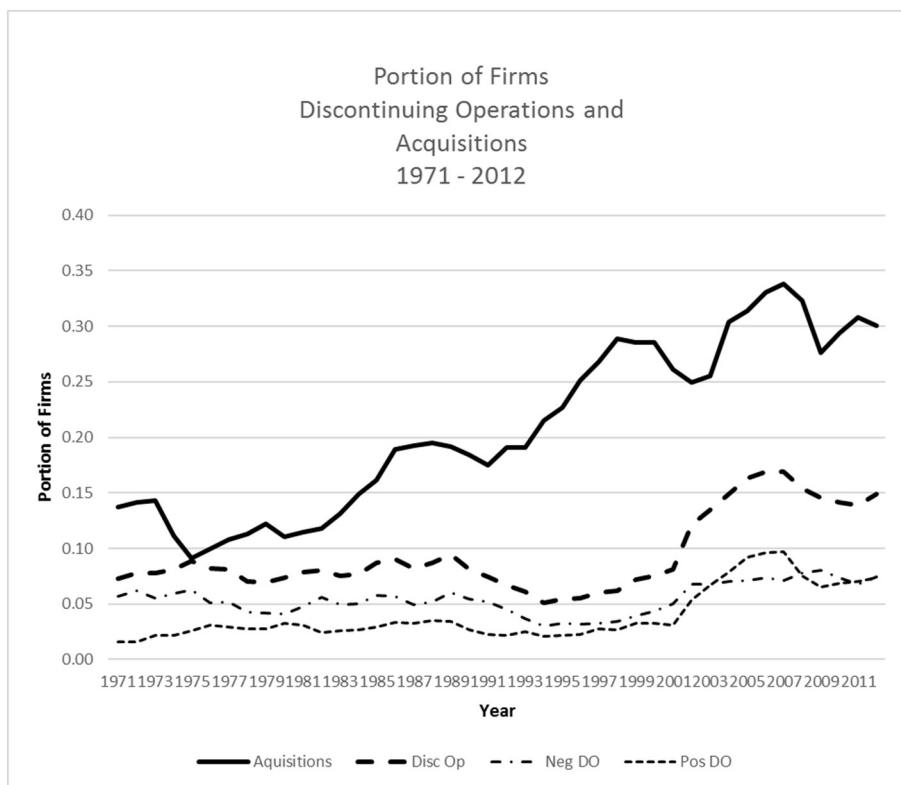


Fig. 1. Portion of firms discontinuing operations and acquisitions.

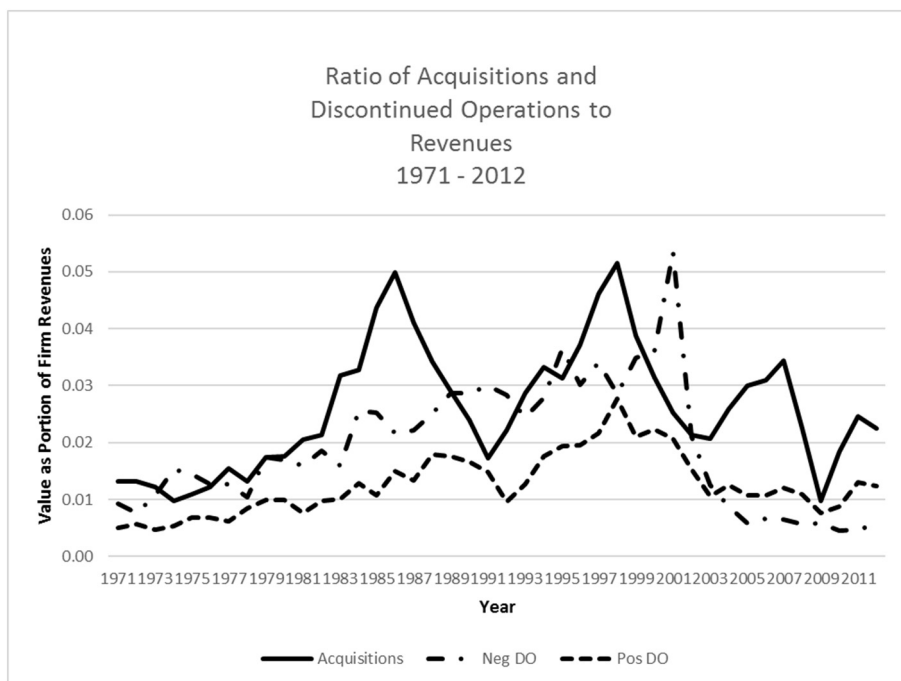


Fig. 2. Ratio of acquisitions and discontinued operations to revenues.

#### 4.1. Acquisitions

Porter (1987), Ravenscraft and Scherer (1987), Kaplan and Weisbach (1992), Mulherin and Boone (2000) and Basu (2010) find that acquisitions are often followed by divestitures. These earlier studies led to research about whether divestitures result from poor acquisition choices (Bergh, 1997; Capron et al., 2001; Hoskisson et al., 1994; Kruse, 2002). Dranikoff et al. (2002) and Brauer (2006) note that

there are many reasons to divest an acquired unit. Weston (1989) and Bergh (1997) argue that firms often desire some of the assets of a target, but not all. In such cases, it is common to sell immediately units that do not fit into the planned corporate structure. Examples include recent acquisition and divestiture activities of Motorola, Google and Lenovo discussed earlier.

The visual evidence in Figs. 1 and 2 suggests that there are contemporaneous and lagged relationships between the portion of the



firms making acquisitions and the magnitude of the purchases with decisions to discontinue operations. Therefore, we develop two related hypotheses on the relationship between discontinued operations and acquisitions. The first concerns the timing of divestitures following an acquisition.

**Hypothesis 1A.** Firms that make acquisitions in the current and prior years are most likely to discontinue operations.

The second concerns how the magnitude of the acquisition affects the disposal decision.

**Hypothesis 1B.** Firms that make large acquisitions in the current and prior years are most likely to discontinue operations.

#### 4.2. Extent of corporate diversification

Managers often discuss disposing of ancillary divisions to concentrate on their core business operations. Prior research by [Comment and Jarrell \(1995\)](#), [John and Ofek \(1995\)](#) and [Daley et al. \(1997\)](#), identifies corporate focus as an important reason for divestiture decisions. These studies generally rely on small samples to examine asset sales and spin-offs. By concentrating on announcements of discontinued operations derived from annual income statements, we can utilize a much broader sample, which allows us to generalize the reasons behind managerial disposal decisions.

Our approach also allows us to assess whether firms that are trying to sharpen corporate focus are more likely to discontinue positive- or negative-valued operations. There may be an interrelationship between poor performance and the incentive to sharpen corporate focus. For example, [John and Ofek \(1995\)](#) argue asset sales help a corporation to focus its business by improving investment policy. [Maksimovic and Phillips \(2002\)](#) find that successful conglomerates exploit the economic return to scale by utilizing their superior general ability, and these firms are relatively large. [Dittmar and Shivadasani \(2003\)](#) show that efficiency in investment improves after divestitures. More recently, [Warusawitharana \(2008\)](#) also finds evidence that asset sales are strongly associated with weak operating performance. All these results indicate that the realization of the poor performance of previous investment strategies can trigger a focus strategy.

It might seem that poorly-performing entities would be more likely to divest failing operations with negative values; however, there is no clear reason that these firms would divest only negative-valued units. When tighter focus is a main objective, an entity must evaluate its strengths and weaknesses, and this may result in disposition of positive as well as negative-valued lines. Especially for large firms, rational decisions about asset disposals are critical to avoid suboptimal expansion into areas where they have limited expertise to fully exploit their comparative advantage. Hence, our corporate focus hypothesis is:

**Hypothesis 2.** Firms with highly diverse operations are most likely to discontinue either negative or positive-valued operations.

#### 4.3. Changes in corporate diversification

Our third question is whether discontinued operations are part of an on-going corporate restructuring process, or if over-diversification leads to disposal decisions. There may be some optimal level of complexity of firm operations, and managers may be trying to achieve such an equilibrium given current conditions. However, since this calibration is a slow and evolving process, it is difficult to identify individual divestiture decisions as exercises in optimization. Rather, the actions may be intermediate steps in a flow of restructuring activities.

We develop two alternative hypotheses about changes in the extent of corporate diversification in the years leading-up to a disposal. Diversification may eventually drain resources away from other profitable operations. At some point, managers of an enterprise that has been diversifying rapidly might see that this strategy is counterproductive,

and then begin to divest units. [Basu \(2010\)](#) finds that soon after a burst of diversification, many firms reverse their decisions. [Kaplan and Weisbach \(1992\)](#) find that about 40% of acquisitions made from 1971 to 1982 end-up as divestitures by 1989. Therefore, a competing hypothesis is:

**Hypothesis 3A.** Firms where diversification has recently increased are most likely to discontinue an operation.

Alternatively, managers may have already begun to undo over-extension, such that their current divestiture is merely another step in the on-going narrowing of corporate focus. Accounting researchers often view divestitures as isolated (transitory) events ([Bradshaw & Sloan, 2002](#); [Burgstahler, Jiambalvo, & Shevlin, 2002](#); [Fairfield, Sweeney, & Yohn, 1996](#)), but they may be a part of broader restructuring activities. [Dittmar and Shivadasani \(2003\)](#) and [Denis, Denis, and Sarin \(1997\)](#) show that divestitures are often preceded by other restructuring events such as management turnovers or mergers. [Matsusaka \(2001\)](#) provides accounts of five companies, each going through a cycle of acquisition and divestiture that took place over a period of 30 years, indicating that restructuring can be a protracted process. [Brauer and Schimmer \(2010\)](#) suggest that divestitures may be a learning process wherein managers implement a series of changes as their strategy evolves. Therefore, the final competing hypothesis is:

**Hypothesis 3B.** Firms where diversification has recently decreased are most likely to discontinue an operation.

It is important to take some care in testing this third set of hypotheses. Firms often report multiple discontinued operations over several years, in close proximity. Sometimes these are adjustments to earlier estimates. But, often a number of divestitures follow closely upon an earlier disposal. Therefore, we attempt to assess differences in the results for firms that announce only a single discontinued operation.

## 5. Description of explanatory variables

We employ a series of multinomial logistic regression specifications to test our hypotheses. The dependent variables are multinomial indicators that a firm has discontinued an operation. We include twelve explanatory variables to test our three propositions, and another seven independent factors as control variables. Most of the explanatory factors are measures over several years before the decision to make the divestiture. This structure is an important element of our empirical design, as the lagged values of the independent variables help to mitigate endogeneity issues, because measures from prior years are less likely to be influenced by the factors driving the present divestiture decision.

### 5.1. Variables to test our hypotheses

In our first hypothesis, we test whether there is a distinct association between divestitures and either contemporaneous or prior acquisitions. We also examine whether there are clear patterns in reports of disposals with positive or negative values following acquisitions. We create two sets of variables to examine the effects of acquisitions on subsequent divestitures. The first are four one/zero dummy variables set to one if the firm makes an acquisition in the same year as the announced discontinued operation, D-ACQ, or any of three preceding years, L1D-ACQ, L2D-ACQ, and L3D-ACQ. We employ the other four variables to examine the effect of the *magnitude* of the acquisition on the divestiture decision. To do so, we calculate the ratio of the announced size of the acquisitions (in the statement of cash flows) to revenues for the contemporaneous and each of the three preceding years, ACQ-REV, L1ACQ-REV, L2ACQ-REV, and L3ACQ-REV.

Our second hypothesis concerns the effect of corporate diversification on the decision to discontinue an operation. As a proxy, following [Scherer and Ravenscraft \(1984\)](#), we calculate a Herfindahl Index for each firm in each fiscal year. This index is the sum of the squared values

of the ratio of sales for each operating unit to total firm sales. For a firm with  $N$  units, the relationship is as follows.

$$HERF = \frac{1}{N} \sum_{i=1}^N (s_i/S)^2$$

The value of the index decreases as the entity is more operationally diverse. For instance, if a firm has two divisions that both contribute 50% of sales, the value of the index is 0.50 (0.25 + 0.25). For a less diversified firm, where one unit contributes 90% of revenues and the other 10%, the index value is higher 0.82 (0.81 + 0.01). If the measure has a value of one, the firm is completely undiversified. This proxy is used in earlier studies by [John and Ofek \(1995\)](#), [Comment and Jarrell \(1995\)](#), [Berger and Ofek \(1999\)](#) and [Dittmar and Shivadasani \(2003\)](#). Our explanatory variable to test the hypothesis,  $HI$ , is the average value of this index for the three years before the announcement of a discontinued operation.

In the third hypothesis, we test how recent changes in diversification affect decisions to discontinue operations. Therefore, we first calculate the change in the Herfindahl Index over the prior three years. Since we hope to understand differences between firms that are increasing or decreasing corporate focus, we create two one/zero dummy variables to capture these directional changes; the first is set to one if diversification is decreasing,  $HI-CH-INC$ , the second if it is increasing,  $HI-CH-DEC$  (recall that increasing value of the Herfindahl Index implies less diversification and vice versa). Because focus cannot increase for firms that are undiversified, we create a third dummy variable,  $HI-DEC-SUN$ , set to one if diversification has decreased at a firm that had a Herfindahl Index value of one four years in the past. This will show how choices at these previously undiversified entities differ from others that have changed their focus in recent years.

## 5.2. Control variables

We include eight control variables in our models. [Hoskisson et al. \(1994\)](#), [Bergh \(1997\)](#), [Capron et al. \(2001\)](#), [Kruse \(2002\)](#) and [Schlingemann, Stulz, and Walking \(2002\)](#) find that weak performance explains many corporate divestitures. Therefore, we include three performance measures, one based on earnings, another on leverage and the third on market performance. The first is the average return on assets (ROA) over the previous three years, which captures the general profitability. The second is a measure of financial leverage (LEV), the ratio of total liabilities to assets. [Lang, Poulsen, and Stulz \(1995\)](#) and [Allen and McConnell \(1998\)](#) show that firms facing greater financial constraints are more likely to dispose of assets to raise needed cash. The third control variable is the average value of Tobin's  $Q$  for the three prior years (TOBINQ), which is a proxy for market participants' assessment of firm valuation.

Firm size is often an important determinant of financial policies, and is frequently used as a proxy for ease of access to financial markets. Because the distribution of revenues is often seriously skewed, we employ an alternative approach suggested by [Aggarwal and Samwick \(1999\)](#). For each fiscal year, we collect the descriptive statistics for the firms on Compustat that trade on the nine major North American stock exchanges.<sup>5</sup> We use the mean and standard deviation for each year to construct a cumulative density function (CDF) of corporate revenue. For each observation, we find the percentage of firms with lower values of revenue under the CDF for that year (CDF-REV). These take on a value between zero and one. For instance, if CDF-REV is 0.90, this firm is larger than 90% of the firms traded on the major exchanges in that fiscal year.

[Darrough, Guler, and Wang \(2014\)](#) find that many nonrecurring items are interrelated. Therefore, we include a one/zero dummy

<sup>5</sup> These are the Toronto, Montreal and Alberta Stock Exchanges in Canada, and the New York, American, Boston, Midwest, Pacific and Philadelphia Exchanges in the United States.

variable, SPI, set to one if a firm reports a special item in Compustat<sup>6</sup> in the contemporaneous or any of the three prior years. In accordance with their findings, we expect that this variable will be positively associated with the probability that a firm will discontinue an operation.

We employ measures of firm-specific risks based on the Altman Z-Score. [Altman \(1968\)](#) developed the following model of the probability of bankruptcy for manufacturing firms:

$$Z' = 1.2 (WC / TA) + 1.4 (RE / TA) + 3.3 (EBIT / TA) + 0.6 (BVEQ / BVLIAB) + 1.0 (REV / TA).<sup>7</sup>$$

Altman proposed three “zones” for the probability of bankruptcy. If the Z-Score is less than 1.80, the firm is in danger of bankruptcy. If is greater than 2.99, the entity is considered safe. Between these two values he classifies the firms as “ignore.” Because the original Z-Score model was designed to assess manufacturing firms, [Altman \(1983\)](#) later proposed a second revised model for non-manufacturing firms:

$$Z'' = 6.56 (WC / TA) + 3.26 (RE / TA) + 6.72 (EBIT / TA) + 1.05 (BVEQ / BVLIAB).$$

In this specification, a firm is considered in danger if the score is less than 1.10, and is safe if it is higher than 2.60. We estimate the appropriate Altman Z-Score for each observation. For manufacturing enterprises (SIC codes 3000–4999), we use the original specification, and for all other entities, we use the revised model. To capture the risks that a firm faces, we create two one/zero dummy variables. One, SAFE, if the estimated Z-Score for the entity is above the specified value for the model as described above, and the other, DANGER, if it is below the recommended value for such observations.

Finally, the business cycle may affect the decision to discontinue an operation. Our proxy for macroeconomic conditions is the annual percentage change in real per capita gross domestic product (CHRPCGDP), which we collect from the Bureau of Labor Statistics. In earlier studies, [Duhaim and Grant \(1984\)](#) and [Ilmakunnas and Topi \(1999\)](#) contend that divestitures should be more common during recessions, but they find little evidence in support of that argument. On the other hand, [Shleifer and Vishny \(1992\)](#) advance their Liquidity Hypothesis, suggesting that firms should be reluctant to dispose of units at fire-sale prices in economic downturns, and [Maksimovic and Phillips \(2001\)](#) and [Eisfeldt and Rampini \(2006\)](#) provide empirical evidence of the anticipated cyclical nature of asset sales.

## 6. Description of the datasets and unavailable statistics

### 6.1. Description of the datasets

We collect most of the required data from 1976 through 2012 from the annual Compustat database. The figures needed to calculate the Herfindahl Index of corporate diversification are taken from the Historical Segments database in Compustat. These data are only available from 1976. Because of the required lags to estimate this variable, a firm must have observations for at least five consecutive years to be included, which limits the beginning of the sample period to 1980. We also remove the entities in the financial sector from the sample (industries 45 through 48 in the Fama and French fifty industrial classifications). After eliminating observations with missing values for the variables used in the study, we are left with an unconstrained sample of 123,415 firm-year observations. Of these, 8895 announce negative-valued discontinuations, and 7000 with positive values. In the three years prior the divestiture, the level of

<sup>6</sup> Special Items is an entry created by S & P and presented on Compustat. It represents “any significant non-recurring item.” These include losses from flood, fire and natural disasters, restructuring or reorganization costs, and write-downs or write-offs of receivables and intangibles, along with many other items.

<sup>7</sup> The explanatory variables in [Altman's \(1968\)](#) model are the ratios of (1) working capital, (2) retained earnings, (3) earnings before interest and taxes, and (4) revenues all to the book value of assets. The fifth is the book value of equity to liabilities.

corporate diversification, as measured by a Herfindahl Index, decreased at 28,053 of the firms, increased for 30,142, and of these 20,315 of these were single-unit operation before the changes in corporate focus began. Of the total, 35,651 made external acquisitions in the contemporaneous or three previous years.

We also employ a matching technique, used in earlier studies Berger and Ofek (1999), Krishnaswami and Subramaniam (1999), and Dittmar and Shivadasani (2003), to control for year, industry and firm size. In our setting, there are several benefits to selecting a matched sample for comparison. It helps to control for differences in behavior across industries. It also accounts for temporal effects, including changes in macroeconomic and equity market conditions. As an added benefit, this approach can reduce endogeneity problems (Colak & Whited, 2007).

We use four criteria to choose these pairings. First, the observation must be in the same Fama-French industry sector and the same fiscal year as the firm that discontinues an operation. Next, their value of total assets in the year before must be within 20% of the target firms. After matching on these three criteria, we eliminate all potential matches that discontinue an operation in the three proceeding or subsequent years.<sup>8</sup> This criterion assures that the chosen control firm is not involved in divestiture activities in the same time-window as the treatment firm. Of the remaining potential matches, one is chosen at random to ensure that there are no repeated matches for any fiscal year and industry. This yields a sample of 13,117 pairs, for a total sample size of 26,234 firm-year observations. Of the firms that report discontinued operations, 7383 are of negative values, and 5734 have positive values.

## 6.2. Descriptive statistics

The univariate statistics for the observations in the matched sample are given in Table 1. The first four columns of the table contain the number of observations, the median, mean, and the standard deviation for the thirteen explanatory variables for each of the three classes based on whether the firm has discontinued an operation, and if so, whether the book-value of the divestiture is positive or negative. The last two columns contain test statistics for the differences between the two types of firms that announce divestitures and those that do not. The first is a nonparametric Wilcoxon Rank Test for differences between two of the subsamples, which is especially useful if the distributions are skewed. The other is a *t*-test for the difference of the means of the subsamples. Because the variance often differs between the groups, we use the Satterthwaite approximation of the *t*-value.

### 6.2.1. Variables to test the hypotheses

The test statistics for the measures of acquisition activities generally support our hypotheses. We only provide statistics for these measures in the concurrent year, but our logit regressions will provide more information on the relationships with prior acquisitions. The tests on the dummy variable, D-ACQ, suggest that the firms that discontinue an operation, especially with a positive value, are significantly more likely to make an acquisition. The value for the Wilcoxon Rank test is 8.34, at a 1% significance level, for positive-valued disposals and 2.13, at a 5% significance level, for negative-valued discontinuations. The results for the measure of the size of acquisitions, ACQ-REV, show that firms that announce a positive valued divestiture are much more likely to have made a recent large acquisition.

As expected, in the years leading-up to a divestiture, the companies that discontinue an operation are far more diversified than the control firms. The median firm in the control sample has a Herfindahl Index (HI) of one, meaning that they are completely undiversified, and the

<sup>8</sup> We do not strictly enforce the rule that the firm must not recapitalize in the subsequent three years for observations after 2010. Since three years of data are not available in these cases, all the observations would be lost if we forced the issue.

**Table 1**  
Univariate statistics matched sample.

Variable	Class	Median	Mean	Std dev	Wilcoxon rank test	<i>t</i> -Test mean diff
D-ACQ	Neg DO	0.0000	0.3245	0.4682	2.13**	2.12**
	Pos DO	0.0000	0.3722	0.4834	8.34***	8.21***
	No DO	0.0000	0.3101	0.4626		
ACQ-REV	Neg DO	0.0000	0.0402	0.5289	1.04	1.86*
	Pos DO	0.0000	0.0667	0.8439	8.32***	3.34***
	No DO	0.0000	0.0281	0.2433		
HI	Neg DO	0.6799	0.6901	0.2538	-36.08***	-33.41***
	Pos DO	0.6420	0.6627	0.2508	-39.81***	-37.83***
	No DO	1.0000	0.8116	0.2432		
HI-INC	Neg DO	0.0000	0.3830	0.4862	28.22***	27.30***
	Pos DO	0.0000	0.4489	0.4974	34.94***	33.25***
	No DO	0.0000	0.2014	0.4011		
HI-DEC	Neg DO	0.0000	0.3637	0.4811	13.62***	13.39***
	Pos DO	0.0000	0.3457	0.4756	10.15***	9.92***
	No DO	0.0000	0.2724	0.4452		
HI-DEC-SUN	Neg DO	0.0000	0.2401	0.4272	7.90***	7.74***
	Pos DO	0.0000	0.2558	0.4364	9.66***	9.31***
	No DO	0.0000	0.1933	0.3949		
ROA	Neg DO	0.0065	-0.0469	0.2113	-45.43***	-16.92***
	Pos DO	0.0169	-0.0473	0.2843	-33.44***	-13.65***
	No DO	0.0474	0.0177	0.3350		
LEV	Neg DO	0.5790	0.6020	0.4796	25.46***	11.85***
	Pos DO	0.5845	0.6272	0.5694	25.23***	12.52***
	No DO	0.4840	0.5199	0.4714		
TOBINQ	Neg DO	1.2406	1.6427	1.9922	-20.38***	-10.25***
	Pos DO	1.3210	1.7287	2.2002	-10.48***	-6.26***
	No DO	1.4214	1.9415	2.0237		
REV_CDF	Neg DO	0.5398	0.5261	0.2766	-7.66***	-7.43***
	Pos DO	0.6047	0.5678	0.2908	3.08***	2.64**
	No DO	0.5831	0.5562	0.2820		
DANGER	Neg DO	0.0000	0.3963	0.4892	31.76***	30.69***
	Pos DO	0.0000	0.3437	0.4750	22.47***	21.18***
	No DO	0.0000	0.1922	0.3940		
SAFE	Neg DO	0.0000	0.3669	0.4820	-34.49***	-35.62***
	Pos DO	0.0000	0.4149	0.4927	-25.75***	-26.07***
	No DO	1.0000	0.6174	0.4860		
SPI	Neg DO	1.0000	0.8681	0.3384	20.65***	22.36***
	Pos DO	1.0000	0.8866	0.3171	21.81***	24.92***
	No DO	1.0000	0.7457	0.4355		
Observations	Neg DO	7383	Pos DO	5734	No DO	13,117

\*\*\* Significant with 1% confidence.

\*\* Significant with 5% confidence.

\* Significant with 10% confidence.

average index value is about 81%. On the other hand, the averages for the firms making disposals are around 65%. The test statistics show that their diversity, compared to non-divesting entities, is highly statistically significant.

The figures in Table 1 also support our hypotheses that enterprises that announce discontinuations are likely to have recently altered their level of diversity. The control firms are about 20% more likely to have decreased their level of diversification in the three previous years (HI-INC). Entities announcing negative-valued operations are about 38% more prone to have decreased diversification, compared with 44% for firms making positive-valued divestitures. So companies reporting discontinuations seem far more likely to have been sharpening corporate focus in the recent past. About 27% of the control firms have recently increased their diversity (HI-DEC), and of these 19% had only a single operating unit four years prior (HI-DEC-SUN). Diversification increased for 36% of divesting firms and for 34% of entities announcing negative and positive-valued discontinued operations respectively; about 25% of the enterprises where diversification decreased were single-unit firms four years before.

### 6.2.2. Control variables

We also test for differences between divesting and matching firms for six of our control variables. The test results tend to support the



previous findings. As expected, the test statistics suggest that the entities that discontinue an operation have lower return on assets (ROA) and Tobin's Q (TOBINQ) measures, and higher financial leverage (LEV). Based on our measure of firm size (REV-CDF), companies that announce negative-valued divestitures are smaller than the control sample, and those making positive-valued discontinuations are larger than average. The divesting firms are far more likely to have Altman Z-Scores in the danger zone (DANGER), 40% for negative- and 34% for positive-valued discontinued operations while the statistic for the control sample is only 20%. The companies reporting discontinuations are less liable to be in the safe zone (SAFE). Only about 37% of firms reporting negative-valued divestitures and 41% of those making positive-valued reports are in the safe zone, as compared to 62% for the control sample. The firms reporting discontinued operations are also more likely to have announced other non-recurring items in recent years (SPI): over 80% for the divesting companies as opposed to 75% for control firms.

## 7. Logistic regression model specifications and parameter estimates

### 7.1. Logistic regression model specification

To test out hypotheses, we estimate a multinomial logistic (logit) regression model, of the form below, in a multivariate setting to assess the effects of the explanatory variables on the probability of firms announcing a .

$$\begin{aligned} \text{DO-CHOICE} = & \beta_0 + \beta_1\text{D-ACQ} + \beta_2\text{D-L1ACQ} + \beta_3\text{D-L2ACQ} + \beta_4\text{D-L3ACQ} + \\ & \beta_5\text{ACQ-REV} + \beta_6\text{L1ACQ-REV} + \beta_7\text{L2ACQ-REV} + \beta_8\text{L3ACQ-REV} + \\ & \beta_9\text{HI} + \beta_{10}\text{HI-INC} + \beta_{11}\text{HI-DEC} + \beta_{12}\text{HI-DEC-SUN} + \\ & \beta_{13}\text{ROA} + \beta_{14}\text{LEV} + \beta_{15}\text{TOBINQ} + \beta_{16}\text{CDF-REV} + \beta_{17}\text{SPI} + \\ & \beta_{18}\text{DANGER} + \beta_{19}\text{AFE} + \beta_{20}\text{CHRPCGDP} + \varepsilon. \end{aligned}$$

We estimate the model using two different samples. The dependent variable is divided into three classes: firms that do not discontinue an operation, those that announce a negative-valued divestiture, and entities reporting positive-valued discontinuations. The enterprises that do not announce a divestiture are the control group. Therefore, the estimated parameters show how the two classes of firms that discontinue an operation differ from those that do not.

The empirical results for our multinomial logistic regression specification are shown in Table 2. The figures in the left-hand panel are based on a matched sample with an equal number of that discontinue an operation and that do not. This specification controls for year, industry and size. Firms in the control sample do not report discontinued operation within a seven-year window around the event. The estimates in the right-hand panel are for the unconstrained sample, comparing the firms that discontinue an operation to all available observations. In this specification, we include a variable to capture macroeconomic conditions to observe their effect on disposal decisions (CHRPCGDP).

The parameter estimates in a logit model are not directly comparable to those in an OLS regression. In logit, the relationship between the discrete dependent variable and an explanatory factor differs at every point along the distribution, and is affected by the values of the other independent variables. Therefore, we also present a summary of the “marginal effects” for each coefficient estimate. These represent the change in the probability of announcing a discontinued operation for a one-unit change in an explanatory variable. The marginal effects also differ at every point, so as is common, we present the sample average of the individual marginal effects.<sup>9</sup>

To judge the relative magnitude of the effects of the continuous independent variables on the likelihood that a firm will discontinue an

operation, we also compute an “economic effect,” which is the product of the average marginal effect and the standard deviation of the predictor variable for the entire sample. This measure shows the percentage increase (or decrease) in the likelihood that a firm will discontinue an operation for a one standard deviation change in the explanatory factor. There is no reason to compute the economic effect for the independent dummy variables, which can only take values of one and zero.

Comparison of the two sets of results shows that the explanatory power is much higher for the specification using the matched sample. It has an estimated Maximum Rescaled R<sup>2</sup> of over 22%, and only 14% for the specification based on the unconstrained sample. In general, the magnitudes of the marginal and economic effects are greater for the model based on the matched sample. In the discussion to follow, we will concentrate on the results for the matched sample, and comment on those for the unconstrained sample where there are notable differences.

### 7.2. Results for the hypotheses tests

Our first set of hypotheses concerns the interrelationship between acquisitions and discontinued operations. We employ two sets of variables to study these relationships. The first, to test Hypothesis 1A, is a set of dummy variables coded to one if a firm reports an acquisition in either the contemporaneous or the three prior years. The parameter results on these variables shown in Table 2 display a very interesting pattern. Firms are over 6% (with a p-value less than 1%) less likely to announce a negative-valued discontinuation in the year in which they make an acquisition (D-ACQ). There is no statistically significant difference between those announcing positive-valued divestitures and the control samples. In the year after an acquisition (L1D-ACQ), entities are more likely to announce discontinuations of either sign, but the marginal effects show that the increase in the probabilities is 1% or less. Then, in the second year after an acquisition (L2D-ACQ), reports of both positive and negative-valued discontinued operations are 3% or 4% more common (with a p-value less than 1%), and the effect is even more pronounced, 5% or 6% (with a p-value less than 1%), three years after (L3D-ACQ). The marginal effects suggest that negative-valued divestiture are slightly more likely than positive ones in the second and third years after an acquisition, but there are clearly large groups announcing discontinued operations of either sign. Collectively, these results show that negative-valued divestitures are less liable to occur at the time of an acquisition. The negative reports that occur after two or three years are likely to be the recognition of failed investments. But, it is interesting that many firms also begin to divest positive-valued assets in the later years.

There is very little evidence in support of Hypothesis 1B showing that the magnitude of acquisitions in the prior three years (L1ACQ-REV, L2ACQ-REV or L3ACQ-REV) has a discernable effect on future decisions to discontinue an operation of either sign. This may be because we use the cash value of acquisitions that probably does not account for their full magnitude, which creates a bias against support of our hypothesis H1B. But, in the contemporaneous year, there is clear evidence that firms that make large acquisitions (ACQ-REV) are about 1% more likely to announce positive-valued divestitures (the p-value is slightly greater than 5%). This piece of evidence fits very nicely with the stories of Weston (1989) and Bergh (1997) that firms making large acquisitions of diversified entities are then likely to quickly divest the unwanted elements of those businesses, as was the case when Google immediately divested itself of Motorola's set-top box unit after acquiring Motorola Mobility in 2012.

For firms that announce a discontinued operation of either sign, the parameter estimates on the Herfindahl Index, HI, for the prior three years are statistically significant and negative. The magnitude of the coefficients are about –0.80 for both negative and positive-valued discontinued operations (with p-values less than 1%). Because a lower value of the index represents greater diversification, this result lends

<sup>9</sup> See Greene (2012, p. 690).

**Table 2**  
Multinomial logistic regression parameter estimates.

Variable	Class	Matched sample				Unconstrained sample			
		Parameter estimate	Standard error	Marginal effect	Economic effect	Parameter estimate	Standard error	Marginal effect	Economic effect
Intercept	Neg DO	- 0.2591	0.1246**			- 2.3857	0.0874***		
	Pos DO	- 1.2489	0.1327***			- 3.3907	0.0966***		
D-ACQ	Neg DO	- 0.1804	0.0407***	- 0.0617		- 0.1445	0.0295***	- 0.0113	
	Pos DO	- 0.0326	0.0432	- 0.0422		- 0.0300	0.0323	- 0.0030	
D-L1ACQ	Neg DO	0.1508	0.0414***	0.0103		0.1233	0.0303***	0.0080	
	Pos DO	0.0987	0.0446**	- 0.0047		0.0413	0.0338	0.0020	
D-L2ACQ	Neg DO	0.2753	0.0410***	0.0420		0.2368	0.0299***	0.0163	
	Pos DO	0.2514	0.0441***	0.0330		0.2223	0.0334***	0.0128	
D-L3ACQ	Neg DO	0.3948	0.0391***	0.0677		0.3348	0.0281***	0.0231	
	Pos DO	0.3482	0.0421***	0.0551		0.2705	0.0315***	0.0157	
ACQ-REV	Neg DO	0.0392	0.0556	0.0080	0.0041	0.0148	0.0173	0.0009	0.0069
	Pos DO	0.1078	0.0528**	0.0173	0.0089	0.0377	0.0110***	0.0019	0.0014
L1ACQ-REV	Neg DO	- 0.0412	0.0414	- 0.0057	- 0.0028	0.0084	0.0156	0.0005	0.0036
	Pos DO	- 0.0366	0.0417	- 0.0070	- 0.0034	0.0189	0.0139	0.0010	0.0006
L2ACQ-REV	Neg DO	- 0.0151	0.0562	- 0.0004	- 0.0001	- 0.0260	0.0265	- 0.0017	- 0.0011
	Pos DO	0.0323	0.0539	0.0041	0.0012	- 0.0087	0.0266	- 0.0004	- 0.0003
L3ACQ-REV	Neg DO	- 0.0473	0.0437	- 0.0081	- 0.0040	- 0.0333	0.0230	- 0.0021	- 0.0035
	Pos DO	- 0.0492	0.0526	- 0.0078	- 0.0035	- 0.0320	0.0294	- 0.0016	- 0.0012
HI	Neg DO	- 0.8531	0.1021***	- 0.1593	- 0.0409	- 1.0958	0.0690***	- 0.0700	- 0.0171
	Pos DO	- 0.7799	0.1060***	- 0.1246	- 0.0320	- 0.9813	0.0736***	- 0.0501	- 0.0122
HI-INC	Neg DO	1.1375	0.0559***	0.1932		1.0449	0.0395***	0.0683	
	Pos DO	1.4688	0.0598***	0.2089		1.4216	0.0443***	0.0808	
HI-DEC	Neg DO	0.8265	0.0607***	0.1186		0.8292	0.0438***	0.0521	
	Pos DO	0.7188	0.0697***	0.0942		0.7394	0.0544***	0.0382	
HI-DEC-SUN	Neg DO	- 0.2122	0.0634***	- 0.0938		- 0.0709	0.0438	- 0.0082	
	Pos DO	0.1359	0.0706*	- 0.0344		0.3011	0.0526***	0.0129	
ROA	Neg DO	- 1.1947	0.0998***	- 0.2404	- 0.0701	- 1.1281	0.0391***	- 0.0082	- 0.0089
	Pos DO	- 1.2471	0.1019***	- 0.2088	- 0.0617	- 0.0905	0.0228**	- 0.0046	- 0.0050
LEV	Neg DO	0.1681	0.0406***	0.0288	0.0144	0.0945	0.0114***	0.0060	0.0769
	Pos DO	0.2476	0.0438***	0.0387	0.0193	0.0175	0.0065***	0.0009	0.0114
TOBINQ	Neg DO	- 0.1634	0.0132***	- 0.0296	- 0.0609	- 0.1105	0.0099***	- 0.0071	- 0.1213
	Pos DO	- 0.1247	0.0130***	- 0.0198	- 0.0407	- 0.0281	0.0075***	- 0.0014	- 0.0197
CDF-REV	Neg DO	- 1.0262	0.0676***	- 0.1920	- 0.0543	- 0.4161	0.0463***	- 0.0266	- 0.0080
	Pos DO	- 0.6591	0.0726***	- 0.1045	- 0.0296	0.0550	0.0509	0.0028	0.0008
DANGER	Neg DO	0.3868	0.0461***	0.0599		0.3050	0.0310**	0.0196	
	Pos DO	0.3097	0.0503***	0.0505		0.2767	0.0350***	0.0140	
SAFE	Neg DO	- 0.5170	0.0422***	- 0.1362		- 0.3803	0.0304***	- 0.0303	
	Pos DO	- 0.3600	0.0451***	- 0.1166		- 0.2951	0.0330***	- 0.0194	
D-SPI	Neg DO	0.5234	0.0432***	0.1877		0.5626	0.0335***	0.0518	
	Pos DO	0.6861	0.0494***	0.2249		0.7223	0.0397***	0.0575	
CHRPCGDP	Neg DO					- 2.6384	0.5750***	- 0.1685	- 0.0033
	Pos DO					- 5.3157	0.6203***	- 0.2717	- 0.0052
		Observations		26,234		Observations		123,415	
		Neg DO		7383		Neg DO		8895	
		Pos DO		5734		Pos DO		7000	
		No DO		13,117		No DO		107,520	
		Max rescale				Max rescale			
		R-square		0.2212		R-square		0.1411	

\*\*\* Significant with 1% confidence.

\*\* Significant with 5% confidence.

\* Significant with 10% confidence.

strong support to Hypothesis 2, based on the work of Comment and Jarrell (1995), John and Ofek (1995) and Daley et al. (1997), who argue that firms that divest a unit are more diverse than those that do not. The economic effects suggest that a one standard deviation decline in the Herfindahl Index (meaning the firm is more diversified) indicates that it is about 3% or 4% more likely to discontinue an operation. These effects also suggest that more diverse enterprises are slightly more likely to announce a negative-valued than positive-valued discontinued operation.

To test our third hypothesis, we include three one/zero dummy variables to examine how previous corporate diversification actions affect current decisions to discontinue operations. Firms where the level of diversification has changed in the past are far more likely to announce a divestiture in the current period. But, the marginal effects show that there is a vast difference based on the direction of past changes. Firms where diversification has decreased over the past three

years, HI-INC, are about 20% more likely to discontinue an operation of either sign than a control firm, while those where diversity has increased, HI-DEC, are about 10% more likely to divest a unit of either sign (both at 1% significance levels). This suggests that large numbers of divesting firms have been changing corporate focus in either direction, but that a current discontinued operation is far more likely to represent a link in a chain of previous divestitures, than to be the beginning of a move to sharpen corporate focus after a program of diversifying expansion in recent years.

Firms that had only a single operating unit four years previously and subsequently diversified, HI-DEC-SUN, are an interesting case. In the matched sample, the marginal effects suggest that such enterprises are 9% less prone to announce a current negative-valued discontinued operation than control firms. But, when compared to the unconstrained sample, entities that discontinue a negative-valued operation are not different from the control group. The estimated parameters suggest that

previously undiversified companies that announce positive-valued discontinued operation are 1% more liable to increase diversification than control firms.<sup>10</sup>

### 7.3. Subsidiary results on Hypothesis 3

It is possible that these tests of our third hypothesis shown in Table 2 may be somewhat misleading. It is not uncommon for firms to announce a series of discontinued operations over a period of several years. Sometimes, these may simply be adjustments to the original reported amount. But, occasionally a company will undergo a flurry of discontinuations over several years. The prevalence of such activities could conceivably account for our findings that discontinued operations are more likely to occur after diversification has already begun to decline.

To mitigate the influence of firms that announce frequent discontinued operations, we conduct a further test using a smaller sample. Prior research shows that multiple reports of restructuring activities send different signals to markets than do isolated actions (Cready, Lopez, & Sisneros, 2010; Khurana & Lippincott, 2000).

The distribution of the number of reports of discontinued operations by firms over the time they are included in the Compustat database is given in Table 3. For comparison, we also include the distribution of the number of observations per firm (recall that an entity must have at least five consecutive observations to be included). About 62% of the total observations, 8054 entities, do not report discontinued operations. Of the 5017 firms that announce discontinued operations, 1728 report only once, meaning that 3289 make multiple divestitures. A handful of firms report very frequently; 28 companies announce discontinued operations over 14 times during their lives.

For this specification, we eliminate all firms that announce more than a single discontinued operation in the Compustat database. This assures that any reported disposal cannot be part of an ongoing chain of publically announced divestitures. We collect a matched sample from the universe of firms that never discontinue an operation. Again, the matches are drawn from the same Fama-French industry sector, in the same fiscal year, and are of roughly the same size as the discontinuing entities. This results in a much smaller sample with 1788 observations (547 announce a negative-valued discontinued operation, 347 make positive-valued divestitures, and there are 894 control firms).

We do not present the results in tabular form, but we will concentrate on the findings for the three dummy variables to test the second hypothesis (HI-INC, HI-DEC and HI-DEC-SUN).<sup>11</sup> The explanatory power of the model is still respectable, the Maximum Rescaled R<sup>2</sup> is still over 15%, but because of the small sample size, fewer of the parameter estimates are statistically significant.

The coefficient estimates on HI-INC and HI-DEC for firms that announce both positive and negative-valued discontinued operations are still positive and highly statistically significant as in Table 2. But, the marginal effects tell a different story. Firms where diversification has been decreasing (HI-INC) are about 14% more liable to discontinue an operation. But now, the companies where diversification has been increasing (HI-DEC) are more likely to report a divestiture. Those announcing negative-valued discontinued operations are over 23% more prone to have increased diversification, and those making positive-valued divestitures are almost 20% more likely. Again, the portion of firms making negative and positive divestitures is of almost the same magnitude.

The results for HI-DEC-SUN are somewhat similar to those in Table 2. Firms that announce negative-valued discontinued operations

<sup>10</sup> However, this is a case where the average marginal effect takes the opposite sign. Ai and Norton (2003) note that this can often occur for parameter estimates for interactive variables in a logistic regression setting.

<sup>11</sup> The results are available from the authors on request.

**Table 3**  
Distribution of reports of discontinued operations by firm and Compustat observations per firm.

Number of reports of DO	Number of firms	Percentage	Years listed on Compustat	Number of firms	Percentage
0	8054	61.62%	5	1386	10.60%
1	1728	13.22%	6	1260	9.64%
2	1111	8.50%	7	1102	8.43%
3	641	4.90%	8	951	7.28%
4	448	3.43%	9	885	6.77%
5	295	2.26%	10	739	5.65%
6	223	1.71%	11	650	4.97%
7	154	1.18%	12	612	4.68%
8	110	0.84%	13	555	4.25%
9	89	0.68%	14	534	4.09%
10	68	0.52%	15	378	2.89%
11	52	0.40%	16	366	2.80%
12	26	0.20%	17	351	2.69%
13	30	0.23%	18	354	2.71%
14	14	0.11%	19	317	2.43%
15	5	0.04%	20	257	1.97%
16	4	0.03%	21	284	2.17%
17	5	0.04%	22	224	1.71%
18	3	0.02%	23	215	1.64%
19	1	0.01%	24	169	1.29%
20	3	0.02%	25	146	1.12%
21	4	0.03%	26	127	0.97%
22	2	0.02%	27	118	0.90%
23	1	0.01%	28	110	0.84%
			29	88	0.67%
			30	99	0.76%
			31	81	0.62%
			32	68	0.52%
			33	79	0.60%
			34	56	0.43%
			35	113	0.86%
			36	156	1.19%
			37	241	1.84%
Total	13,071	100%		13,071	100%

and where diversification has been increasing, are far less likely to have been completely undiversified four years earlier. On the other hand, for companies that report positive-valued discontinued operations under this specification, the estimates on the parameter are not statistically significant.

Again, for many firms that report a discontinued operation, diversification is either increasing or decreasing over the three prior years. But, after controlling for possible series of tightly-timed announcements, divestitures are somewhat more common among those where the corporation was less focused in the past. So, the overall results suggest that isolated discontinuations follow periods of (over-) diversification, while a sequence of actions tightening corporate focus tends to precede announcements of discontinued operations.

### 7.4. Empirical results for the control variables

We include seven (eight) control variables in our logit models for the matched (unconstrained) sample. Parameter estimates for these factors are given in Table 2. The results conform to our expectations. In the model based on the matched sample, firms are 6% or 7% more likely to discontinue an operation if their returns on assets for the three prior years (ROA) are one standard deviation below average (though the results are notably weaker when using the unconstrained sample). Enterprises where financial leverage (LEV) is one standard deviation higher than average are about 1.5% or 2% more liable to divest a unit (the effect is much stronger for firms that discontinue a negative-valued operation for specification based on the unconstrained sample). As expected, firms with lower values of Tobin's Q in recent years (TOBINQ) are more likely to discontinue an operation. The economic effects

suggest that companies with low relative equity values are particularly liable to dispose of a negative-valued operation, while smaller firms, based on relative revenues (CDF-REV), are far more likely to discontinue an operation. This is even the case in the matched sample where we make an attempt to control for firm size and for this reason, purposely choose a matching criterion other than revenues. To account for possible interactions with other restructuring activities, we also include a dummy variable set to one if the company announces a special item in the current or prior three years (SPI). The parameter estimates on this variable are positively statistically significant at a 1% significance level, and the marginal effects for the matched sample results suggest that firms that discontinue operations are about 20% more likely to have reported other restructuring activities.

We employ two dummy variables derived from the Altman Z-Scores, which capture the probability of bankruptcy risks. The parameter estimates for these two factors are highly significant. They show that firms that meet Altman's definition of danger of bankruptcy (DANGER) are over 5% more likely to discontinue an operation at a 1% significance level. The results are even stronger for enterprises that fall in the "safe" zone (SAFE). The marginal effects in the matched sample specification suggest that firms safe from bankruptcy are about 12% less liable to make a divestiture. These findings confirm that operating performance is a critical determinant of decisions to divest assets.

We are also interested in the effect of macroeconomic conditions on the decision to discontinue operations. Therefore, we employ the annual change in real per capita GDP (CHRPCGDP) to capture these effects. Because the matched sample is selected by year, we cannot incorporate a time-related variable in that specification, but we do include it in the model using the unconstrained sample. We find some evidence that discontinuations are more common when the economy is slow or declining. This is contrary to the predictions of Shleifer and Vishny' (1992) Liquidity Hypothesis. But, the economic effects show that the relationship is not very powerful, which is somewhat similar to the findings of Duhaime and Grant (1984) and Ilmakunnas and Topi (1999).

#### 7.5. Logistic regression model estimates based on firm size

We also separate the sample based on firm size. Because our explanatory variable is the cumulative density function of annual revenues for all firms listed on the nine major North American exchanges, REV-CDF, it is simple to divide the sample above and below the average. These specifications produce some interesting differences, mainly regarding the relative magnitude of current and prior acquisitions on the decision to discontinue operations, which is presented in Table 4.

The estimates for firms of above average size are given in the left-hand panel, and for the smaller firms in the right-hand panel. There is clearly little difference in the parameter estimates on the explanatory variables describing corporate diversification (HI, HI-INC, HI-DEC and HI-DEC-SUN), the dummy variables for current and prior acquisitions (D-ACQ, L1D-ACQ, L2D-ACQ and L3D-ACQ) and the control variables (ROA, LEV, TOBINQ, CDF-REV, DANGER, SAFE and D-SPI) between the two subsamples. These results are all consistent with our main findings concerning Hypotheses 1A, 2, 3A and 3B reported above.

There are, however, sharp contrasts on the variables explaining Hypothesis 1B, concerning the relative magnitudes of past acquisitions. For the small firms, none of the variables measuring the size of previous acquisitions against revenues (ACQ-REV, L1ACQ-REV, L2ACQ-REV or L3ACQ-REV) are statistically significant. But, among the larger firms, most are. For these major companies, there are significantly positive relationships between positive-valued discontinued operations and acquisitions in the present (ACQ-REV) and prior year (L1ACQ-REV). On the other hand, the large firms are less prone to make a negative-valued discontinuation in the second (L2ACQ-REV) and third years (L3ACQ-REV) after a larger acquisition. These results lend strong

support to the contentions of Weston (1989) and Bergh (1997), that many divestitures are sales of unwanted assets following major acquisitions. When large firms make major acquisitions, they dispose of positive-valued units for up to a year after the purchase. Again, this is supported by anecdotal evidence in Google's actions following its acquisition of Motorola Mobility. Interestingly, for two further years, large companies are less likely than control firms to dispose of negative-valued assets following acquisitions of greater magnitude.

There are also other noteworthy differences between the large and small firms. First, in the summary statistics at the bottom of Table 4, it is clear that bigger companies are more likely to announce positive-valued discontinued operations. These represent about 46% of divestitures by large firms, and 40% for small enterprises.<sup>12</sup>

#### 7.6. Robustness checks

We conduct a series of sensitivity analyses to ensure that our empirical results are robust. We executed the model using the variables to test each of our hypotheses in isolation (D-ACQ, L1D-ACQ, L2D-ACQ and L3D-ACQ for Hypothesis 1A, ACQ-REV, L1ACQ-REV, L2ACQ-REV and L3ACQ-REV for Hypothesis 1B, HI for Hypothesis 2, and HI-INC, HI-DEC and HI-DEC-SUN for Hypotheses 3A and 3B). In all four of the specifications, we obtain very similar results for the parameter estimates on the variables to test the hypotheses and for those on the explanatory factors. In addition, instead of using the dummy variable to capture the change in recent diversification, we employ the continuous value itself. We find that firms that discontinue an operation are most likely to be decreasing diversity in the recent past, which is sensible given our results in Table 2. The other results are little changed.

In their study, John and Ofek (1995) use the number of segments as an alternative measure of corporate diversity. Therefore, we also estimate models using measures based upon the number of and changes in the number of segments for a firm over the prior three years in place of those based on the Herfindahl Index. In all of these specifications, we again find clear evidence that more diverse firms are more likely to discontinue operations. In general, there is also support for our earlier findings that divestitures are more common when diversification has been changing in the recent past; either increasing or decreasing. But, the results are weaker and more inconsistent than when the dummy variables to capture these changes are based on the Herfindahl Index. In particular, the estimates of the marginal effects for the Logit models imply that changes in the number of segments have a less pronounced effect on the decision to discontinue an operation. These results suggest that changes in the Herfindahl Index capture a more subtle adjustment in the extent of corporate diversification than mere changes in the number of segments.

We also subdivide the sample with respect to five parameters to see if these have significant effects on the hypothesis tests. In all cases, we use the matching criteria described above to select a control firm from the same subclass for each entity that discontinues an operation in the subsamples. Because, in 2002, FASB promulgated SFAS No. 144, which instituted a significant change in the definition of discontinued operations,<sup>13</sup> we split the sample into observations before and after (inclusive) 2002. Second, because we find a strong interrelationship between discontinued operations and other non-recurring items, we also divide the sample depending upon whether or not a firm reported any special items in the concurrent or three previous years. This meant that we had to remove the dummy variable to capture this effect (SPI) from the two models. Third, we also split the firms into three categories

<sup>12</sup> There are 3862 reports of negative-valued discontinued operation and 3343 with positive-values for large firms, but for small firms, these figures are 3239 and 2182, respectively.

<sup>13</sup> Barua et al. (2010) and Curtis et al. (2014) provide interesting results concerning earnings management based on regulatory changes in reporting of discontinued operations.



**Table 4**  
Multinomial logistic regression parameter estimates samples based on firm size.

Variable	Class	Large firms				Small firms			
		Parameter estimate	Standard error	Marginal effect	Economic effect	Parameter estimate	Standard error	Marginal effect	Economic effect
Intercept	Neg DO	1.0277	0.2078***			- 0.7511	0.2199***		
	Pos DO	- 1.3234	0.2182***			- 1.1736	0.2408***		
D-ACQ	Neg DO	- 0.1787	0.0546***	- 0.0426		- 0.1428	0.0676**	- 0.0788	
	Pos DO	- 0.0648	0.0568	- 0.0265		0.0083	0.0741	- 0.0660	
D-L1ACQ	Neg DO	0.1582	0.0574**	0.0313		0.1503	0.0667**	- 0.0181	
	Pos DO	0.1189	0.0600**	0.0199		0.0333	0.0751	- 0.0464	
D-L2ACQ	Neg DO	0.2535	0.0568***	0.0549		0.3259	0.0647***	0.0253	
	Pos DO	0.2272	0.0594***	0.0470		0.3457	0.0719***	0.0206	
D-L3ACQ	Neg DO	0.3411	0.0535***	0.0753		0.5454	0.0635***	0.0667	
	Pos DO	0.3159	0.0559***	0.0677		0.5086	0.0707***	0.0541	
ACQ-REV	Neg DO	0.1764	0.1828	0.0320	0.0053	0.0185	0.0477	0.0035	0.0076
	Pos DO	0.5891	0.1689***	0.0976	0.0163	0.0655	0.0420	0.0098	0.0027
L1ACQ-REV	Neg DO	0.1922	0.1870	0.0349	0.0103	- 0.0320	0.0380	- 0.0060	- 0.0043
	Pos DO	0.4821	0.1785***	0.0799	0.0045	- 0.0466	0.0391	- 0.0070	- 0.0049
L2ACQ-REV	Neg DO	- 0.2930	0.1453**	- 0.0532	- 0.0025	- 0.0258	0.0419	- 0.0048	- 0.0028
	Pos DO	- 0.0886	0.1313	- 0.0147	- 0.0089	- 0.0120	0.0428	- 0.0018	- 0.0010
L3ACQ-REV	Neg DO	- 0.4351	0.1469***	- 0.0790	- 0.0073	- 0.0220	0.0362	- 0.0041	- 0.0027
	Pos DO	- 0.2751	0.1418*	- 0.0456	- 0.0125	- 0.0367	0.0524	- 0.0055	- 0.0036
HI	Neg DO	- 1.0526	0.1290***	- 0.1912	- 0.0513	- 0.8524	0.1940***	- 0.1596	- 0.0345
	Pos DO	- 0.7968	0.1328***	- 0.1320	- 0.0354	- 0.9462	0.2094***	- 0.1421	- 0.0307
HI-INC	Neg DO	0.8248	0.0791***	0.1591		1.4742	0.0880***	0.2092	
	Pos DO	1.3993	0.0845***	0.2187		1.6192	0.0954***	0.1936	
HI-DEC	Neg DO	0.5294	0.0907***	0.0712		1.0632	0.0908**	0.1385	
	Pos DO	0.5798	0.1041***	0.0776		0.8102	0.1046***	0.0945	
HI-DEC-SUN	Neg DO	- 0.1814	0.0887**	- 0.0783		- 0.2038	0.1024**	- 0.1032	
	Pos DO	0.2736	0.0982***	0.0043		0.0254	0.1156	- 0.0755	
ROA	Neg DO	- 5.4899	0.3803***	- 0.9973	- 0.0815	- 0.6568	0.1046***	- 0.1230	- 0.0526
	Pos DO	- 5.2313	0.3901***	- 0.8669	- 0.0708	- 0.7601	0.1066***	- 0.1142	- 0.0488
LEV	Neg DO	0.2328	0.1201*	0.0423	0.0100	0.0659	0.0452	0.0123	0.0089
	Pos DO	0.7244	0.1110**	0.1200	0.0283	0.1141	0.0428**	0.0171	0.0123
TOBINQ	Neg DO	- 0.2308	0.0335***	- 0.0419	- 0.0391	- 0.0686	0.0135***	- 0.0130	- 0.0383
	Pos DO	- 0.1181	0.0316***	- 0.0196	- 0.0183	- 0.0620	0.0138***	- 0.0093	- 0.0278
CDF-REV	Neg DO	- 1.8749	0.1662***	- 0.3406	- 0.0471	- 1.072	0.1988	- 0.0201	- 0.0028
	Pos DO	- 0.5788	0.1751***	- 0.0959	- 0.0133	- 1.1730	0.2223***	- 0.1311	- 0.0183
DANGER	Neg DO	0.3082	0.0631***	0.0241		0.4734	0.0765***	0.0993	
	Pos DO	0.1425	0.0672**	0.0329		0.4013	0.0878***	0.0961	
SAFE	Neg DO	- 0.2593	0.0559***	- 0.0818		- 0.7199	0.0735***	- 0.1704	
	Pos DO	- 0.1017	0.0579*	- 0.0586		- 0.4578	0.0837***	- 0.1460	
D-SPI	Neg DO	0.3931	0.0639***	0.1677		0.4948	0.0628***	0.1728	
	Pos DO	0.5007	0.0703***	0.1919		0.6927	0.0739***	0.2234	
		Observations		14,410		Observations		10,842	
		Neg DO		3862		Neg DO		3239	
		Pos DO		3343		Pos DO		2182	
		No DO		7205		No DO		5421	
		Max rescale				Max rescale			
		R-square		0.2191		R-square		0.2651	

\*\*\* Significant with 1% confidence.

\*\* Significant with 5% confidence.

\* Significant with 10% confidence.

based on the classes associated with the Altman Z-Scores: Safe, Ignore and Danger. Again, this meant that the dummy variables SAFE and DANGER had to be removed from the models. Fourth, we separate the sample into two groups one with R & D spending and the other with no R & D spending. Fifth, we split the sample into one with and the other without acquisitions, requiring that the associated variables be dropped from the models. Based on all five of these divisions of the sample, there is little difference in the signs or statistical significance of the (remaining) parameter estimates between the subclasses.

In addition, we include industry and year dummy variables in versions of our unconstrained model. The industry dummy variables are based on the Fama-French fifty sector classification. Because the change in GDP varies over time, we cannot include year dummies in the model including this variable, but we do include the industry variables. In the second specification, we drop the economic control variable, and include both industry and year dummy variables. In both cases, the

results remain very similar to those presented in Table 2. Collectively, the various different variables, model specifications and subsamples that we employ, all confirm our main results. Collectively, these sensitivity tests provide further assurance of our findings.

### 8. Summary and conclusions

In this study, we examine the effects of acquisitions and corporate focus on decisions to discontinue operations. Concentrating on these announcements allows us to employ a larger sample than is found in most previous empirical work on divestitures. Because reports of discontinued operations take both negative and positive values, we are also able to provide some insight into the quality of the divested assets. We use a series of multinomial logistic regression models to test our three hypotheses.

We find that decisions to discontinue operations are highly corre-



lated with recent acquisitions. Firms are much less likely than the control sample to dispose of negative-valued assets in the year that they make an acquisition. They are far more likely to announce both positive and negative-valued discontinued operations in the second and third years after an acquisition. The findings reinforce the notion that divestitures tend to follow acquisitions, and establishes that not all are failures, as the disposal of positive-valued assets is almost as common as those of negative-valued assets.

There are distinct differences on how the magnitude of an acquisition affects decisions to divest assets between firms of different sizes. Among small companies, the scale of the acquisition has little effect on current or future divestitures. However, large firms are far more prone to discontinue positive-valued operations in the year of or the year after an acquisition, and are less likely to announce negative-valued divestitures in the second or third years following. Collectively, the results on the variables concerning acquisitions correspond with the notion that most divestitures immediately following an acquisition are unwanted but valuable assets, and those following later are generally less valuable units.

As expected, we find strong evidence in support of the Corporate Focus Hypothesis, where highly diversified firms are more likely to dispose of assets. Earlier empirical work finds such a result for public announcements of divestitures, but we show that the same motives lead to the more numerous announcements of discontinued operation. Our findings confirm the hypothesis that over diversification can lead to managerial inefficiency and misallocation of internal resources, and suggests that divestitures sharpen corporate focus.

We are the first to examine the implications of where announcements of discontinued operations occur in the cycle of corporate

contraction or expansion. We find clear evidence that firms that have either diversified or contracted in the past three years are more likely to discontinue an operation. The typical divestiture is most likely to be a continuation of previous sharpening of corporate focus. But, when we examine a smaller sample of firms that announce only a single discontinued expansion, these companies are most likely to have expanded in recent years. These results suggest that once managers determine that their firm is over-diversified, they often begin a series of divestitures seeking to move to a more manageable operating scale.

Although it is not one of our fundamental hypotheses, we are the first to show that firms facing low bankruptcy risk are less likely to discontinue operations, and those in serious danger of failure are more likely to do so. These results are especially strong among small firms. This finding suggests that divestiture announcements contain useful information for investors about increased risk of bankruptcy.

Overall, we find interesting and compelling evidence on how corporate focus and acquisitions affect decisions to discontinue operations. Concentrating on discontinued operations, which are announced in public accounting statements, allows us to employ a far broader sample of divestitures than most previous empirical studies. We provide some noteworthy evidence on differences between firms that divest positive and negative-valued units. As expected, disposals tend to follow acquisitions, and among larger firms, positive-valued divestitures occur immediately after the purchase, and negative-valued disposals are less likely in later years. More widely-diversified firms are more prone to discontinue operations, and the divestitures seem to occur in sequences once a manager realizes a firm is over-diversified, setting off a search for a more optimal corporate configuration.

## Appendix A. Definition of variables

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DO-CHOICE	Tertiary variable depending on whether a firm announces a discontinued operation [DO] with either a positive or negative value, or does not report.
D-ACQ	Dummy variable set to one if a firm announces an acquisition [AQC] in the year.
D-L1ACQ	Dummy variable set to one if a firm announces an acquisition [AQC] in the prior year.
D-L2ACQ	Dummy variable set to one if a firm announces an acquisition [AQC] two years prior.
D-L3ACQ	Dummy variable set to one if a firm announces an acquisition [AQC] three years prior.
ACQ-REV	The ratio of acquisitions to revenues in the year. [AQC / REVT]
L1ACQ-REV	The ratio of acquisitions to revenues in the prior year. [AQC / REVT]
L2ACQ-REV	The ratio of acquisitions to revenues two years prior. [AQC / REVT]
L3ACQ-REV	The ratio of acquisitions to revenues three years prior. [AQC / REVT]
HI	Herfindahl Index measure of corporate diversification based on the sum of the squared values of the ratio of divisional sales [SALES from the historical Segments Database] to total firm sales averaged over the prior three years.
HI-INC	Dummy variable set to one if the Herfindahl Index for the firm increases over the prior three years. Signifies a decrease in corporate diversification.
HI-DEC	Dummy variable set to one if the Herfindahl Index for the firm decreases over the prior three years. Signifies an increase in corporate diversification.
HI-DEC-SUN	Dummy variable set to one if the Herfindahl Index for the firm decreases over the prior three years and the entity was completely undiversified four years before (diversification cannot decrease for such companies).
ROA	Return on assets averaged over the prior three years. [NI / AT]
LEV	Ratio of total liabilities to assets averaged over the prior three years. [LT / AT]
TOBINQ	Ratio of the sum of the end-of-fiscal-year market-value of equity and the book-value of preferred stock and liabilities to the book-values of assets averaged over the prior three years. [((CSHO * PRCC_F) + PSTK + LT) / AT]
CDF-REV	Percentage of firms traded on major exchanges with lower values of revenue [REVT] under the cumulative density function for the prior year
SPI	Dummy variable set to one if special items [SPI] are non-zero in the current or the prior three years.
DANGER	Dummy variable set to one if the estimated Altman-Z Factor for the firm for that year is below the specified "Danger" threshold.
SAFE	Dummy variable set to one if the estimated Altman-Z Factor for the firm for that year is above the specified "Safe" threshold.
CHRPCGDP	Is the percentage change in real per capita Gross Domestic Product for the year. [Data from the Bureau of Labor Statistics]
Variables to calculate Altman Z-factor	
WC/TA	Ratio of net working capital to total assets for the year. [(ACT - LCT) / AT]
RE/TA	Ratio of retained earnings to total assets for the year. [RE / AT]
EBIT/TA	Ratio of earnings before interest and taxes to total assets for the year. [OIADP / AT]

REV/TA	Ratio of revenues to total assets for the year. [REVT / AT]
BVEQ/ BVLIAB	Ratio of market value of equity to liabilities for the year. [(CSHO * PRCC,F) / LT]

Compustat variable names shown in squared brackets.

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