Why Mergers Fail

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ABSTRACT

A number of empirical studies have shown that negative abnormal returns often result shortly after a once promising merger is consummated. There are few consistent explanations, however, as to why so many mergers result in such poor performance. This paper sheds light on this issue by examining the effect that structural factors (including market concentration and R&D intensity) have on post-merger abnormal returns. The paper also attempts to assess how differences in valuation among bidders, along with the presence of multiple bidders, influence the performance of the merged firm. Our findings show that firm value is positively impacted in the first one to three years post merger by acquiring related assets, but that participating in a merger wave in these years has a negative influence. Over longer periods of time these effects are not evident and instead post-merger performance is impacted foremost by intangible asset intensity.

Why Mergers Fail *

I. Introduction

There is considerable evidence that a large share of acquisitions made in the U.S. are unprofitable *ex post* or that they lead to reorganization and/or divestitures of many of the merged assets not long after the merger. Why does this pattern emerge? Why is it that the factors that originally motivated the merger did not yield the anticipated value?

To examine why many mergers have failed, it is useful to consider the motives behind the acquisition. Some of the most often cited potential benefits to mergers include operational, marketing, and financial synergies (including traditional scale economy rationales), gains in market share (and, hopefully, market power), and R&D improvements. This paper uses a multi-faceted approach to explore the determinants of merger outcomes, focusing on the key structural and valuation factors that drove the companies to merge.

To analyze merger success and failure, we analyze the abnormal returns to the merged company, whereby company returns are compared over a period of time to a market capital-weighted index of comparable equities. Abnormal returns are calculated over one, three, and five years and are adjusted for the market performance over the specified years. The sample of mergers used in this study is a group that was reviewed by the government for potential antitrust violations, most of which were challenged (though eventually consummated) and all of

which were viewed to be horizontal.

In addition to assessing the influence of structural factors such as market concentration and R&D intensity, this paper also examines the effect of valuation discrepancies on post-merger performance. The inherent uncertainty attached to a firm's market value allows for valuation differences between bidders and the owners and management of a target firm. It has been suggested that acquirers overbid to gain control of another firm, and, therefore, the underperformance of a merger can be influenced by the premiums paid. Acquirers may pay overly large premiums due to management's miscalculation of the value of the target's intangible assets and / or goodwill. The presence of multiple bidders can also raise the acquisition price; this is essentially the "winner's curse" discussed by many authors[1], which claims that overvaluation of the auctioned asset is a function of the number of bidders, and the return to the winning bidder is inversely related to the uncertainty in the value of the auctioned asset (Boone and Mulherin, 2008). Finally, the merger may have been initiated as part of a pattern or wave of consolidation in a particular industry. Being part of the wave then may impact the price paid and post merger performance.

This paper reviews the prior financial and economic literature on the factors that potentially explain the below average performance of the merged firm. We then present the data used and our regression techniques for assessing the impact that particular structural and valuation factors have on merger performance. The results then follow, which show significant negative average abnormal returns for each period studied with the magnitude of these negative abnormal returns generally increasing with the length of time. The factors influencing the results

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[1] An early discussion of this is Wilson (1969).

vary somewhat based on the time frame analyzed. However, we generally find, in both the short- and long-run, that merger challenges, merger wave participation, and the role of intangible assets matter, while less of an impact arises from HHI and R&D intensity.

II. Previous Empirical Evidence on Merger Outcomes

There is a long and multidimensional literature investigating the impacts of mergers and acquisitions, with these impacts measured by economists in terms of profit performance, stock price indicators, and subsequent pricing patterns.[2] Other performance measures have been employed by the management literature. One of the earliest studies was that of Gort and Hogarty (1970), who reported on other findings showing mergers through the 1960s producing neutral impacts on firm profitability, losses for acquiring firms, and gains for acquired firms. Lubatkin (1983) reviews major empirical studies on mergers from the 1970s, continuing to find at best neutral impacts in general on acquiring firm profitability.

On the other hand, in their survey article, Jarrell et al. (1988) note that many capital market event studies have found substantial returns to stockholders in acquired companies – ranging from 19 percent gains during the 1960s to 30 percent or more during the 1970s and 1980s. They acknowledge, however, that returns to acquiring firms were smaller, but still significant, in the 1960s and 1970s before turning negative (though not significantly different from zero) in the 1980s. They also note that studies which have sought to identify explanations for returns from mergers and acquisitions have found an increased number of bidders to play a

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[2] In recent years there have been several "merger retrospective" studies, which have focused on the competitive or output price effects of mergers – while important for public policy, these studies (some are surveyed in Hunter et al. (2008)) are less related to our focus on managerial motivations and merger success from the standpoint of the firms involved.

role in increasing target firm returns and lowering acquiring firm returns. For the most part, these studies have focused only on "abnormal" returns –relative to a market return—around a short "event window" determined by the announcement of the merger.[3]

Roll (1986) also discusses these results, but focuses on a particular explanation for the lack of acquiring firm gains – "hubris", by which he means that these firms are those whose perceived value for the takeover target is in the upper tail of the distribution, in the absence of any real synergies due to the acquisition. What he does not pursue, and what this paper addresses in part, are characteristics of mergers which make hubris more or less likely.

Ravenscraft and Scherer (1989) looked at an alternative – and intuitively, more straightforward -- measure of merger success: business unit profitability. They find that acquired companies tended to have been more profitable than average pre-merger – especially for smaller firms – consistent with the event study result of abnormal returns to acquired firm stockholders. However, comparing these profits to business unit operating profits post-merger suggested, on average, declining profits (though some suggestion that "mergers of equals" fared better).

Gugler et al. (2003), investigating mergers in various countries during the 1980s and 1990s, use accounting data to compare their post-merger profit performance (through five years later) to control groups of firms in the same broad industry group not involved in merger activity. They find that five years post-merger the most common result is increased profitability but reduced sales, with common patterns across countries, consistent with enhanced market power. Nevertheless, it remains the case that a substantial share of mergers (for the U.S., the country

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[3] Jensen (1988) is somewhat more optimistic in interpreting studies, though acknowledges that returns to acquiring-firm shareholders on average are roughly zero in mergers, and had declined levels in earlier periods.

with the bulk of the sample mergers, 41%) fail to have positive profit impacts.[4]

Another explanation of merger outcomes relates to whether the merger was part of an industry consolidation that is often referred to as a merger wave. Mitchell and Mulherin (1996) suggested that merger waves are driven by technological or regulatory shocks, which are likely to increase the level of uncertainty in the industry; others[5] have argued that merger waves are driven by overvaluation. Duchin and Schmidt (2010) investigate how merger waves affect stock market performance and find that in-wave mergers result in worse performance, which they argue is due to poorer firm governance than out-of-wave mergers. They find that CEO turnover is inversely related to merger performance out-of-wave; this relationship, however, is less apparent for mergers occurring in-wave. The authors argue that the performance risks from a failed merger are lower because CEOs are then evaluated relative to their peers who were engaging in similar mergers. Duchin and Schmidt (2010) also contend that uncertainty is greater surrounding in-wave mergers because the high volume of these mergers limits analyst coverage.

Roll (1986) believes that merger failure can be attributed largely to "hubris" of management, a view related to the literature on the winner's curse. Boone and Mulherin (2008) examine 308 major takeovers over the 1989-1999 period "to determine whether winning bidders fare worse as the level of competition in a corporate takeover increases and as the uncertainty in the value of the target firm rises" (p. 2). Using SEC (S-4) documents providing information on the nature of the bid (auction or negotiated) as well as the numbers of bidders pre-announcement, they examine bidder returns – but only in a relatively short window (at longest, up to 4 months

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[4] By type of merger, horizontal mergers are found to be the most likely source of long-term profit gains (especially in manufacturing).
[5] See Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004).

post-announcement) – and also operating income for up to 3 years post-completion of the acquisition. Generally, they do not find evidence in support of a winner's curse in the market for corporate acquisitions.

In this paper we examine the presence of multiple bidders, as well as intangible asset/sales intensity, and the merger (deal) premium (the excess over market value that the acquirer pays to consummate the transaction) to consider whether hubris and/or value uncertainty influence post merger performance. A negative influence of any of these would be consistent with the winner's curse hypothesis, while a positive effect would imply that the bidders had insights regarding the value of the target that allowed them to gain from the merger relative to other acquirers.

Another strand of the literature analyzes the impact that financial and operational[6] synergies as well as structural factors, to include market concentration and R&D-intensity, have on mergers. Sonenshine (2010) examined the effect that acquirer R&D-intensity, *post merger* concentration levels, and changes in market concentration, have on the merger premium. He finds acquirer R&D-intensity to have a positive influence on the merger premium, but *ex-post* merger concentration levels to have a negative effect. He attributes the positive R&D-intensity effect to the belief by acquirers that they can better monetize the value of their R&D portfolio through a horizontal merger. The negative effect of *ex post* HHI level, Sonenshine (2010) explains, implies that above a certain threshold, the increased benefits to greater market concentration are limited.

Like Sonenshine (2010), our empirical work examines a set of horizontal mergers that

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[6] See Slusky and Caves (1991), Fee and Thomas (2004).

were investigated by the Justice department for concentration concerns in order to gather concentration and other merger information. We use an event study framework similar to Agrawal (1992), Dimson and Marsh (1986) and Lakinishok and Vermaelen (1990) approach whereby the returns to the merged firm are compared to those of a market capitalization-weighted index.

Using this event study methodology Agrawal (1992) finds a 10% mean underperformance of the merged company relative to the market index, and attributes this difference to either issues unrelated to the merger or to the market being slow to adjust to the merger announcement, so the post-merger performance captures part of the acquirers' stock price decline after the merger announcement. He then points out that these explanations are inconsistent with the market efficiency hypothesis.

We plan to use a similar approach in determining the one, three year, and five year abnormal returns. By assessing abnormal returns up to five years, we mitigate the influence of the change in acquirer value from the merger announcement. In addition, only acquisitions of significant relative size are used, which heightens the impact of the merger versus other unrelated factors. We then assess the effects that key valuation and structural variables have on post merger abnormal return stock market performance.

III. Data

The data set for this paper includes 63 mergers announced and consummated during an

eleven year span[7] from 1996 to 2006. See Table 1 for a list of the mergers. The commonality in these mergers is they were all reviewed and often challenged[8] by the FTC or DOJ for violation of the Clayton Act, Section 7b.   Only publicly held, free-standing, North American companies were used in order to obtain stock prices and other information on the firm. In addition, the target had to account for at least 10% of the value of the acquirer firm, as the merger has to be significant enough to affect the post merger performance.[9]

Of the 63 mergers covered, 46 were challenged; 2nd requests were issued for the other 17 mergers, but these were not challenged. Also, 28 (44%) were considered part of a "merger wave". Like Harford (2005) and Duchan and Schmidt (2010), we identify a merger wave as occurring in those industries in which the number of mergers taking place during a time period is at least 95% percent of all mergers occurring in that decade. Also, following Duchan and Schmidt (2010), we limited a merger wave per industry to a 24 month period and allowed only one merger wave per 10 year period (the 1990s and 2000 to 2008). See Table 2 for a list of merger waves. The industry merger waves in this study occurred in the telecommunications (two waves), aerospace, life sciences, oil and gas, and computer hardware/software industries.

Abnormal returns (AR) for each merged company were calculated using the technique found in Agrawal et. al. (1992) which is summarized in the following equation,

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[7] During this eleven year time period, approximately 750 to 800 second requests per the HSR Act were issued, and 500 to 550 proposed mergers were publicly challenged by the Department of Justice and FTC.

[8] Challenged mergers refer to mergers that are publicly disputed by the government after a HSR 2nd request. In these cases an injunction was sought in federal court to block the merger, though eventually a settlement was reached allowing the merger to proceed.

[9] Since stock market values fluctuate considerably, inpractice, we generally excluded mergers if the ratio of sales between acquirer and acquired firm was lower than 10%. There were a few exceptions where the acquired firm's sales were limited but its market capitalization was roughly 10% of the value of the acquired firm. For example, Ilex Oncology, which was acquired by Genzyme or Alza, which was acquired by J&J, had limited sales but relatively high market capitalization because their R&D-intensity was very high.

(1) $AR = R_{it} - R_{st} - (\beta_i - \beta_s)(R_{mt} - R_{ft})$

R_{it} refers to the monthly returns for each merged company from the date of the merger announcement. R_{st} refers to the returns to the index for the market decile of the merged firm; the market decile is based on the market capitalization of the security at the time of the merger. This amount is then adjusted by the risk–adjusted equity market return[10] over the one, three, and five year period to account for the influence of the equity market on the post merger return. The equity market return is also adjusted by the Beta of the security (β_i) and the decile (β_s) to account for how they are influenced by the market. Betas are estimated by regressing 60 month post merger returns for the security and market capitalization decile against the market or S&P 500. Merged companies in the first and second highest market capitalization decile account for 35% and 30% of the data set respectively.[11]

Abnormal monthly returns are then summed for 12, 36, and 60 months to obtain cumulative abnormal returns (CARs). The first observation for the one, three, and five year CARs corresponds to the month of the merger announcement.

(2) $CAR = \sum_{1}^{n} AR_i$

For each merger key explanatory variables were gathered. Table 3 shows the frequency of mergers by industry (defined by NAICs code) and the average one, three, and five year CARs by industry. We see that the mergers in the telecommunications industry generally had the worst returns, while those in the services industry had the best returns.

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[10] Calculated as the difference between the market (S&P 500) return and the risk-free (30 day Treasury Bills)

[11] This data set is slightly more biased toward larger market capitalization than the data set of Agrawal et. al. (1992). Sixty-one percent of their mergers were in the top three deciles.

The key structural variables of interest in this study are R&D intensity and market concentration. The model employed includes acquirer and target R&D-intensity, each measured by R&D expenditures divided by sales for the two years prior to the merger, HHI level, as provided in the DOJ or FTC complaint documents, and percentage of target firm sales contributed by the affected product line.

Valuation variables for examining the winners curse hypotheses include the presence of multiple competitive bidders, intangible asset intensity (divided by sales), and merger premiums. Valuation variables also include a fixed effect indicating whether the transaction occurred as part of a merger wave. Merger (deal) premiums -- the amount paid above market price -- were defined as follows.

$$(3)\ \ DP_j = \frac{[S_m*(1-\%\Delta S\ \&\ P) - MV_i]}{MV_i}$$

The denominator is the market value (MV_i) of the target, which is the closing stock price multiplied by number of shares outstanding, one month prior to the merger announcement. The announcement date is the day in which the acquisition candidate received its first official bid.[12] The numerator is the difference between the amount offered for the acquisition (S_m) – brought back one month at the rate of change in the S&P 500 to match the timing of MV -- and the market value of the stock.

Intangible assets include intellectual property, goodwill, and other items that lack

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[12] In three cases the initial offer was rejected and later a second or third offer was accepted. In these cases the deal premium is calculated as the percent change between the accepted offer and the market value 30 days prior to the initial offer, with the accepted offer adjusted for the change in the S&P 500 during that longer period (three months in the Boston Scientific/Guidant merger, two months in the Verizon/MCI merger, and six months in the Oracle/Peoplesoft case).

physical properties but add value to the company.   The ratio used is an average of the two years of reported intangible assets divided by the sales immediately prior to the merger.

Control variables include the deal financing method, which is the percent of the merger financed by the acquirer using cash versus its own stock. Assuming that gains from a merger are shared equally by the target and the acquirer, Hamermesh (2003) notes that if the terms of the deal involve a stock payment, stockholders of the acquirer and target should receive their pro-rata benefit from the merger in increased profit, and no or little merger premium should be paid. However, if there is a cash offer, then shareholders should receive a premium, so one might see differences in the deal premium, based on whether the merger is financed by cash or stock. Since we are also controlling for the deal premium in the model, the coefficient for the cash variable represents the influence of deal financing beyond any direct effect on the deal premium.

Control variables also include deal size and the ratio of size (by sales) of the acquirer to the target. Time dummy variables and industry fixed effects were included as well. Information regarding the HHI level was also collected for each merger; in many cases, the weighted average of these variables was used as the challenge included many product lines.[13] Information on the percent that the challenged product represents of the target's total sales was also gathered, to determine the importance of the product lines to the overall company's business and the effect that this line may have post merger abnormal returns.[14]

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[13] Often a merger challenge covered multiple product lines. In these cases the change in HHI amounts were weighted by the percent of the sales that they represent for the target.

Tables 4 and 5 present summary statistics for the structural and valuation explanatory variables respectively. Table 6 shows information sources for the study. Table 7 provides a description of the variables.

IV. Methodology

The objective of the study is to shed light on some of the factors that may explain merger success or failure. We used one, three, and five year CARs as shown in equation 2 as our measures of merger success. The significance of the CARs was determined by dividing the average one, three, and five year CARs by their standard error.

Upon obtaining CARs for the three time periods, we regressed these values agaist key structural, valuation, and control variables as shown in equation 4.

(4) $CAR_j = \beta_1 + \beta_2 lnRD_j + \beta_3(lnRD_i) + \beta_4 ln(HL)_m + \beta_5(Comp) + \beta_6 ln(IntA_i) + \beta_7 ln(DP_i) + \beta_8 Wave + \beta_9[X] + \varepsilon$.

In this equation, i references the acquired company, j the acquirer, and m the merger. The first two explanatory variables are the target's R&D-intensity (RD_i) and the acquirer's R&D-intensity (RD_j) in logs. These variables are used to assess whether there are differences in merger performance based on either the R&D-intensity of the acquirer or target. [15] A positive coefficient would lend support to the notion that the value of research and development efforts grows with increased size and/or concentration since the merging firms are in the same industry. From a negative coefficient we can infer that combining R&D efforts reduces value, due to

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[15] In addition, we tried using the absolute value of the difference in R&D-intensities between the merging firms. This value was found to be insignificant when it was used as an explanatory variable instead of acquirer or target R&D-intensity. The three variables were not all used in one model due to colinearity.

inefficiencies and/or loss of innovating champions (Hitt et al., 1991). The third variable, HHI is used to assess the influence that the presumed post-merger market concentration has on abnormal returns. Data on both HHI and change in HHI were gathered, but only one of the variables was used because of collinearity between the two variables.[16]

The valuation variables of interest are a competitive bidding dummy, intangible asset intensity levels in logs, a merger wave dummy, and the magnitude of the deal premium. Following Boone and Mulherin (2008), we test for the winners curse by using a dummy variable with a value of one indicating the presence of multiple bidders or an auction versus zero for a negotiated bid. Based on the literature, we expect lower post-merger returns from an auction although it is unclear why a firm would bid more than its view of the target's intrinsic value. The second test of the winners curse as presented by Boone and Mulherin (2008) is the value the acquirer places on the target's intangible assets as a percent of sales (IntA). This term is a proxy for the uncertainty of a firm's asset value.

Another valuation variable is the deal premium (DP). Simply put, does the premium used to consummate the deal affect the performance of the merged firm? If perfect information exists in the financial markets then the deal premium that a firm extends represents the value of synergies they see in combining the companies. Therefore, we might expect to see no impact on post-merger performance; however, overbidding might suggest a negative impact. Finally, we use a dummy variable (1=in-wave) to assess whether cumulative abnormal returns are influenced by the merger being part of a wave of mergers in the industry.

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[16] The regression model was run using log HHI level and log change in HHI. The results were virtually the same. We showed the results in Table 9 using log HHI because the the R-squared was slightly higher.

The control variables (X) include financing (cash versus stock), product overlap[17], deal size, and relative deal size (measured by the ratio of acquirer to target sales). In addition, year effects are used whereby a 1 indicates the year of the merger and 0 is placed in all other years. Also, industry effects are used with a 1 showing the presence of the merger in one of the ten industries.

V. Results

Table 8 shows the one, three, and five year CARs for monthly returns. There are four fewer observations for five year abnormal returns versus one and three year abnormal returns since some of the mergers occurred in 2006 making five year returns for these mergers unavailable. We see from Table 8 that one, three, and five year CARs are negative and that the CARs are increasingly negative over time. The three and five year abnormal returns are significant to the five and one percent levels respectively. These findings are fairly consistent with previous research.[18]

Table 9 shows results for one, three, and five year CARs regressed against the structural, valuation, and control variables. We see that the coefficient for challenged mergers is positive and significant for one and three year CARs. This finding indicates that the firms engaged in horizontal mergers challenged by the government (though eventually approved) fared better than the other mergers, perhaps due to the market power achieved (which likely prompted the government response). This effect, however, is not found over the five year period, suggesting perhaps that regardless of the market power created through the merger, entry and other changes

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[17] This term refers to the percentage the sales of the challenged product represents of the total sales of the acquired company. This variable indicates the relevance of the product line prompting the government challenge, to the overall business of the acquired firm.

[18] See Agrawal (2002) and others.

occurring in the industry eventually erode this power.

It is also interesting to note that log HHI and log product overlap have little impact on merger performance, negative and weakly significant in the one (not quite significant for HHI) and three year periods. To the extent that the government decision to challenge the merger depends in part on HHI, much of the positive impact of market concentration may already be accounted for by the Challenge variable. This negative residual impact of HHI (and of product overlap) then could occur from combining businesses with significant overlap and high levels of duplication between the merging companies.

We also see in Table 9 that the coefficient for merger wave is negative and significant for the one and three year CARs but not for 5-year CARs. The findings for one and three year CARs lends support to the hypothesis that consummating a merger as part of a merger wave tends to result in lower returns, perhaps due to the poorer firm governance and/or weaker external constraints (via insufficient analyst coverage) when a large group of mergers occurs in an industry sector at once – often in response to regulatory or technology shocks.

Also, the coefficients for the deal premium and the competitive dummy variable are negative and significant for one year CARs. This finding lends support to the winner's curse hypothesis whereby merger performance is negatively impacted by a competitive auction or when an acquirer pays a higher premium relative to the market value to effectuate the transaction. However, the coefficient for the log of intangible assets is positive in the one year CAR regression. This finding could be viewed as counter to the winner's curse, which hypothesizes that firms over pay for hard to value, intangible, assets; an alternate interpretation could be that firms with significant intangible assets are also those with stronger possible future

15

growth prospects.

We also created a few interaction terms (between regressors and the challenge dummy) to assess the differential impact that the merger challenge combined with key variables has on merger performance. In doing so, we found the joint effect of the deal premium and the merger challenge to be positive and significant when regressed against one year CARs. This finding would appear to indicate that increasing merger premiums for challenged mergers signals to investors *ex ante* the potential benefits that may accrue from increased market power and/or synergies achieved through the merger. This effect was observed in the first year after the merger, but was not found in the three and five year regression results. No other interaction terms were found to have a significant effect on merger performance, and, therefore, were not shown in the results.

For five year CARs the above effects appear to dissipate, except the value of the firm's intangible assets continues to have a positive effect. There is also some weak evidence in Table 9 - the negative and significant coefficient for acquirer R&D-intensity in the 5-year CAR equation - that there are detrimental effects to combining R&D efforts, perhaps due to excessive duplication of programs and to underestimating (at time of merger) the difficulties in coordinating research activities by the two merging firms. The lingering, negative effect may also be due to the loss of senior R&D staff --"innovation champions" who leave the company post merger due to cutbacks in R&D-efforts and disruption of programs, as noted by Hitt et al. (1991). It is interesting to note that the effect is only seen with acquirer's R&D-intensity as log R&D-intensity of the target does not affect the CARs in any of the series.[19] Finally, the

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[19] It should be noted that none of the industry effects (except for 3-year CARs for the telecommunications

coefficient for log deal size is negative and significant for five year CARs indicating that diseconomies may accrue in the long run from large mergers. It is interesting to note that the coefficient for log sales ratio is not significant in the short or long run indicating that the differential size of the merging partners does not impact merger performance.

To quickly summarize our main results, in the initial few years after the merger key valuation and product–market variables appear to have the greatest influence on post merger performance. Over longer periods of time as evidenced by the 5-year CARs, it is the intangible factors as shown by the positive coefficient for intangible assets and the negative coefficients for acquirer R&D-intensity that affect firm value. Also, deal size may have a negative impact on merger performance in the long run.

V. Conclusions

This paper examined the determinants of merger failure by considering how abnormal returns of merged companies are impacted by key structural and valuation variables. Like previous work we find that abnormal returns were negative over one, three, and five year periods. Differences appear in the significance of the explanatory variables between the one/three year period and five year periods. In the former, the size of the deal premium and the signal of a government challenge influence post-merger abnormal returns, as does participation in a merger wave. We also see that product overlap and the post-merger Herfindahl index have a (weak) negative impact. As a government challenge may be related to both, the interpretation of these effects is somewhat unclear.

industry) were significant.

17

Also, mergers occurring during a merger wave appear to have a negative impact on firm value. This finding implies that firms may overreact to changing regulations or industry shocks in pursuing acquisitions, and that both internal and external pre-merger analysis may suffer in periods of significant acquisition activity. For the longer (five year) period it is intangible asset intensity along with acquirer R&D-intensity that influences abnormal returns. The implication for firm strategy is that gains in intangible assets may have a longer term positive impact on firm value, but significant inefficiencies may arise causing negative long term effects on firm value when R&D-intensive firms engage in a large horizontal merger. Also, we see the effect of the merger challenge to dissipate over five year abnormal returns.

This study examined the determinants of post merger stock market performance. It is left for future research to examine other effects, such as the consumer welfare impacts from higher prices and/or innovation impacts from changes in patent and /or R&D intensity. A more careful look at subjective evaluations of merger performance may also prove fruitful.

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Table 1 – List of Mergers

Acquirer	Target	Deal Size (In billions)	Five Year CARs	Three Year CARs	One Year CARs
Chevron	Texaco	$45.00	-34%	-62%	-12%
Shell	Penzoil	$1.80	-24%	-25%	-28%
Amgen	Immunex	$16.00	-82%	-80%	-41%
Allergan	Inamed	$3.30	7%	13%	3%
Genzyme	Ilex	$0.51	53%	-21%	-10%
P&G	Gillette	$57.00	-26%	10%	5%
Boston Scientific	Guidant	$27.00		-69%	-58%
Pfizer	Pharmacia	$60.00	-101%	-71%	-21%
Sanofi	Aventis	$58.00	-7%	-12%	-9%
Teva	Ivax	$7.40	-20%	25%	12%
BP	Arco	$26.80	-67%	-40%	-13%
Valero	Ultramar	$6.00	130%	-9%	-6%
Rohm & Haas	Morton	$4.60	-15%	14%	10%
Valspar	Lilly	$0.76	-30%	5%	-14%
JDSU	E-TEK Dynamics	$13.50	-67%	-88%	10%
Precision Cast	Wyman Gordon	$0.72	78%	76%	-13%
Astra	Zeneca	$30.50	-53%	-7%	5%
Penn	Argosy	$2.20	43%	71%	28%
Dow Chemical	Union Carbide	$13.50	-39%	-23%	-33%
Oracle	PeopleSoft	$10.30	-8%	28%	-7%
Tyco	Mallinckrodt	$4.20	-43%	-23%	30%
United Health	PacifiCare	$8.15		-61%	-25%
3D Systems	DTM	$0.05	25%	1%	6%
Honeywell	Allied Signal	$14.00	-63%	-26%	-11%
Computer associates	Platinum Technologies	$ 3.5	74%	34%	56%
Exxon	Mobil	$73.7	-66%	-11%	11%
SBC	Ameritech	$52.0	-65%	1%	31%
Suiza	Broughton	$0.12	40%	5%	-28%
First Data	Concord	$7.0		-43%	-33%
GA Pacific	Fort James	$11.0	26%	29%	39%
Verizon	MCI	$8.50	-51%	13%	-20%
Allied Waste	Browning Ferris	$9.40	-26%	9%	22%
Eaton	Aeroquip Vickers	$1.70	23%	17%	-3%

Table 1 – List of Mergers (Continued)

Acquirer	Target	Deal Size (In billions)	Five Year CARs	Three Year CARs	One Year CARs
TRW	BDM	$1.01	22%	-25%	-12%
Watson	Andrx	$1.90		38%	-24%
Excelon	PJM East	$12.0	-32%	43%	18%
McClatchy	Knight Ridder	$0.88		-302%	-48%
Quest	Unilab	$1.60	-41%	-25%	-33%
Glaxo	Smithkline	$70.0	-97%	-67%	6%
CBS	American Radio	$1.60	114%	122%	67%
Conoco	Phillips	$33.00	3%	-19%	-35%
Thermal Electric	Fisher Scientific	$12.80		61%	6%
Bell Atlantic	GTE	$51.80	-32%	2%	14%
Federal Mogul	T&N	$2.40	-233%	-165%	67%
Provident	Unum	$11.43	-83%	-19%	-39%
El Paso	Sonat	$6.00	-92%	66%	5%
Novartis	EON Labs	$2.57	-49%	-4%	6%
Daimler	Chrysler	$40.00	-96%	-84%	0%
Boeing	McDonnell Douglas	$13.30	-63%	-33%	-29%
Anthem	Wellpoint	$14.20	14%	26%	-16%
Sprint	Nextel	$36.00	-112%	-47%	1%
Ebay	Paypal	$ 1.50	-21%	33%	44%
Yellow	Roadway	$1.10	-89%	-19%	7%
JNJ	Alza	$11.80	-57%	-45%	11%
Whirlpool	Maytag	$2.60		-7%	9%
Kimberly	Scott Paper	$9.50	-8%	-13%	5%
Biogen	Idec	$6.79	14%	-22%	19%
Millennium	Cor Therapeutics	$2.00	-158%	-95%	-87%
Adobe	Macromedia	$ 3.40	27%	0%	-1%
Motorola	General Instruments	$17.00	-62%	-45%	14%
Juniper	Netscreen	$4.00	-7%	-74%	-21%
HP	Compaq	$25.00	17%	-29%	39%
Cisco	Scientific Atlanta	$6.90	-49%	23%	9%
Average		**$15.5**	-29%	-17%	-2%

Table 2. Merger Waves

Merger Wave	Time period
Oil and gas	1998 - 2000
Life Sciences	2000-2002
Life Sciences	1997-1999
Technology	2002-2004
Telecommunications	1996-1998
Telecommunications	2004-2006
Health care	2004-2006
Aerospace	1997-1999

Table 3. Abnormal Returns By Industry

Industry (Primary NAICS codes)	Frequency - Total Mergers/ Challenged Mergers	Five Year Abnormal Return	Three Year Abnormal Return	One Year Abnormal Return
Petroleum (324110)	6	-20%	-26%	-17%
General Manufacturing[20] (Various)	10	-33%	-15%	10%
Life sciences (325411)	16	-57%	-30%	-8%
Consumer (311111, 325611)	3	7%	8%	-11%
Hardware/software (334111, 334611)	8	1%	-13%	11%
Chemical processing (325110)	2	-27%	-5%	-12%
Aerospace / Defense (336411)	4	-9%	5%	-4%
Telecommunications (517110)	7	-79%	-60%	5%
Other services[21] (Various)	10	43%	40%	21%
Healthcare	3	-48%	-35%	-21%
Total	63	-28%	-17%	-2%

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[20] General manufacturing includes automotive, appliances, paints, and building products.

[21] Other services include movie theaters, gaming, airlines, newspapers, financial processing, supermarkets, and utilities.

Table 4. Post Merger Abnromal Returns Relative to Structural Variables

Variable	N 5 Year return/ 1 & 3 year returns)	Extremes	Five Year Abnormal Returns	Three Year Abnormal Returns	One Year Abnormal Returns
HHI Level	26 / 30	High: HHI Levels>=3,633	-39%	-25%	-3%
	30 / 33	Low: HHI Levels<=3,582	-20%	-9%	-4%
Acquirer R&D Intensity	14 / 13	High: R&D>=4.2%	-27%	-19%	-6%
	45 /49	Low: R&D<=4.2%	-30%	-17%	-1%
Challenge	43/47	Challenge	-28%	-15%	-2%
	16/16	Not challenge	-33%	-25%	0%
Total			-29%	-17%	-2%

Table 5. Post Merger Abnromal Returns Relative to Valuation Variables

Variable	N 5 Year return/ 1 & 3 year returns)	Binary Categories	Five Year Abnormal Returns	Three Year Abnormal Returns	One Year Abnormal Returns
Merger Wave	28 / 27	In Wave	-41%	-30%	-11%
	31/ 36	Out of Wave	-19%	-7%	1%
Cash	10 /15	Primarily cash transaction	-10%	-33%	-8%
	39 /48	Primarily stock transaction	-39%	-18%	-2%
Deal Premiums	21/23	High Premium>32%	-55%	-13%	2%
	38/40	Low Premium<32%	-19%	-22%	-3%
Competitive Bid	5/6	Competitive	7%	-8%	-14%
	54 / 57	Not Competitive	-36%	-23%	-2%
Intangible Assets ratio to sales	12 / 14	High Premium>25%	-5%	-9%	5%
	47 / 49	Low Premium<25%	-36%	-22%	-2%
Total			-29%	-17%	-2%

Table 6. **Data Sources**

Source	Use
Antitrust complaints documents (Federal Trade Commission,[22] Department of Justice[23]) web sites	Listing of challenged mergers, deal sizes, change in HHI amounts, and post merger HHI levels
Center for Research and Security Prices (CRSP)	Monthly stock returns, S&P 500 index returns, market capitalization returns, 30-day Treasury yield returns
Press releases	Merger announcement dates, and deal financing,
Merrill Lynch market cap ratings See http://ycharts.com/calculations/rankings/market_cap	Market capitalization of merged firm for abnormal return calculation.
Standard and Poors' Compustat Data Base, North America – Simplified Financial Extract Report	Company sales, research and development expenses,
Annual reports for the merging companies in the study	R&D expenditures, merger information. and sales information to determine challenged products as a percent of total sales
S-4 and press releases	Competitive versus auction bids

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[22] See http://www.ftc.gov/os/caselist/index.shtm for a list of Federal Trade Commission cases.

[23] See http://www.justice.gov/atr/cases.html for a list of Department of Justice cases.

Table 7. Variable Descriptions

Variable	Description	Purpose
Acquirer R&D Intensity	Average of acquirer R&D expenses divided by sales for two years prior to the merger	Examine the synergies and/or diseconomies in R&D from the merger
Target R&D Intensity	Average of target R&D expenses divided by sales for two years prior to the merger	Examines the synergies and/or diseconomies in R&D from the of merger
Intangible asset intensity	Average of intangible assets divided by sales for two years prior to the merger	Examines the synergies derived from acquiring intangible assets as well as the potential mis-pricing of these assets
Herfindahl Level	Weighted Average Herfindahl Level projected by the government for the affected markets	Influence of market concentration on firm value
Cash	Percent of payment to shareholders in cash versus acquirer stock 1 = All cash, 0 = all stock	Control variable covering the influence of deal financing
Deal Size	Total value of the transaction to include cash, stock, and debt retirement	Controls for the size of the transaction
Sales Ratio (relative deal size)	Ratio of sales of the acquirer to the target	Control variable covering the influence of sales differential size in the merging companies
Product Overlap	Average of challenged product line(s) as a percent of target company sales	Relative importance of the challenged product to the target
Time Dummy Variables	For 1996 to 2006 t = 1 merger year t = 0, all other years	Control for year effects
Industry Dummy Variables	i = 1 for industry i = 0, not in industry	Control for industry presence

Table 8 – Mean CARs

	Mean CARs		
	1-year	**3-year**	**5-year**
Mean	-1.79%	-17.5%	-29.4%
Standard error	3.5%	7.6%	8.5%
T statistic	-0.51	-2.30**	-3.45***
Range	-87% to 67%	-3.02% to 1.22%	-2.3 to 1.3%
n	63	63	59

Table 9 – Effect of Structural and Valuation Variables on Total Abnormal Returns

Dependent Variable – Cumulative Abnormal Returns

	One Year	Three Year	Five Year
Log Acquirer R&D	-0.01	-0.01	-0.07*
	(0.01)	(0.03)	(0.03)
Log HHI Level	-0.14	-0.74*	-0.02
	(0.12)	(0.38)	(0.25)
Log Target R&D	0.02	0.031	-0.01
	(0.02)	(0.04)	(0.05)
Log Intangible Assets	0.04*	0.03	0.12**
	(0.02)	(0.04)	(0.05)
Log Deal Size	-0.03	-0.03	-0.12**
	(0.04)	(0.05)	(0.06)
Log Sales Ratio	0.04	0.09	0.14
	(0.05)	(0.10)	(0.12)
Challenge	1.48**	4.99**	0.06
	(0.64)	(2.17)	(1.53)
Log Product Overlap	-0.08*	-0.26*	-0.01
	(0.04)	(0.15)	(0.11)
Competitive	-0.24*	-0.04	0.64
	(0.14)	(0.39)	(0.42)
Cash	0.08	-0.21	-0.45
	(0.13)	(0.34)	(0.37)
Wave	-0.24**	-0.79***	-0.31
	(0.11)	(0.30)	(0.25)
Log Deal Premium	-0.14**	-0.01	0.01
	(0.05)	(0.04)	(0.05)
Challenge*log Deal Premium	0.16**	-0.01	0.02
	(0.06)	(0.11)	(0.13)
Time effects	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
Constant	-0.20	-0.07	0.32
	(0.64)	(1.56)	(1.72)
R-squared	.61	.43	.58
N	63	63	59

Notes: Robust standard errors are in parenthesis;   ***, **, and * denote statistical significance levels of 1%, 5%, and 10% respectively; MSE denotes mean squared error.