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Investigating the economic role of mergers

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Abstract

We investigate the economic role of mergers by performing a comparative study of mergers and internal corporate investment at the industry and firm levels. We find strong evidence that merger activity clusters through time by industry, whereas internal investment does not. Mergers play both an ''expansionary'' and ''contractionary'' role in industry restructuring. During the 1970s and 1980s, excess capacity drove industry consolidation through mergers, while peak capacity utilization triggered industry expansion through non-merger investments. In the 1990s, this phenomenon is reversed, as industries with strong growth prospects, high profitability, and near capacity experience the most intense merger activity.

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1. Introduction

This paper investigates the economic role of corporate mergers and acquisitions by studying both the firm and industry level forces that motivate them. We classify these forces broadly as either ''expansionary,'' in which case mergers are similar in spirit to internal investment, adding to the capital stock of a firm or industry; or ''contractionary,'' whereby mergers facilitate consolidation and reduction of the asset base.

From the point of view of the acquiring company, the first-order effect of mergers is a net addition to the firm's stock of assets. This has two implications. Firstly, a significant portion of merger activity should be explained by factors that motivate firms to expand and

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grow. Secondly, mergers and internal investment should be related, since they are similar ways of adding to a firm's asset base and productive capacity. Therefore, the choice between investing internally and acquiring another firm boils down to considering the relative net benefits of the alternatives.

Industry-wide forces can also precipitate mergers, for example, a reaction to a change in the industry structure, in response to some fundamental shock. This somewhat intuitive view has gained prominence in recent years. Jensen (1993) proposes that most merger activity since the mid-1970s has been caused by technological and supply shocks, which resulted in excess productive capacity in many industries. He argues that mergers are the principal way of removing this excess capacity, as faulty internal governance mechanisms prevent firms from "shrinking" themselves. Mitchell and Mulherin (1996) document that a substantial portion of takeover activity in the 1980s could be explained by industries reacting to major shocks, such as deregulation, increased foreign competition, financial innovations, and oil price shocks. In addition, Morck et al. (1988) suggest that hostile takeovers are "responses to adverse industry-wide shocks."

When mergers are due to industry-wide causes, their association with expansion becomes less clear-cut. In particular, at the industry level, the immediate effect of own-industry mergers is the reallocation of existing assets. Clearly, this reallocation can occur in the context of an industry-wide expansion, as firms may attempt to increase their size and scale in order to afford large capital investments.[1] However, it is also clear that to the extent that mergers within an industry allow firms to remove duplicate functions and rationalize operations, they often result in an overall decrease in the industry's asset base. These are two fundamentally different types of merger activity, and the tension between their effects on industry-level productive capacity, growth in one case and neutral or reduction in the other, suggests that merger activity can be decomposed into two fundamental roles: "expansion" and "contraction."

While the notion that mergers play different economic roles has been previously cited, and to some extent intuitively held by many merger researchers, there is scant empirical work linking these disparate roles. This paper is aimed at filling this gap. We examine the determinants of mergers and internal corporate investment, within a framework that allows us to test for the incidence of different types of mergers, expansionary or contractionary, over time and across industries. Also, by performing the analysis both at the industry- and firm-level, we can empirically verify our premise that merger activity is related to both firm-specific and industry-wide causes.

Given our previous definitions, we test for the expansionary role of mergers at the firm and industry-level by determining the extent to which mergers and internal investment both respond to the same external incentives to add assets. In particular, this story predicts that both merger and non-merger investment should be increasing in estimates of growth opportunities, such as Tobin's q. We also expect that the incentives to expand are stronger in times when existing capacity is near exhaustion, and thus both merger and non-merger investment should be positively related to capacity utilization. In contrast, the contractio-

[1] This explanation is often cited as the main reason behind the media and telecommunications mergers of the 1990s.

nary role implies that merger activity should be negatively related to capacity utilization, particularly at the industry level.

Regression analysis on the industry-level determinants of merger and non-merger investment finds that industry capacity utilization has significant and opposite effects on merger and non-merger investment. Excess capacity drives industry consolidation through mergers, while peak capacity utilization induces industry expansion through non-merger investments.[2] Further analysis reveals that the negative relationship between mergers and capacity utilization is restricted to the 1970s and 1980s, while in the 1990s, the relation is positive and significant, indicating that the role of mergers in facilitating expansion and contraction changes over time. The evidence suggests that in the mid-1970s and 1980s, as the economy adjusted to a variety of shocks to capacity and competition (see Mitchell and Mulherin, 1996), industries restructured and consolidated via mergers. However, during the 1990s, merger activity appears more related to industry expansion, as industries near capacity, with high q, and increased profitability are more likely to experience intense merger activity. In addition, we find a strong positive relation between industry shocks and own-industry mergers in the 1990s. This is consistent with recent findings by Mulherin and Boone (2000) and Andrade et al. (2001) who each find significantly higher merger activity in recently deregulated industries in the 1990s.

We also perform clustering tests, which indicate significant time series clustering of mergers by industry of the acquirer. In particular, industry rankings of merger activity are essentially independent through time, while similar rankings for non-merger forms of investment show strong persistence from one 5-year sub-period to the next. Also, on average, half of an industry's mergers occur within a span of 5 years during our sample period from 1970 to 1994. This evidence is suggestive of mergers resulting from industry shocks, unlike non-merger investments. These results on acquirer industry clustering are similar to those found for target firms by Mitchell and Mulherin (1996), and for both mergers and divestitures in the 1990s by Mulherin and Boone (2000). In a separate test, we find that in four out of five sub-periods, industry rankings of merger and non-merger investment are independent of each other, indicating a lack of either complementarity or substitutability between merger and other types of investment.

At the firm level, we find further evidence of an important expansionary component to mergers. In particular, we find that firms classified as "high q" are significantly more likely to undertake both mergers and non-merger investment projects than "low q" firms, as would be predicted by the q-theory of investment. Moreover, we find a strong positive relation between sales growth and both mergers and non-merger investment. Therefore, both merger and non-merger investments seem to respond similarly to firm-level incentives to grow.

The sample used in our study is described in the next section. Section 3 characterizes industry level merger and non-merger investment activity. Section 4 reports firm-level analysis. The final section summarizes our results and concludes.

[2] The positive relation between internal investment and industry capacity utilization is also reported in Kovenock and Phillips (1997).

2. Data sources and sample description

One of the main difficulties in performing industry-level empirical work is deciding on relevant industry classifications and allocating firms to them. Both CRSP and Compustat report SIC codes for most firms they cover, but these data are fraught with errors. In fact, recent studies (see for example, Kahle and Walkling, 1996, Guenther and Rosman, 1994 and the CRSP documentation manuals) indicate that more than one-third of firms on both databases do not match at the two-digit level of SIC code, which for many industries is already an excessive level of aggregation.[3] In addition, since Compustat only reports current SIC codes, while CRSP reports historical classifications, matching worsens as one goes further back in time.[4]

The data set we use for this paper is based on the universe of firms and industries covered by Value Line from 1970 to 1994. This provides a ready-made, widely accepted industry classification scheme, allowing us to sidestep the problems with SIC codes mentioned above. For each year during the sample period, we compile a list of all firms and their industry assignments from the fourth quarter edition of Value Line (see Appendix A for details on this procedure).

We exclude all firms classified under: (1) foreign industries (e.g., "Japanese Diversified," or "Canadian Energy"), (2) ADR's, (3) REIT's, and (4) investment funds and/or companies. We also eliminate 6 firms that were not in Compustat, as well as 67 firms that were classified as "Unassigned" or "Recent Additions" in some years but were not subsequently assigned to an industry. There are also 30 firms that, for at least 1 year, Value Line placed in two different industries, which we randomly assign to one of them. The resulting sample contains 2969 firms, representing 37,147 firm-years.

Merger data consist of a subset of the CRSP Merger Database including all mergers between CRSP-listed firms over the 1970–1994 period. The database includes transaction announcement and completion dates obtained from the Wall Street Journal Index for most mergers, where completion is defined as the earliest date in which control (+50% interest) is achieved. For 196 deals where a completion date is not available, it is estimated as 4 months following the announcement, which corresponds to the median time period elapsed between announcement and completion for the mergers that report both dates. We assign each merger a value based on the total market value of the target at completion, defined as the sum of total book debt and preferred stock [Compustat items 9, 34 and 56], market equity capitalization [from CRSP], less excess cash, estimated as total cash in the balance sheet [Compustat item 1] in excess of 5.5% of sales,[5] with all balance sheet items as of pre-completion fiscal year-end (see Appendix C for a listing of Compustat data items

[3] For example, SIC code 2800 includes firms which produce chemicals, drugs, and toiletries and cosmetics, all of which we classify separately.

[4] However, this should not lead one to conclude that since CRSP reports historical SIC codes, that it must be the preferred classification source, because as Kahle and Walkling (1996) show, Compustat classifies current firms more accurately. In fact, CRSP SIC code allocations have so many mistakes that they effectively offset any advantage from having historical numbers.

[5] 5.5% corresponds to the median ratio of cash to sales for all firms on Compustat from 1970 to 1994.

used in this paper). Targets in the financial sector are valued only at market equity. In addition, for 612 target firms not available in Compustat, we hand-collect capitalization figures from the annual Moody's Industrial, OTC, Transportation and Utilities manuals. As a result, only 66 mergers are not assigned a value, and are therefore excluded from the analysis. Our method for assigning deal values allows us to maximize use of the sample by not requiring the parties involved to disclose the price of the transaction. On the other hand, it assumes that the acquirer obtains 100% of the target at the completion date. While that may be true for most mergers in the sample, there are some for which the completion date merely represents acquisition of control, which was later followed by a "clean-up merger" at a different price. In addition, we exclude leveraged buyouts and other going-private deals, which were very common in the 1980s. This is because our analysis focuses on acquirers that can and do engage in both mergers and non-merger investment, rather than firms whose sole purpose is to perform takeovers.[6]

Finally, we search through the merger data set for deals where the acquirer belonged to our industry sample at the time of the merger completion and the deal was completed after 1969. This procedure yields 1711 mergers, of which 1682 have estimated values that are allocated to the respective acquirer in the fiscal year of completion. Table A2 in Appendix B shows how the mergers are distributed by industry and year. In addition, for each of these mergers, we attempt to allocate the target firm to an industry at the time of the initial merger announcement, by searching in Value Line, or by matching combinations of CRSP, Compustat and Dun and Bradstreet Million Dollar Directory SIC codes (see Appendix B for details on the target industry assignment procedure). For the subset of target firms assigned to an industry, we classify the merger as diversifying or own-industry by comparing acquirer and target industry classifications at announcement. Diversifying mergers are defined as deals where the industry of the acquirer and the target differ, while the opposite is true for own-industry merger. In total, 1536 targets are successfully assigned to an industry, resulting in 656 diversifying and 880 own-industry mergers.

3. Mergers and non-merger investment at the industry level

The goal of this section is to gain insights into the industry-level forces behind merger and non-merger investment. Specifically, we test (1) the degree to which mergers and non-merger investment are related to shocks to industry structure, (2) whether mergers tend to occur in times of industry-wide excess capacity, and (3) whether mergers tend to occur in times of strong industry growth prospects.

Most industry-level empirical analysis we perform is based on industry-wide measures of annual merger and investment "intensities," which we define as the total value of merger and investment activity in the industry, scaled by the total book assets of all firms in the industry at year-end. This method is useful in two respects: (1) the intensities can be compared across time, industries, and types of merger and non-merger investment, since

[6] Excluding LBO's and other going-private deals makes our merger series different at the aggregate level from the ones used by other authors, who include all takeovers of domestic targets.

they are fairly insensitive to changes and/or differences in industry composition,[7] and (2) at the firm level, investment is aimed at replacing depreciated assets and/or adding new assets, therefore, it is natural to scale investment by some measure of the capital stock in place.[8] We estimate annual industry-level intensities for six types of expenditures: (1) Merger, (2) Diversifying Merger, (3) Own-Industry Merger, (4) CAPX, (5) R&D, and (6) Non-Merger Investment (defined as the sum of CAPX, R&D and advertising expenses). For merger-related intensities (1, 2 and 3 above), the denominator in the intensity measure includes all firms reporting non-missing book assets, whereas for non-merger investment intensities (4, 5 and 6), we also require firms to report non-missing CAPX to ensure that the same firms are included in the numerator and denominator. When calculating the non-merger investment intensities, R&D and advertising are set to zero whenever missing.

Table 1 reports summary statistics on the total level of investment by our sample firms between 1970 and 1994. This total includes both merger and non-merger investment, as defined above.[9] The table also displays the percentage of total investment made up of merger activity. Note that the relative importance of merger activity changes over time. This is seen more clearly in Fig. 1, which plots the average ratio of merger to total investment expenditures for our sample firms on an annual basis.[10] Firm-level expenditures on mergers relative to internal investment increased dramatically in the late 1980s, not surprising considering the period corresponds to a well-known economy-wide merger wave. However, it is interesting that even during the recession that followed in the early 1990s, merger activity remained at a significantly higher level than in the 1970s. Perhaps this represents a shift in the overall propensity of firms to acquire others, which would also be consistent with the subsequent explosion in merger activity of the late 1990s, the largest merger wave ever (see Andrade et al., 2001).

3.1. Historical patterns in industry merger and non-merger investment

Mitchell and Mulherin (1996) document significant clustering of target firms by industry during the 1980s.[11] In this sub-section, we test for such industry clustering in both merger

[7] Furthermore, these intensities are later used as dependent variables in panel regressions, in which case the scaling provides a rough but somewhat effective means of controlling for heteroscedasticity.

[8] See Kaplan and Zingales (1997) and Mitchell and Mulherin (1996) for recent examples of empirical studies where proxies for firm value scale investment and merger expenditures.

[9] Aggregate investment peaks in the early 1980's but that is due mainly to changes in the composition of Value Line over the sample period. In particular, starting in the early 1980's, the banking and brokerage industries have constituted a larger portion of the sample relative to early periods (see Table A1 in Appendix A). As these industries perform little non-merger investment (especially CAPX and R&D), they reduce the overall level of investment in the total sample.

[10] Both Table 1 and Fig. 1 understate total merger activity, given the way we identify merger in this study. In particular, we only look at merger between Value Line acquirers and CRSP-listed targets. We ignore foreign acquirers and targets, acquisitions of plants and divisions, as well as LBO's and other going-private transactions.

[11] There is also evidence of clustering in earlier periods. Nelson (1959) identifies pronounced differences in takeover rates across industries over time, using data for the first half of the century. Gort (1969) confirms those results with data on takeovers in the 1950s, and suggests they are caused by "economic disturbances" due to rapid changes in technology and/or stock prices.

Table 1
Summary statistics on real investment expenditures by sample firms, and comparison of industry-level investment intensity rankings across 5-year sub-periods from 1970 to 1994

Summary Statistics:

	1970–1974	1975–1979	1980–1984	1985–1989	1990–1994
Real total investment (merger and non-merger) in billions of 1994 dollars	$1377	$1954	$2340	$2291	$2168
Merger as of total investment (%)	3.8%	4.9%	9.4%	12.5%	7.9%

Sub-period correlations

	Spearman's rank correlation coefficient			
	1970–1974 vs. 1975–1979	1975–1979 vs. 1980–1984	1980–1984 vs. 1985–1989	1985–1989 vs. 1990–1994
Merger	0.376 (0.006)	0.331 (0.015)	0.114 (0.403)	0.175 (0.198)
CAPX	0.830 (0.000)	0.860 (0.000)	0.659 (0.000)	0.729 (0.000)
R&D	0.970 (0.000)	0.969 (0.000)	0.949 (0.000)	0.931 (0.000)
Non-merger investment	0.883 (0.000)	0.912 (0.000)	0.853 (0.000)	0.855 (0.000)

Total investment expenditures include both merger and non-merger investment, and are reported in constant 1994 dollars. Comparisons between pairs of consecutive sub-periods are based on Spearman's rank correlation coefficient. Industry rankings are based on investment intensities that are calculated for each industry as the average over the sub-period of the annual ratio of total investment of each type by firms in the industry to the total book assets of the industry at year-end. Industry merger values are the total value of all transactions in the CRSP Merger Database involving acquirers in the industry. Capital expenditures (CAPX), research and development (R&D) and advertising include all sample firms with Compustat data. Non-merger investment is the sum of CAPX, R&D, and advertising. CAPX rankings exclude financial sector firms. R&D rankings include only industries related to manufacturing and mining. *P*-values are in parentheses.

and non-merger investment activity. In contrast to those authors, we look at the industry of the acquirer, not the target. A finding that mergers cluster by industry over time would support the claim that, to some extent, merger activity is a result of industry shocks.

We divide the sample period (1970–1994) into five equal sub-periods, and calculate industry-level sub-period intensities for all six of the investment measures defined above,

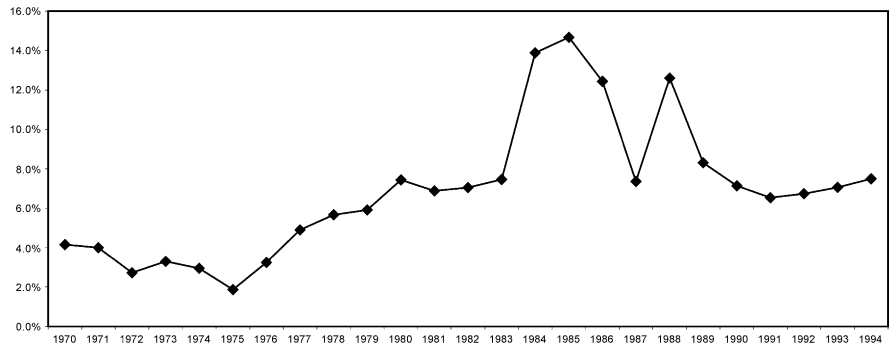

Fig. 1. Merger activity as the percentage of total firm-level investment (average across all firms).

by averaging the annual intensities within each sub-period.[12] Then, each of the industry-level investment intensity series is ranked within each sub-period, and we compare the rankings over time and across forms of investment.[13] Therefore, we are testing whether the relative ranking across industries, for each form of investment, is persistent over time.

For each of merger, CAPX, R&D and non-merger investment, we analyze the stability of rankings over time. We perform a Spearman's rank correlation test for each pair of consecutive sub-periods (see Gibbons, 1985 for details). Since the null hypothesis is that the rankings are independent each period, rejection indicates a strong level of stability in the rankings. Table 1 reports our results.

The first thing to note is the striking contrast between the stability of merger and non-merger rankings across sub-periods. While industry merger rankings, particularly in the 1980s, exhibit little correlation from one sub-period to the next, the rankings for CAPX, R&D and total non-merger investment intensity are nearly constant.[14] This is evident not only from the puny *p*-values, but the magnitude of the test statistics themselves, which can be loosely interpreted as correlation coefficients. The industry-rank correlations average 0.25 across sub-periods for mergers and 0.88 for non-merger investment. Additionally, the average industry has approximately 50% of its mergers occur within a 5-year sub-period over the 25-year sample period (see Table A2 in Appendix B). These results suggest strong time series clustering of industry merger activity, while rejecting the notion of clustering for non-merger investment. The result that non-merger investment does not cluster by industry is important, as it strengthens the restructuring interpretation of the evidence on mergers. In some sense, if both merger and non-merger investment clustered, we would be hard-pressed to argue that mergers play a distinct restructuring role, one that cannot be fulfilled by other forms of investment.[15]

Given the markedly different historical patterns in merger and non-merger investment, it is interesting to check whether at each point in time there is any relation, positive or negative, between the two. In particular, we want to know whether there is any evidence of complementarity or substitutability between internal and external investment, or its components. Towards that goal, within each sub-period, we compare the rankings between the following sets of investment intensity pairs: (1) merger and non-merger investment, (2) diversifying merger and non-merger investment, (3) own-industry merger and non-merger

[12] We also estimate business cycle-based sub-periods, using NBER's classification of expansions and contractions. This resulted in five cycles during our sample period: 1970–1974, 1975–1979, 1980–1982, 1983–1990, and 1991–1994 (this last period is not a complete cycle, since it has been a period of expansion only). Changing the sub-period definition did not impact the results, and the inferences remained unaltered, therefore, only the equal sub-periods are reported.

[13] For CAPX and R&D rankings, we exclude certain industries because: (1) Compustat does not report CAPX or R&D expense for them, or (2) by the very nature of their business, these firms do not perform R&D investment. As a result, CAPX rankings exclude firms in the financial sector, while the R&D rankings include only manufacturing and mining firms.

[14] If depreciation rates differ greatly across industries but are fairly constant through time, it can be argued that the stability in CAPX and non-merger investment intensity rankings is partly due to industries replacing depreciated assets.

[15] A separate impliction of the results on industry clustering is that merger event studies are poorly specified statistically. The assumption of independence across events is certainly violated, and is likely even more severe a problem for long-term performance studies (see Mitchell and stafford, 2000).

investment, and (4) diversifying merger and own-industry merger. The statistical procedure used is again the Spearman's rank correlation test. Note that under the null hypothesis, the rankings within each sub-period are independent—a rejection indicates some complementarity or substitutability between investment forms, depending on the sign.

Table 2 contains our results for these tests. In general, the merger and non-merger investment intensities are independent within sub-periods. Therefore, there is no persistent evidence that firms merge conditionally on high levels of internal investment in the industry, during our sample period. There is some indication that merger and non-merger investment in the late 1980s are complements, apparently driven by diversifying mergers. In other words, the industries that experienced high levels of merger activity in the late 1980s were also industries that were expanding via internal investment. Note that in addition, we find virtually no relation between own-industry and diversifying mergers, suggesting that it is important to analyze these separately.

In short, during the 1970–1994 sample period, merger intensities differed significantly through time by industry, and showed little relation to non-merger investment within any given sub-period. The picture that emerges is one where industry non-merger investment is fairly stable through time, while there are periods of intense merger activity at the industry level, perhaps in response to changing industry conditions that bring about broad restructuring.

3.2. Panel regressions: the determinants of industry merger and non-merger investment

In this section, we search for more specific evidence on the expansionary and contractionary motives for mergers by examining the relation between annual industry-level merger and non-merger investment activity, industry capacity utilization, shocks, and proxies for growth opportunities. The regression framework allows us to control for other

Table 2
Comparison within sub-periods of industry-level investment intensity rankings across investment types. Sub-periods are 5-year intervals from 1970 to 1994

Investment comparison	1970–1974	1975–1979	1980–1984	1985–1989	1990–1994
Merger vs. non-merger investment	0.009 (0.950)	−0.021 (0.875)	0.210 (0.123)	0.308 (0.024)	0.057 (0.677)
Diversifying merger vs. non-merger investment	−0.069 (0.614)	−0.265 (0.051)	0.032 (0.813)	0.287 (0.035)	−0.031 (0.822)
Own-industry merger vs. non-merger investment	−0.008 (0.954)	0.107 (0.432)	0.073 (0.593)	0.108 (0.429)	0.064 (0.639)
Diversifying merger vs. own-industry merger	0.259 (0.057)	0.005 (0.972)	−0.039 (0.777)	−0.112 (0.409)	−0.184 (0.177)

Comparisons are based on Spearman's rank correlation coefficients. Industry rankings are based on investment intensities that are calculated for each industry as the average over the sub-period of the annual ratio of total investment of each type by firms in the industry to the total book assets of the industry at year-end. Industry merger values are the total value of all transactions in the CRSP Merger Database involving acquirers in the industry. Capital expenditures (CAPX), research and development (R&D) and advertising include all sample firms with Compustat data. Non-merger investment is the sum of CAPX, R&D, and advertising. CAPX rankings exclude financial sector firms. R&D rankings include only industries related to manufacturing, mining and utilities. *P*-values are in parentheses.

determinants of merger and non-merger investment, such as business conditions and industry structure characteristics. The dependent variables in our panel regressions are "merger," "own-industry merger," and "non-merger investment" intensities. For the merger-based dependent variable, we have the problem that in many industry-years there are no mergers, as can be seen in Table A2 (Appendix B). Therefore, the intensity measure is censored at zero, which makes ordinary least squares (OLS) estimates inconsistent. We account for this by fitting Tobit specifications, which are designed to explicitly correct for this type of censoring.[16] For the non-merger-based dependent variables, censoring is not a problem, and simple OLS regressions are estimated. To allow comparable inferences from both Tobit and OLS specifications, only raw Tobit coefficients are reported, i.e., not conditioned on the dependent variable being strictly positive (for a discussion on this point, see Greene, 1993).

From Compustat, we create the following set of annual industry-level explanatory variables, which are all constructed as ratios of sums over firms in the industry at year-end:[17]

Variable	Definition	Requirements for inclusion of firm
Tobin's q (q)[18]	[book assets + market equity − book equity]/book assets	market equity, book equity>0 book assets>0
Cash flow (CF)	EBITDA/sales	sales>0
Sales growth (SALESGRO)	[sales(t)/cpi(t)]/[sales($t-2$)/cpi($t-2$)] − 1	sales(t and $t-2$)>0, presence in industry at time t
Shock	abs[sales growth (t) − mean(sales growth in all t)]	same as sales growth
Industry concentration (INDCONC)[19]	sum[(sales/total industry sales)^2]	sales>0[20]

Note that the above definition of 2-year sales growth is somewhat biased, since it only includes firms that are present at time t. Therefore, it underestimates industry growth if there has been entry, and industry decline if there has been exit. The same goes for the "shock" variable, which is based on the sales growth calculation.

[16] See Greene (1993) and Maddala (1983) for detailed discussions on Tobit estimation techniques, the form of the likelihood function, and the asymptotic variance matrix.

[17] Summing over all numerator and denominator firms before creating the ratio makes these independent variables "value-weighted" measures.

[18] This definition of q is flawed in many respects: (1) it assumes replacement value of assets and market value of liabilities is well proxied by book value, (2) it assumes average and marginal q are the same, (3) it ignores tax effects. Still, it is easy to calculate and it's minimal data requirements allow for maximal coverage on Compustat, which likely explains why it is commonly found in the macro and finance literatures (see Blanchard et al., 1994 and Kaplan and Zingales, 1997 for recent examples).

[19] We use the natural logarithm of INDCONC in all of our regressions. The industry concentration measure that we use is also known as the Hirshman–Herfindahl Index.

[20] For years, where less then two-thirds of the firms in the industry reported positive sales, we estimated the INDCONC using one of the following procedures: (1) if 1970 or 1994 is missing, we regress the valid INDCONC's on a time trend and predict the missing values for those 2 years, otherwise (2) we linearly interpolate using INDCONC's available on dates surrounding the missing year.

From CITIBASE, we obtain industry capacity utilization rates (CAPUTIL). Only figures for manufacturing, mining and utilities are available, therefore service and financial industries are assigned "missing" codes for this variable. Also, since the capacity utilization ratios are reported on the basis of two-digit SIC codes for the most part, wherever our industries are more finely classified than the figures on CITIBASE, we assign the same capacity utilization figure for all the industries covered by the classification (e.g., both the electrical equipment and electronics industries are given the CITIBASE "Electrical Equipment" capacity utilization rate).

All regression specifications exclude three financial sector industries[21] because: (a) Compustat does not report CAPX for these firms, making non-merger investment invalid, and (b) differences in accounting and the nature of the businesses themselves make it difficult to define variables comparable to cash flow, capacity, etc. In addition, the explanatory variables are always as of the beginning of the period, i.e., lagged by 1 year. This is done to accommodate the fact that variables such as q are forward-looking, so their effect must precede the investment, as well as the more practical point that depending on how investment is financed or a merger accounted for, accounting-based variables such as profitability and sales growth may be affected by the merger or investment itself, generating a spurious correlation. Finally, all regression specifications include both year and industry dummy variables.

Our choice of independent variables is motivated by the need to control for other factors which theory suggests should influence investment activity. On the other hand, since some of these theories, such as q-theory, are meant to describe firm-level investment, arguably they are better suited to the firm-level analysis of Section 4. Still, to the extent that growth prospects are correlated across firms in an industry, we might expect to see some industry-wide effects, and therefore the variables are included in the industry-level specifications. For example, assuming q-theory is well specified at the industry level, all forms of investment should be positively related to q. This is captured in our "base" specification, where q is measured as a continuous variable. However, another interpretation of the theory suggests that firms with good growth opportunities should be investing, while firms with poor growth opportunities should not. It is not clear what can be said about the relation between investment and q, conditional on having good or bad growth prospects. Therefore, we present specifications that also include the "high q" and "low q" dummy variables, which are meant to identify the industries with good and poor growth opportunities. Each year, we sort the industries on the basis of q, classifying the bottom third as "low q" and the top third as "high q," and then assigning them to dummy variables of the same name. In addition, this classification scheme helps get around some of the empirical problems with measures of q. Since our estimates of q likely have measurement error, we are more comfortable making inferences based on the broader classifications. This will be particularly important for the firm level analysis in Section 4, where measurement errors are more severe.

We also include a measure of industry profitability and cash flow (CF), which not only captures some measure of industry business conditions, but also helps pick up elements of growth prospects and "real q" that our noisy estimate of q might fail to measure.

[21] They are: (1) Bank and Thrift, (2) Brokerage, Leasing and Financial Services, and (3) Insurance.

Table 3

(a) Ordinary least squares panel regressions of annual non-merger investment intensities on industry-level variables

	Levels			Industry-adjusted		
Low q		−13.28	−9.08		−17.07	−16.27
		(−5.71)***	(−3.44)***		(−5.92)***	(−4.97)***
High q		6.26	9.54		8.74	22.87
		(2.62)***	(3.05)***		(2.62)***	(5.52)***
q	11.54	7.59	−0.19	38.06	26.60	21.76
	(5.84)***	(3.61)***	(−0.08)	(17.31)***	(9.29)***	(6.90)***
Cash flow	151.55	130.21	−2.40	65.70	73.67	93.04
	(5.59)***	(4.83)***	(−0.06)	(3.47)***	(3.95)***	(3.59)***
Sales growth	26.40	19.98	27.04	26.66	15.56	−0.07
	(4.88)***	(3.68)***	(3.26)***	(3.53)***	(2.05)**	(−0.01)
Industry shock	−4.57	−1.25	−4.77			
	(−0.57)	(−0.16)	(−0.45)			
Industry concentration	2.89	4.45	2.80	13.82	13.58	20.51
	(1.01)	(1.57)	(0.63)	(8.18)***	(8.17)***	(10.82)***
Capacity utilization			0.78			0.40
			(4.62)***			(1.86)*
R^2	0.76	0.77	0.83	0.34	0.37	0.54
N	1297	1297	699	1297	1297	699

(b) TOBIT panel regressions of annual merger intensities on industry-level variables

	Levels			Industry-adjusted		
Low q		−0.06	1.55		−2.65	−3.14
		(−0.02)	(0.34)		(−0.82)	(−0.89)
High q		6.37	2.16		4.50	5.44
		(1.50)	(0.41)		(1.21)	(1.24)
q	0.33	−1.64	0.75	4.16	0.64	3.93
	(0.09)	(−0.43)	(0.19)	(1.67)*	(0.19)	(1.16)
Cash flow	55.95	46.96	30.15	52.72	53.94	28.18
	(1.14)	(0.95)	(0.46)	(2.57)**	(2.62)***	(1.04)
Sales growth	16.68	14.73	40.90	15.66	12.39	33.48
	(1.63)	(1.42)	(2.83)***	(1.83)*	(1.41)	(2.61)***
Industry shock	25.11	25.99	29.27			
	(1.69)*	(1.75)*	(1.59)			
Industry concentration	−25.92	−25.91	−21.62	−7.38	−7.59	−5.22
	(−4.87)***	(−4.85)***	(−2.66)***	(−3.97)***	(−4.07)***	(−2.48)**
Capacity utilization			−0.47			−0.39
			(−1.60)			(−1.62)
Log-likelihood	828.31	829.44	554.42	753.24	754.59	535.55
N	1298	1298	700	1298	1298	700

Table 3 (*continued*)

(c) TOBIT panel regressions of annual own-industry merger intensities on industry-level variables

	Levels			Industry-adjusted		
Low q		0.07	− 1.57		− 1.25	− 6.07
		(0.02)	(− 0.34)		(− 0.40)	(− 1.67)*
High q		2.11	5.11		− 1.83	3.65
		(0.50)	(0.93)		(− 0.50)	(0.83)
q	1.11	0.51	0.26	3.57	4.04	0.58
	(0.33)	(0.14)	(0.07)	(1.49)	(1.29)	(0.17)
Cash Flow	28.59	25.97	45.09	56.47	57.27	67.20
	(0.59)	(0.54)	(0.68)	(2.79)***	(2.82)***	(2.37)**
Sales Growth	15.54	14.92	41.65	− 1.24	− 1.04	36.68
	(1.56)	(1.46)	(2.83)***	(− 0.15)	(− 0.12)	(2.84)***
Industry Shock	26.67	26.79	17.53			
	(1.84)*	(1.84)*	(0.95)			
Industry	− 13.31	− 13.43	− 5.25	− 3.38	− 3.31	0.51
Concentration	(− 2.52)**	(− 2.52)**	(− 0.63)	(− 1.88)*	(− 1.83)*	(0.24)
Capacity			− 0.55			− 0.65
Utilization			(− 1.96)**			(− 2.65)***
Log-Likelihood	560.04	560.16	392.82	466.67	466.84	373.80
N	1298	1298	700	1298	1298	700

Statistical significance at the 1%, 5%, and 10% levels are denoted by ***, **, and *, respectively.
Panel refers to 55 industries and 25 years covering 1970–1994. Annual (type) merger/investment intensities are calculated for each industry as the ratio of total value of (type) acquisitions/investments over the year by firms in the industry to the total book value of assets in the industry at year-end. Mergers are determined to be diversifying if the target and acquirer are in different industries at the time of announcement, or own-industry if both parties are in the same industry. Industry capital expenditures (CAPX), research and development (R&D), and advertising are based on sample firms with Compustat data. Non-merger investment is the sum of CAPX, R&D, and advertising. q is estimated as the ratio of the industry's total market value of assets (book value of assets + market value of common equity − book value of common equity) to its total book value of assets. Low (high) q is a dummy variable equal to one if the industry's q is below the 33rd (above the 67th) percentile of all industry q's during the year. Cash flow (CF) is calculated as the sum across firms in the industry of EBITDA divided by the sum across firms in the industry of sales. High CF is a dummy variable equal to one if the industry's CF is above the 67th percentile of all industry CFs during the year. Sales growth is the 2-year growth rate in industry sales, based on the firms assigned to the industry in year t. Industry shock is calculated as the absolute value of the deviation of industry sales growth from the mean sales growth for the industry over the sample period. The industry market concentration index is the natural logarithm of the sum of squared market shares (based on sales) calculated each year for each industry. Capacity utilization is the percentage of total industry capacity utilized (available for manufacturing, mining, and utilities). All specifications include year and industry dummies, although not reported. Industry-adjusted independent variables are net of the industry's own time series mean. N refers to the number of observations. t-statistics are in parentheses. All coefficients are multiplied by 1000.

Industrial organization theory suggests that the level of merger activity is affected by changing industry characteristics and/or conditions. Therefore, to control for differences in industry structure, we include the natural logarithm of the market concentration index (INDCONC).

We attempt to capture "shocks" to the industry by including lagged sales growth and the absolute deviation of sales growth from its long-term mean (our shock variable). This is arguably a very weak proxy, since it primarily captures shocks to demand, and fails to

identify technological shocks that primarily affect costs of production, as well as any forward-looking industry changes, such as anticipated deregulation.

All of the regressions are estimated with independent variables measured both in levels and as deviations from their industry's time series mean. The level regressions are meant to capture the marginal effect of the industry-level variables on merger/investment intensity across all industries and time, while the industry-adjusted variables are designed to capture the marginal effect of the independent variables during periods when they are unusually high or low relative to the historical average for that industry.

Table 3 displays our results for both the entire panel of 55 industries, and the restricted panel of industries for which CAPUTIL data is available. The regression results are largely consistent with there being an important industry-restructuring component to merger activity. We find opposite signs on the capacity utilization coefficient for merger and non-merger investment. Consistent with the claim by Jensen (1993) that recent mergers have been largely motivated by the need to eliminate excess capacity, we find a significantly negative relation between own-industry merger and utilization rates. We also find some evidence that mergers are related to industry shocks. Mitchell and Mulherin (1996) show that industry shocks motivate industry restructuring and account for a significant portion of takeover activity from the target's perspective. Based on that evidence, we expect a positive relation between shocks and own-industry mergers, as industries undergoing restructuring consolidate, and indeed, find the effect of SHOCK to be restricted to own-industry mergers.

The positive and significant coefficient on q, which is predicted by q-theory, only appears in the specifications involving non-merger forms of investment. All of the coefficients on q, as well as the high and low q dummy variables, are significant and of the predicted sign for the non-merger investment specifications, both in levels and industry-adjusted. Together with the positive relation between non-merger investment and capacity utilization, this evidence suggests that there is a strong industry-wide component to firm-level growth prospects. We find no relation between merger intensity and q, although it is not clear that q-theory predicts such a relation for the industry in the first place.

We also find a strong positive relationship between merger and non-merger investment and both cash flow, as proxied by EBITDA/sales, and sales growth. This result is broadly consistent with the previous evidence on the link between cash flow and investment at the firm level (for a recent discussion see Kaplan and Zingales, 1997). It should be noted that EBITDA/sales and sales growth might proxy for components of "real q" which our measure for q does not capture. Alternatively, a positive relation between investment and cash flow is consistent with some degree of capital market imperfection, which forces industries to rely primarily on internally generated funds in order to invest.

The opposite signs of the coefficient on INDCONC for merger and non-merger investment intensity in the industry-adjusted specifications suggest an interesting interpretation. When industries are particularly concentrated, relative to their historical average, expansion is likely to occur via internal investment. On the other hand, the negative coefficient on INDCONC in the merger regressions suggests that high levels of industry concentration deter firms from pursuing acquisitions, perhaps due to antitrust regulations or even just a lack of targets. However, we caution that this latter result might also be due to problems with the coverage of our merger sample. We implicitly assume that all zero

Table 4
Panel regressions of annual industry investment intensities on industry-level variables split by decade—independent variables in LEVELS

	Non-merger investment			Mergers			Own-industry mergers		
	1970–1979	1980–1989	1990–1994	1970–1979	1980–1989	1990–1994	1970–1979	1980–1989	1990–1994
Low q	−0.73	−9.42	5.40	−0.23	14.02	−1.36	−0.17	2.63	−70.16
	(−0.17)	(−1.98)**	(1.27)	(−0.03)	(1.45)	(−0.11)	(−0.02)	(0.30)	(−2.45)**
High q	9.54	0.59	−0.03	−0.15	−5.94	12.82	2.30	3.17	115.58
	(1.76)*	(0.12)	(−0.01)	(−0.02)	(−0.58)	(1.00)	(0.25)	(0.36)	(2.42)**
q	1.18	34.26	35.49	7.53	50.99	−40.06	4.28	19.61	−307.81
	(0.42)	(3.23)***	(5.81)***	(1.71)*	(2.38)**	(−1.78)*	(0.94)	(1.04)	(−2.73)***
CF	72.98	−11.79	38.15	125.91	−2.62	335.14	76.85	77.84	2498.30
	(0.99)	(−0.20)	(0.50)	(1.08)	(−0.02)	(1.33)	(0.62)	(0.67)	(2.50)**
SALESGRO	−10.79	10.50	29.23	19.25	45.28	34.13	17.15	27.34	11.99
	(−0.82)	(0.87)	(1.71)*	(0.89)	(1.81)*	(0.66)	(0.74)	(1.24)	(0.14)
SHOCK	12.20	−8.87	21.20	34.58	40.80	7.27	51.61	−20.79	681.25
	(0.70)	(−0.56)	(1.04)	(1.20)	(1.21)	(0.12)	(1.66)*	(−0.68)	(2.39)**
INDCONC	−5.51	−1.98	12.84	10.46	−11.67	−41.55	14.48	12.04	−93.56
	(−0.36)	(−0.22)	(1.18)	(0.44)	(−0.61)	(−1.16)	(0.56)	(0.72)	(−1.48)
CAPUTIL	0.71	0.57	0.99	−0.83	−0.38	2.05	−0.79	−0.55	9.61
	(2.88)***	(2.15)**	(3.06)***	(−2.04)**	(−0.68)	(1.84)*	(−1.83)*	(−1.10)	(2.34)**
N	279	280	140	280	280	140	280	280	140

Statistical significance at the 1%, 5%, and 10% levels are denoted by ***, **, and *, respectively.

Panel refers to 55 industries and 25 years covering 1970–1994. Annual (type) merger/investment intensities are calculated for each industry as the ratio of total value of (type) acquisitions/investments over the year by firms in the industry to the total book value of assets in the industry at year-end. Mergers are determined to be diversifying if the target and acquirer are in different industries at the time of announcement, or own-industry if both parties are in the same industry. Industry capital expenditures (CAPX), research and development (R&D) and advertising are based on sample firms with Compustat data. Non-merger investment is the sum of CAPX, R&D, and advertising. q is estimated as the ratio of the industry's total market value of assets (book value of assets + market value of common equity − book value of common equity) to its total book value of assets. Low (high) q is a dummy variable equal to one if the industry's q is below the 33rd (above the 67th) percentile of all industry q's during the year. Cash flow (CF) is calculated as the sum across firms in the industry of EBITDA divided by the sum across firms in the industry of sales. High CF is a dummy variable equal to one if the industry's CF is above the 67th percentile of all industry CFs during the year. Sales growth (SALESGRO) is the 2-year growth rate in industry sales, based on the firms assigned to the industry in year t. SHOCK is calculated as the absolute value of the deviation of industry sales growth from the mean sales growth for the industry over the sample period. The industry market concentration index (INDCONC) is the natural logarithm of the sum of squared market shares (based on sales) calculated each year for each industry. Capacity utilization (CAPUTIL) is the percentage of total industry capacity utilized (available for manufacturing, mining, and utilities). All specifications include year and industry dummies, although not reported. N refers to the number of observations. Specifications involving non-merger investment intensities are estimated using OLS, while merger-related specifications employ TOBIT. t-statistics are in parentheses. All coefficients are multiplied by 1000.

merger intensities represent no mergers in the industry over the year. Failure to identify mergers increases the probability of small industries (in terms of number of firms) reporting zero transactions in a given year. Since INDCONC is roughly inversely related to the number of firms, the negative relation between merger intensity and INDCONC might be spurious. Still, we do not believe that the significance of INDCONC is completely driven by measurement errors, as our merger sample is quite comprehensive.

The overall results suggest that mergers, particularly own-industry mergers, appear to play a key role in affecting major industry change. Own-industry mergers seem to follow industry shocks, and occur in times of excess capacity, consistent with the hypothesized contractionary motive for mergers. On the other hand, periods of peak utilization and good growth prospects require capacity expansion via increased internal investment. However, one must be careful not to generalize the results to all own-industry mergers through time. Jensen (1993) for example, explicitly notes that the industry restructuring role should refer primarily to mergers from the mid-1970s through the late 1980s, as this is the time "when excess capacity began to proliferate in the worldwide economy." Morck et al. (1988) suggest that a key determinant of merger, takeover and LBO activity in the 1980s is the need to restructure industries that have experienced adverse economic shocks. We allow for the possibility that the contractionary role of mergers is period-specific, by splitting the panel regressions by decade. Table 4 reports the results for these decade-by-decade specifications. For most variables, results are qualitatively consistent over the 1970s, 1980s, and 1990s. While statistical significance might be concentrated in just one decade, the signs tend to be preserved throughout. One major exception is industry capacity utilization. In particular, in specifications involving either mergers or own-industry mergers, the sign on CAPUTIL is negative (and sometimes statistically significant) during the 1970s and 1980s, while positive (and sometimes significant) in the 1990s. Note also the strongly positive sign on the high q dummy and CF for own-industry mergers during the 1990s. These results are consistent with Jensen (1993) and Morck et al. (1988), and suggest that the restructuring role for mergers is important during the 1970s and 1980s, as industries react to excess capacity by merging. However, during the 1990s merger activity appears more related to industry expansion, as industries with high q, increased profitability and near capacity, are more likely to experience increased merger activity.

4. Mergers and non-merger investment at the firm level

At the firm level, the net effect of a merger or an internal investment is largely the same, namely an increase in the firm's asset base and/or productive capacity. Therefore, we hypothesize that from the point of view of the investor–acquirer, both merger and non-merger investment will respond similarly to external incentives to invest. This section documents this expansionary motive for mergers, by examining the determinants of both corporate merger and non-merger investment. Moreover, we gain insights into the previously identified contractionary motive for mergers by analyzing the pre-merger characteristics of the acquirer and target companies, with the overall goal of better understanding who the buyers and sellers are.

4.1. Defining investment events

The decision to merge is inherently a "lumpy" one—mergers are discrete events, and as such cannot be modeled by a continuous variable. Therefore, to better capture the merger versus non-merger investment decisions of firms, we need to "discretize" the latter. For this purpose, we define a set of individual investment "events," which we calculate as "abnormal" firm-level changes in non-merger investment expenditures (relative to some trend). The rationale is that these large 1-year changes in investment are more likely to be the result of discrete choices by the firms, making them more comparable to mergers.

For each firm in the sample with at least 2 years of valid data on Compustat, we calculate a series of annual non-merger investment intensities, defined (as in Section 3) as the ratio of the sum of CAPX, R&D and advertising expense to the year-end total book assets of the firm. Firm-years with missing CAPX or book assets are excluded. We define annual "abnormal" investment as a deviation from the firm's average non-merger investment, that is, for firm j in year t:

$$\begin{aligned}&(\text{abnormal non} - \text{merger investment})_{jt}\\&\quad = (\text{non} - \text{merger intensity})_{jt} - \text{mean}(\text{non} - \text{merger intensity})_{j}\end{aligned}$$

Next, we combine all abnormal non-merger investment figures across firms and years into one panel, and rank them. The upper-tail of this distribution, more than one standard deviation above the mean, is defined as the set of non-merger events, which we will compare to mergers.[22] Note that this definition of events only includes large positive changes in non-merger investment, so that they represent net additions to assets. A total of 3876 events are classified by this procedure.

In an attempt to remain consistent with the above definition of investment events, we also exclude all mergers where the target value was less than 1% of the total value of the acquirer at the end of the pre-completion year. Again, the idea is to focus on a set of events which likely result from important individual decisions by firms, rather than normal day-to-day operations. This trimming results in 1090 merger events, with 645 classified as own-industry and 363 as diversifying.[23]

4.2. Logit analysis on the determinants of merger and non-merger events

The main econometric tool used in this section is the logit regression, which is designed specifically to analyze the determinants of discrete dependent variables, as is the case with our events. We create four panels of dependent variables, each of which consists of a set of dummy variables for different types of events. They are:

1. NON_MERGER = 1 for non-merger event, 0 otherwise
2. DIV_MERGER = 1 for diversifying merger event, 0 otherwise

[22] A plot of the ranked abnormal non-merger investment panel revealed the following properties of the distribution: (1) centered around zero, (2) near-perfect symmetry, (3) slightly "fatter" tails than a normal of similar mean and variance.

[23] The actual numbers of merger-related events used in the estimation are slightly smaller because some of the firms had missing values for the explanatory variables.

Table 5

(a) Panel regressions of annual individual firm non-merger investment events on firm-level independent variables from 1970 to 1994

	Levels (LOGIT)			Fama–MacBeth Levels (OLS)			Industry-adjusted (LOGIT)			Fama–MacBeth industry-adjusted (OLS)		
	1	2	3	1	2	3	1	2	3	1	2	3
Low q		−160.7	−115.2		−9.5	−6.0		−187.2	−148.6		−9.4	−5.9
		(0.00)***	(0.00)***		(−2.04)**	(−1.12)		(0.00)***	(0.00)***		(−2.01)**	(−1.06)
High q		59.5	62.5		18.3	18.4		115.0	117.7		19.9	20.0
		(0.00)***	(0.00)***		(2.79)***	(2.81)***		(0.00)***	(0.00)***		(2.92)***	(2.93)***
AGENCY			−33.9			−18.0			−29.5			−20.1
			(0.00)***			(−2.42)**			(0.00)***			(−2.40)**
q	230.0	51.7	46.9	15.5	3.3	3.1	17.5	−6.8	−6.9	15.7	2.4	2.2
	(0.00)***	(0.32)	(0.37)	(2.88)***	(0.53)	(0.50)	(0.00)***	(0.16)	(0.15)	(2.84)***	(0.35)	(0.32)
CF	494.3	433.4	462.6	316.6	301.8	312.0	13.3	10.6	11.4	316.4	300.7	311.2
	(0.00)***	(0.00)***	(0.00)***	(7.96)***	(7.43)***	(7.44)***	(0.00)***	(0.00)***	(0.00)***	(6.87)***	(6.47)***	(6.45)***
BOOKLEV	−13.8	−9.1	−8.0	2.1	2.3	2.3	−7.1	−4.7	−4.1	2.0	2.1	2.2
	(0.47)	(0.63)	(0.67)	(0.80)	(0.84)	(0.87)	(0.13)	(0.31)	(0.36)	(0.75)	(0.78)	(0.80)
SALESGRO	54.6	48.8	49.0	35.6	30.9	31.1	15.8	13.2	13.4	30.0	24.8	25.2
	(0.00)***	(0.00)***	(0.00)***	(2.68)***	(2.39)**	(2.39)**	(0.00)***	(0.00)***	(0.00)***	(2.21)**	(1.93)*	(1.96)**
$SALESGRO^2$	−3.0	14.1	14.2	44.5	42.8	43.0	17.5	15.0	15.1	45.6	43.7	44.0
	16.0	(0.00)***	(0.00)***	(5.25)***	(5.28)***	(5.28)***	(0.00)***	(0.00)***	(0.00)***	(5.32)***	(5.33)***	(5.33)***
	(0.00)***											
CAPUTIL	21.7	18.8	18.9	23.3	22.0	21.9	15.0	11.5	11.7	22.9	21.5	21.3
	(0.00)***	(0.00)***	(0.00)***	(5.31)***	(4.98)***	(4.95)***	(0.00)***	(0.00)***	(0.00)***	(5.34)***	(5.05)***	(5.01)***
Number observed	28,592	28,592	28,592				28,580	28,580	28,580			
Number of events	2810	2810	2810				2805	2805	2805			

(b) Panel regressions of annual individual firm own-industry merger events on firm-level independent variables from 1970 to 1994

	Levels (LOGIT)			Fama–MacBeth levels (OLS)			Industry-adjusted (LOGIT)			Fama–MacBeth industry-adjusted (OLS)		
	1	2	3	1	2	3	1	2	3	1	2	3
Low q		− 22.1	− 58.8		− 2.7	− 4.8		− 28.4	− 66.7		− 3.6	− 5.5
		(0.57)	(0.16)		(− 1.53)	(−2.74)***		(0.47)	(0.11)		(− 1.90)*	(−2.99)***
High q		28.6	29.6		1.7	1.8		49.6	51.1		2.1	2.1
		(0.46)	(0.45)		(0.61)	(0.64)		(0.19)	(0.18)		(0.79)	(0.82)
AGENCY			39.5			11.1			41.5			10.1
			(0.01)***			(3.05)***			(0.01)***			(2.61)***
q	90.0	19.9	34.7	− 0.2	− 1.1	− 1.0	9.0	− 1.1	− 0.1	0.4	− 1.0	− 0.9
	(0.41)	(0.88)	(0.79)	(− 0.09)	(− 0.49)	(− 0.43)	(0.36)	(0.93)	(0.99)	(0.26)	(− 0.54)	(− 0.48)
CF	− 74.8	− 92.8	− 151.9	− 16.6	− 18.6	− 25.2	− 3.0	− 3.9	− 6.0	− 18.6	− 21.2	− 27.7
	(0.41)	(0.32)	(0.12)	(− 1.21)	(− 1.35)	(− 1.76) *	(0.34)	(0.23)	(0.08)*	(− 1.37)	(− 1.57)	(− 1.95) *
BOOKLEV	− 37.0	− 34.8	− 38.5	0.2	0.3	0.2	− 5.5	− 4.6	− 5.8	− 0.3	− 0.2	− 0.3
	(0.41)	(0.43)	(0.38)	(0.19)	(0.30)	(0.25)	(0.60)	(0.65)	(0.58)	(− 0.40)	(− 0.33)	(− 0.37)
SALESGRO	49.3	48.3	48.0	13.6	13.1	12.3	18.3	17.8	17.6	14.5	13.5	12.8
	(0.00)***	(0.00)***	(0.00)***	(2.53)**	(2.38)**	(2.24)**	(0.00)***	(0.00)***	(0.00)***	(2.74)***	(2.48)***	(2.35)**
$SALESGRO^2$	− 4.9	− 4.8	− 4.8	− 3.7	− 3.5	− 3.1	5.7	5.6	5.5	− 3.6	− 3.1	− 2.7
	(0.35)	(0.36)	(0.36)	(− 1.03)	(− 0.92)	(− 0.82)	(0.01)***	(0.01)***	(0.01)***	(− 0.97)	(− 0.79)	(− 0.71)
STOCKRET	3.5	3.2	3.1	3.9	3.3	3.1	1.8	1.2	1.1	3.4	2.7	2.5
	(0.34)	(0.40)	(0.41)	(1.06)	(0.91)	(0.84)	(0.67)	(0.78)	(0.80)	(0.97)	(0.76)	(0.70)
CAPUTIL	− 19.3	− 20.0	− 20.0	− 5.5	− 5.9	− 5.9	− 18.4	− 19.4	− 19.3	− 6.1	− 6.5	− 6.4
	(0.01)***	(0.00)***	(0.00)***	(−2.76)***	(−2.91)***	(−2.88)***	(0.00)***	(0.00)***	(0.00)***	(−3.19)***	(−3.41)***	(−3.40)***
Number observed	28,512	28,512	28,512				28,501	28,501	28,501			
Number of events	594	594	594				592	592	592			

(continued on next page)

Table 5 (*continued*)

(c) Panel regressions of annual individual firm diversifying merger events on firm-level independent variables from 1970 to 1994

	Levels (LOGIT)			Fama–MacBeth levels (OLS)			Industry-adjusted (LOGIT)			Fama–MacBeth industry-adjusted (OLS)		
	1	2	3	1	2	3	1	2	3	1	2	3
Low *q*		−118.0	−114.9		−3.8	−3.6		−127.1	−127.0		−3.8	−3.8
		(0.03)**	(0.05)**		(−2.68)***	(−2.23)**		(0.02)**	(0.03)**		(−2.67)***	(−2.29)**
High *q*		33.6	33.7		0.9	0.8		47.0	47.0		1.7	1.6
		(0.50)	(0.50)		(0.37)	(0.33)		(0.33)	(0.33)		(0.73)	(0.69)
AGENCY			−3.1			−1.6			−0.1			−0.5
			(0.89)			(−0.55)			(1.00)			(−0.16)
q	1.7	−144.0	−144.8	1.4	−0.9	−1.0	1.0	−13.5	−13.5	1.4	−1.3	−1.3
	(0.99)	(0.39)	(0.38)	(0.91)	(−0.58)	(−0.60)	(0.93)	(0.35)	(0.35)	(0.83)	(−0.80)	(−0.82)
CF	126.5	79.9	83.1	−2.9	−6.5	−4.9	3.1	1.3	1.3	−1.8	−5.8	−5.1
	(0.26)	(0.49)	(0.48)	(−0.33)	(−0.70)	(−0.52)	(0.43)	(0.75)	(0.75)	(−0.19)	(−0.60)	(−0.50)
BOOKLEV	−153.4	−146.0	−146.1	−0.7	−0.8	−0.8	−29.9	−27.7	−27.7	−0.6	−0.6	−0.6
	(0.04)***	(0.05)**	(0.05)**	(−1.07)	(−1.14)	(−1.18)	(0.07)*	(0.09)*	(0.09)*	(−0.75)	(−0.77)	(−0.82)
SALESGRO	55.8	52.9	52.9	11.9	11.2	11.2	24.5	23.5	23.5	12.3	11.4	11.4
	(0.00)***	(0.01)***	(0.01)***	(3.62)***	(3.52)***	(3.51)***	(0.00)***	(0.00)***	(0.00)***	(3.48)***	(3.29)***	(3.27)***
$SALESGRO^2$	3.2	3.4	3.4	−4.5	−3.9	−3.9	−2.8	−3.1	−3.1	−4.6	−4.0	−3.9
	(0.30)	(0.27)	(0.27)	(−2.31)**	(−2.08)**	(−2.03)**	(0.54)	(0.51)	(0.51)	(−2.09)**	(−1.81)*	(−1.76)*
STOCKRET	10.0	8.9	8.9	7.1	6.5	6.5	11.5	10.1	10.1	7.4	6.7	6.7
	(0.03)**	(0.05)**	(0.05)**	(3.33)***	(3.23)***	(3.23)***	(0.02)**	(0.05)**	(0.05)**	3.66)***	(3.51)***	(3.52)***
CAPUTIL	−4.4	−6.2	−6.2	−2.6	−3.0	−3.0	−4.4	−6.4	−6.4	−2.1	−2.5	−2.5
	(0.59)	(0.46)	(0.46)	(−1.69)*	(−1.89)*	(−1.90)*	(0.56)	(0.41)	(0.41)	(−1.29)	(−1.51)	(−1.52)
Number observed	28,512	28,512	28,512				28,501	28,501	28,501			
Number of events	333	333	333				332	332	332			

(d) Panel regressions of annual individual firm merger events on firm-level independent variables from 1970 to 1994

	Levels (LOGIT)			Fama–MacBeth levels (OLS)			Industry-adjusted (LOGIT)			Fama–MacBeth industry-adjusted (OLS)		
	1	2	3	1	2	3	1	2	3	1	2	3
Low q		−63.2	−81.7		−8.3	−9.7		−69.6	−90.1		−8.9	−10.5
		(0.04)**	(0.01)***		(−3.26)***	(−3.47)***		(0.02)**	(0.01)***		(−3.48)***	(−3.58)***
High q		23.2	23.2		0.9	0.8		36.5	36.7		1.8	1.8
		(0.44)	(0.44)		(0.27)	(0.25)		(0.21)	(0.21)		(0.65)	(0.64)
AGENCY			20.2			7.5			22.4			7.7
			(0.11)			(1.53)			(0.07)*			(1.51)
q	44.8	−49.4	−42.9	0.6	−2.3	−2.2	5.9	−4.7	−4.2	1.7	−2.0	−1.9
	(0.58)	(0.62)	(0.67)	(0.23)	(−0.73)	(−0.70)	(0.43)	(0.60)	(0.63)	(0.60)	(−0.66)	(−0.65)
CF	−30.6	−60.6	−87.2	−26.4	−33.0	−36.8	−1.5	−2.7	−3.7	−27.4	−34.7	−39.3
	(0.66)	(0.40)	(0.24)	(−1.44)	(−1.83)*	(−2.07)**	(0.53)	(0.27)	(0.14)	(−1.43)	(−1.86)*	(−2.09)**
BOOKLEV	−72.1	−69.6	−70.5	−0.8	−0.8	−0.9	−12.4	−11.6	−12.0	−1.3	−1.4	−1.4
	(0.05)**	(0.05)**	(0.05)**	(−0.67)	(−0.67)	(−0.72)	(0.14)	(0.16)	(0.15)	(−1.18)	(−1.21)	(−1.29)
SALESGRO	56.4	54.6	54.5	27.3	26.0	25.4	22.5	21.8	21.8	29.5	27.6	27.1
	(0.00)***	(0.00)***	(0.00)***	(3.65)***	(3.43)***	(3.35)***	(0.00)***	(0.00)***	(0.00)***	(4.08)***	(3.77)***	(3.69)***
$SALESGRO^2$	−0.6	−0.5	−0.5	−7.4	−6.8	−6.4	3.2	3.1	3.1	−7.9	−6.9	−6.5
	(0.81)	(0.85)	(0.85)	(−1.58)	(−1.41)	(−1.33)	(0.07)*	(0.08)*	(0.09)*	(−1.66)	(−1.43)	(−1.35)
STOCKRET	6.2	5.5	5.5	11.6	10.3	10.2	6.4	5.5	5.5	11.2	9.7	9.6
	(0.03)**	(0.05)**	(0.05)**	(2.47)**	(2.25)**	(2.21)**	(0.04)**	(0.08)*	(0.09)*	(2.60)***	(2.28)**	(2.24)**
CAPUTIL	−15.6	−16.9	−16.9	−9.5	−10.3	−10.3	−14.3	−15.7	−15.8	−9.6	−10.4	−10.4
	(0.00)***	(0.00)***	(0.00)***	(−2.94)***	(−3.18)***	(−3.19)***	(0.00)***	(0.00)***	(0.00)***	(−2.87)***	(−3.13)***	(−3.16)***
Number observed	28,592	28,592	28,592				28,580	28,580	28,580			
Number of events	995	995	995				991	991	991			

3. OWNIND_MERGER = 1 for own-industry merger event, 0 otherwise
4. MERGER = 1 for merger event, 0 otherwise

We refrain from defining all the independent variables, due to their similarity to the definitions used in Section 3 at the industry level. The key differences are: (1) all variables are now estimated at the firm level; (2) we no longer include INDCONC and SHOCK, the latter because it requires a long time series of sales growth to be estimated, something most individual firms do not have; (3) we include a measure of the excess returns earned by the firm's stock during the year (STOCKRET); and (4) since we do not have firm-level capacity utilization rates, we replace them with a sales to total book assets ratio, under the assumption that variations in this measure over time should be correlated with the "intensity" of asset use. Brealey and Myers (1996) state that "a high ratio (of sales to total assets) could indicate that the firm is working close to capacity." We adjust the sales to assets ratio for each firm-year by subtracting the median sales to assets ratio across all years of the industry, which is meant to adjust for differences in accounting and/or steady-state capacity utilization rates across industries.

Capital structure can also play a role in influencing investment activity. In particular, higher leverage can lead to under-investment (Myers, 1977) or reduce over-investment in firms with excess free cash flow (Jensen, 1986). In addition, both the agency costs of free cash flow and the financial constraints literature have found that measures of leverage appear significantly in investment regressions. Therefore, our specifications include

Note to Table 5:
Base specifications are estimated via LOGIT (we report adjusted coefficients—"slopes"—evaluated at the average value of the independent variables). Fama–MacBeth specifications are estimated via ordinary least squares, and involve estimating annual cross-sectional regressions, resulting in a time series for each coefficient, from which the mean is reported. Each independent variable is trimmed 1% (0.5% from each tail). Dependent variables are dummy variables set to 1 if the firm participated in the event during the year, and 0 otherwise. A firm is determined to have participated in a non-merger investment event if the firm's abnormal non-merger investment intensity is more than 1 standard deviation above the sample mean abnormal non-merger intensity across all firms and all years. Firm abnormal non-merger investment intensity is the deviation in non-merger investment intensity from its mean estimated over all years available for the firm. Non-merger investment intensity is estimated for each firm-year as the ratio of the sum of CAPX, R&D and advertising expense to total book assets. Mergers are classified as diversifying if the target and acquirer are in different industries at the time of announcement, and own-industry if both parties are in the same industry. Industry-adjusted independent variables for each firm-year are calculated as deviations from the industry median for that year. q is estimated as the ratio of the firm's total market value of assets (book value of assets + market value of common equity − book value of common equity) to its total book value of assets. Low (high) q is a dummy variable equal to one if the firm's q is below the 33rd (above the 67th) percentile of all firm q's during the year. Cash flow (CF) is calculated as EBITDA divided by sales. High CF is a dummy variable equal to one if the firm's CF is above the 67th percentile of all firm CFs during the year. AGENCY is the product of Low q and High CF. Book leverage (BOOKLEV) is calculated as the ratio of the firm's debt (long-term debt + short-term debt + preferred stock) to the firm's book value of common equity. Sales growth (SALESGRO) is the 2-year growth rate. Stock return (STOCKRET) is the net-of-market annual return for the firm's common stock. Capacity utilization (CAPUTIL) is proxied by the deviation of the firm's ratio of sales to book assets from the industry median over the entire period. All specifications include industry dummies and LOGIT specifications also include year dummies. P-values referring to unadjusted coefficients are reported in parentheses for the LOGIT specifications. t-statistics are reported in parentheses for the Fama–MacBeth specifications, based on the standard error of the time series mean of each coefficient. All coefficients are multiplied by 1000.

measures of firm-level financial leverage (BOOKLEV), estimated as the ratio of book debt plus preferred stock to book equity.

In order to reduce measurement error in the independent variables due to potential mistakes in the data reported by Compustat, we trim 1% off the tails (0.5% each) of all explanatory variables separately, which results in a small loss of firm-years with investment events (approximately 200), but a significant improvement in the maximized likelihood values for the fitted models. Finally, as is the case in Section 3, all regression specifications: (a) exclude three financial sector industries, (b) include dummy variables for year and industry (except Fama–MacBeth specifications), and (c) contain beginning-of-period values for the independent variables.

Table 5 displays the results for this section. It is divided into four panels (a through d), one for each of the dependent variables defined above. Explanatory variables can be expressed both in "levels" and in "industry-adjusted" form, where the latter are calculated as deviations from the firm's industry median for the same year, and the table displays results for both types. For all logit specifications, we report adjusted coefficients that are designed to measure the marginal impact of each explanatory variable[24] (see Greene, 1993, Chapter 21). One of the problems with large panel data sets is that often the standard errors are poorly estimated, and usual inference techniques are not valid, because the estimated covariance matrix fails to account for cross-correlations between dependent variables and/or residuals across time. In order to partially account for this, and therefore test the robustness of our logit *p*-values to these estimation problems, we re-estimate each specification using the procedure pioneered by Fama and MacBeth (see Fama, 1976). Our Fama–MacBeth procedure involves estimating annual cross-sectional OLS regressions, which results in a time series of coefficient estimates for each independent variable. The mean and standard error of this time series of estimates of each coefficient, allows us to construct a *t*-statistic for that coefficient, and test whether it significantly differs from zero. These results are displayed in Table 5 under the headings "Fama–MacBeth Levels" and "Fama–MacBeth Industry-Adjusted."

In order to make statements about firms' decisions based on the estimated coefficients of our regressions, we implicitly assume that in every firm-year, firms could have undertaken any form of investment. Therefore, a value of zero for the event dummy variable actually represents a decision not to invest. This assumption could be false if either: (a) there are missing mergers in our sample, or (b) firms were prevented from engaging in certain types of investment, for whatever reason. In an attempt to test the robustness of our results, we re-estimate some of the MERGER and NON-MERGER logit specifications, restricting the sample to firms that at some point engaged in each. The results are mostly unchanged, so we do not report these restricted sample estimates.

As in Section 3, for each dependent variable, the first model we run (which is labeled "1" in Table 5) includes q as a continuous variable, and corresponds to the traditional interpretation of q-theory as predicting that investment should increase with q. However, as we noted before, our reading of the theory suggests that the decision to invest based on

[24] In constructing the adjusted logit coefficients—"slopes"—we evaluate all the independent variables at their sample averages This procedure is meant to improve comparability between the logit estimates and their Fama–MacBeth counterparts, although the relationship is not perfect due to the existence of dozens of dummy variables in our various specifications.

Table 6
Panel regressions of annual individual firm investment events on firm-level variables split by decade

	Event = Merger			Event = Diversifying merger			Event = Own-industry merger			Event = Non-merger investment		
	1970–1979	1980–1989	1990–1994	1970–1979	1980–1989	1990–1994	1970–1979	1980–1989	1990–1994	1970–1979	1980–1989	1990–1994
Low q	−60.1	−56.5	−508.5	−24.7	−62.9	−682.1	−25.7	−79.7	−459.6	−27.9	−117.7	−23.1
	(0.23)	(0.24)	(0.00)***	(0.81)	(0.43)	(0.00)***	(0.67)	(0.21)	(0.02)**	(0.02)**	(0.00)***	(0.72)
High q	32.0	47.9	−127.3	173.8	5.3	−215.0	−4.4	81.0	31.9	18.7	91.8	−19.9
	(0.49)	(0.29)	(0.18)	(0.04)**	(0.94)	(0.14)	(0.94)	(0.19)	(0.81)	(0.05)**	(0.00)***	(0.72)
AGENCY	8.3	14.0	75.9	−41.3	−3.2	124.3	23.4	36.2	61.8	28.7	−7.7	−45.8
	(0.50)	(0.55)	(0.13)	(0.21)	(0.94)	(0.08)*	(0.08)*	(0.22)	(0.44)	(0.43)	(0.31)	(0.19)
q	201.1	−519.1	18.2	329.5	−574.2	74.4	188.8	−597.8	−10.7	−0.3	80.9	162.6
	(0.11)	(0.01)***	(0.96)	(0.12)	(0.05)**	(0.88)	(0.22)	(0.04)**	(0.98)	(0.94)	(0.31)	(0.23)
CF	−77.9	94.8	−427.7	−99.7	323.8	−313.8	−42.9	−34.5	−437.8	1893.3	289.4	711.1
	(0.56)	(0.36)	(0.03)**	(0.70)	(0.04)**	(0.27)	(0.79)	(0.81)	(0.12)	(0.00)***	(0.00)***	(0.00)***
BOOKLEV	−18.3	−148.5	34.5	−4.1	−242.9	−172.6	−29.9	−126.6	149.5	2.7	−70.6	−114.7
	(0.74)	(0.01)***	(0.68)	(0.97)	(0.02)**	(0.40)	(0.67)	(0.10)	(0.13)	(0.01)***	(0.02)**	(0.05)**
SALESGRO	27.8	57.0	71.4	13.9	67.6	51.7	13.6	54.5	68.1	47.5	55.1	−43.9
	(0.29)	(0.00)***	(0.00)***	(0.81)	(0.00)***	(0.12)	(0.67)	(0.12)	(0.01)***	(0.00)***	(0.00)***	(0.05)**
$SALESGRO^2$	−1.6	−0.4	2.9	−36.9	4.6	7.2	0.0	−9256.7	−60.8	0.0	−1.7	−2.9
	(0.71)	(0.91)	(0.70)	(0.95)	(0.22)	(0.36)	(1.00)	(0.91)	(0.95)	(0.33)	(0.42)	(0.58)
STOCKRET	4.9	8.1	2.1	17.0	7.1	7.8	2.8	7.7	−6.1	58.5	17.2	11.4
	(0.40)	(0.06)*	(0.51)	(0.10)	(0.31)	(0.07)*	(0.70)	(0.17)	(0.25)	(0.00)***	(0.00)***	(0.02)**
CAPUTIL	−10.8	−28.7	14.0	−20.2	0.3	9.9	−4.8	−45.5	12.2	28.4	21.6	42.7
	(0.33)	(0.01)***	(0.04)**	(0.29)	(0.98)	(0.37)	(0.73)	(0.00)***	(0.18)	(0.00)***	(0.00)***	(0.00)***
Number observed	10,994	12,003	5595	10,965	11,961	5586	10,965	11,961	5586	10,994	12,003	5595
Number of events	413	476	106	114	170	49	275	271	48	1111	1366	333

q is really a discrete one, i.e., if q exceeds a certain threshold, investment should be undertaken, otherwise not. Empirically, this can be accomplished by classifying firms based on whether q exceeds that threshold or not. Another problem with the continuous measure of q is that there is likely to be a significant measurement error in our estimate of q, so we feel more confident grouping companies into broad categories, rather than relying on the estimates directly. As a result, each year we sort all firms by q and classify them as "high q" or "low q," depending on whether they fall in the top third or bottom third of the distribution. Based on this classification, we create dummy variables which are included in models "2" and "3."

Finally, we define an "AGENCY" dummy variable, which corresponds to those firms which, in a given year, belong to both "low q" and "high CF" (the latter corresponds to firms in the top third of the annual cross-section of firm cash-flow margins). By including this variable, we can test the prediction of the agency costs of free cash flow theory that firms with poor growth or investment prospects, but available cash flow, will over-invest. This test should be especially powerful in the models that include our "low q" dummy in addition to AGENCY, since here we are isolating the marginal effect of higher cash flow on the investment patterns of companies with no growth opportunities. The agency cost of free cash flow theory implies a significantly positive sign on AGENCY in these regressions.

The first striking results to emerge from Table 5 are the consistently positive signs on "high q" and negative signs on "low q," across all forms of investment, merger and non-merger. While the significance level varies across specifications, with "high q" appearing as significant in the non-merger investment regressions, and "low q" in the various

Note to Table 6:
Base specifications are estimated via LOGIT (we report adjusted coefficients—"slopes"—evaluated at the average value of the independent variables). Each independent variable is trimmed 1% (0.5% from each tail) to remove the effect of outliers. Dependent variables are dummy variables set to 1 if the firm participated in the event during the year, and 0 otherwise. A firm is determined to have participated in a non-merger investment event if the firm's abnormal non-merger investment intensity is more than 1 standard deviation above the sample mean abnormal non-merger intensity across all firms and all years. Firm abnormal non-merger investment intensity is the deviation in non-merger investment intensity from its mean estimated over all years available for the firm. Non-merger investment intensity is estimated for each firm-year as the ratio of the sum of CAPX, R&D and advertising expense to total book assets. Merger events are transactions in the CRSP Merger Database involving acquirers in the sample, and where the estimated target value exceeded 1% of the total market value of the acquirer at the end of the pre-completion fiscal year. Mergers are classified as diversifying if the target and acquirer are in different industries at the time of announcement, and own-industry if both parties are in the same industry. q is estimated as the ratio of the firm's total market value of assets (book value of assets + market value of common equity − book value of common equity) to its total book value of assets. Low (high) q is a dummy variable equal to one if the firm's q is below the 33rd (above the 67th) percentile of all firm's q during the year. Cash flow (CF) is calculated as EBITDA divided by sales. High CF is a dummy variable equal to one if the firm's CF is above the 67th percentile of all firm CFs during the year. AGENCY is the product of low q and high CF. Book leverage (BOOKLEV) is calculated as the ratio of the firm's debt (long-term debt + short-term debt + preferred stock) to the firm's book value of common equity. Sales growth (SALESGRO) is the 2-year growth rate. Stock return (STOCKRET) is the net-of-market annual return for the firm's common stock. Capacity utilization (CAPUTIL) is proxied by the deviation of the firm's ratio of sales to book assets from the industry median over the entire period. All specifications include industry and year dummy variables. *P*-values referring to unadjusted coefficients are reported in parentheses for the LOGIT specifications. All coefficients are multiplied by 1000.

merger-related specifications,[25] we consider the results to be supportive of the hypothesis that mergers have an important expansionary role.

The results on AGENCY are more inconsistent across investment types. For both diversifying mergers and non-merger investment, the coefficient estimates on AGENCY are negative, although only significant in the latter case. As stated above, this appears to be inconsistent with the basic predictions of the agency costs of free cash flow theory. In the case of diversifying mergers, the negative coefficient on "low q" and the weakly negative sign on AGENCY should serve to mitigate the concerns that these transactions are the result of rampant agency problems within the acquirers. Previous empirical evidence (e.g., Morck et al., 1990) has indicated that most diversifying mergers are value decreasing, a claim which cannot be addressed in our paper, as we focus on the decision to invest, rather than how much to spend. However, even if acquirers overpay and/or destroy value when diversifying, our evidence suggests that this is not necessarily related to a deliberate desire to overbuild and invest in negative NPV projects, simply due to an overabundance of available cash flow. In fact, the strongly positive coefficient estimates on SALESGRO and STOCKRET for these diversifying acquisitions are more consistent with managerial optimism rather than malice (see Heaton, 1999).

For own-industry mergers, the AGENCY dummy is significantly positive across all specifications. In conjunction with the results discussed above, we could interpret this as implying that own-industry mergers are the only type of major corporate investment activities motivated by costly agency problems within the firm. This might be evidence of a desire to increase market power, or self-serving behavior by managers, who wish to become dominant players in an industry, irrespective of the cost. However, an alternative interpretation of the results is suggested by the view, already expressed, that many of these own-industry mergers are precipitated by the need for industry contraction. In this case, in declining industries (low q) requiring consolidation, it is not surprising that the relatively cash-flow-rich companies (high CF) are the acquirers. For example, if Jensen's (1993) view is correct, then excess capacity generated by productivity shocks could induce both low values of q (since capital needs to exit, not enter these industries) and higher expenditures on own-industry acquisitions. We cannot distinguish between these two interpretations, i.e., agency costs of free cash flow or industry restructuring, although we do find evidence (see Section 4.3) that in own-industry mergers, acquirers tend to be more profitable and have higher q than target companies.

The significant and opposite signs on CAPUTIL are consistent with our evidence in Section 3.2 that own-industry mergers are often a tool for restructuring, where industries with excess capacity undergo consolidation via mergers. The picture that emerges is that

[25] The "high q" and "low q" dummy variables measure marginal effects of q relative to the middle third of the distribution. As we already pointed out, q-theory predicts that firms with q above a certain threshold should be investing, but due to the measurement error in our proxy, we cannot say where this "cut-off" value lies within our estimated values. For example, if the threshold is relatively low, then we would expect that all the "high q" and most "middle third" companies should be investing heavily. In that case, only the coefficient on "low q" would be significant (and negative), while the estimate on "high q" would be statistically insignificant, since there would be no marginal impact in going from the "middle third" to "high q". The opposite would be the case if the threshold is relatively high. Therefore, we consider that if either "low q" is significantly negative or "high q" is significantly positive, that is consistent with q-theory.

own-industry mergers often arise from the need to restructure the industry, perhaps in reaction to some shock. On the other hand, firms that initiate significant internal expansions can be characterized as having had strong operating performance and healthy growth prospects as evidenced by the positive relation between non-merger investment events and sales growth, profitability, and excess returns.

Jensen (1993) suggests that this excess capacity motivation for mergers was predominantly a mid-1970s and 1980s phenomenon. As in Section 3, we explicitly allow for this possibility by splitting the sample by decade, and re-running the logit regressions for each sub-period separately. The results, reported in Table 6, bear out Jensen's prediction, that is, the negative relationship between capacity utilization and either merger or own-industry merger, is restricted to the 1970s and 1980s, while the relationship is positive (and sometimes significant) in the 1990s. This evidence, combined with that of Section 3, strengthens our view that mergers can play two different roles for acquirers, contraction or expansion, and that while the former was more important through the late 1980s, as economic conditions forced a massive reallocation of assets among companies, the latter role seems to better describe merger activity in the 1990s.

Finally, we emphasize the remarkable consistency in the results discussed above across estimation methods. Whether one focuses on "Levels" or "Industry-Adjusted" specifications, the direction and significance of the coefficients is stable, and the same occurs with the "Fama–MacBeth" regressions, which occasionally lead to higher significance levels than the panel logits themselves. This stability and consistency gives us confidence that the effects we uncover are real, irrespective of whether the reader agrees with the interpretations we ascribe to them.

4.3. Acquirer and target characteristics

In this section, we analyze the relative characteristics of acquirer and target companies in different types of mergers. For all mergers used in the regressions of Section 4.2, we compile data on a variety of financial variables for both the acquirer and the target companies, as of the last fiscal year before deal closing. These variables are then differenced for each transaction (acquirer minus target), with the median values of these differences reported in Table 7, together with *p*-values for the test that these median differences are equal to zero.[26] The table contains three panels, for mergers, own-industry mergers and diversifying mergers, respectively. Each panel reports statistics on differences in characteristics both in absolute levels and industry-adjusted, where we subtract the industry median characteristic from the firm's.

Evidence on diversifying mergers is somewhat tricky to interpret. On one hand, acquirers have higher cash flows, consistent with diversifying acquisitions being related to agency problems in firms with excess cash. On the other hand, these acquirers also have higher leverage, which goes against the agency story. In addition, these results do not survive in the industry-adjusted analysis.

[26] The results are qualitatively similar for means of differences (rather than medians), although statistical significance is sometimes less, due to outliers in the observations, which is why we prefer the non-parametric Wilcoxon signed rank test for medians reported in Table 7.

Table 7
Differences in acquirer and target pre-merger characteristics

	Median acquirer characteristics	Panel 1		Panel 2		Panel 3	
		All mergers		Own-industry mergers		Diversifying mergers	
		Levels	Industry-adjusted	Levels	Industry-adjusted	Levels	Industry-adjusted
q	1.142	0.021	0.053	0.097	0.097	− 0.023	0.020
		(0.40)	(0.03)	(0.00)	(0.00)	(0.05)	(0.78)
CF	0.133	0.013	0.008	0.015	0.015	0.011	0.004
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.10)
BOOKLEV	0.606	0.034	− 0.010	− 0.057	− 0.057	0.075	0.042
		(0.09)	(0.60)	(0.01)	(0.01)	(0.00)	(0.19)
MKTLEV	0.434	0.010	− 0.022	− 0.060	− 0.060	0.046	0.019
		(0.89)	(0.04)	(0.00)	(0.00)	(0.07)	(0.86)
SALESGRO	0.116	− 0.003	0.021	0.010	0.010	− 0.010	0.025
		(0.64)	(0.07)	(0.47)	(0.47)	(0.90)	(0.08)
STOCKRET	0.022	0.053	0.132	0.184	0.184	− 0.061	0.051
		(0.21)	(0.02)	(0.00)	(0.00)	(0.26)	(0.83)
CAPUTIL	0.005	− 0.067	− 0.064	− 0.025	− 0.025	− 0.090	− 0.084
		(0.00)	(0.00)	(0.06)	(0.06)	(0.00)	(0.00)

Medians of differences between acquirer and target characteristics in the last fiscal year before transaction closing. Merger events are transactions in the CRSP Merger Database where the estimated target value exceeded 1% of the total market value of the acquirer at the end of the pre-completion fiscal year. Mergers are classified as diversifying if the target and acquirer are in different industries at the time of announcement, and own-industry if both parties are in the same industry. Industry-adjusted independent variables for each firm-year are calculated as deviations from the industry median for that year. *q* is estimated as the ratio of the firm's total market value of assets (book value of assets + market value of common equity − book value of common equity) to its total book value of assets. Cash flow (CF) is calculated as EBITDA divided by sales. Book leverage (BOOKLEV) is calculated as the ratio of the firm's debt (long-term debt + short-term debt + preferred stock) to the firm's book value of common equity. Market leverage (MKTLEV) is similar to BOOKLEV, but the denominator is the firm's market value of common equity. Sales growth (SALESGRO) is the 2-year growth rate. Stock return (STOCKRET) is the net-of-market annual return for the firm's common stock. Capacity utilization (CAPUTIL) is proxied by the deviation of the firm's ratio of sales to book assets from the industry median over the entire period. *P*-values for the Wilcoxon signed rank test for each coefficient are reported in parentheses.

The most interesting results pertain to own-industry mergers, as they tie in directly to the industry contraction role discussed above. Table 7 reports that for the sub-sample of own-industry deals, acquirers have significantly higher *q*, cash flows, and lagged stock returns, as well as lower leverage and capacity utilization, than their target companies. That is, within a given industry, the acquirers are firms that are better performers, at least in relative terms, and also have the ability to carry out the acquisition, in the sense of more debt capacity, and the operational slack to absorb their targets, consistent with the findings in Maksimovic and Phillips (2001). These mergers are also more likely to generate value, given the results of Lang et al. (1989) that mergers between high *q* and acquirers and low *q* targets result in the most overall gains. Overall, our findings suggest that industry restructuring results in a transfer of assets to the relatively effective users, and that the contractionary role of mergers leads to a more efficient allocation of resources and capacity within industries and the economy.

5. Conclusion

There is a growing empirical literature documenting that mergers are efficient means for assets to be reallocated within the economy. Large sample evidence on combined acquirer and target stock returns, as well as post-merger operating performance,[27] suggests that mergers on average increase value, and lead to improved profitability in subsequent years. Song and Walkling (2000) report that stock prices in a given industry tend to appreciate upon an announcement of a takeover, presumably in expectation of other mergers to come, and consistent with mergers being a tool for industries to generate synergies by consolidating and restructuring. In a recent paper, Maksimovic and Phillips (2001) show that mergers and acquisitions on average result in productivity gains for the assets acquired, and that the buyers tend to be relatively more productive firms. Our results add to the literature on the efficiency of merger activity, by suggesting a mechanism by which mergers help firms and industries grow and restructure, particularly in response to shocks.

Overall, our analysis indicates that mergers play a dual economic role. On one hand, mergers, like internal investments, are a means for companies to increase their capital base, in response to good growth prospects. Both merger and non-merger investment are positively related to the firm's Tobin's q and sales growth. On the other hand, mergers appear to facilitate industry contraction. The clustering of mergers by industry suggests that mergers are often a response to industry shocks. Our finding that own-industry mergers are negatively related to capacity utilization during the 1970s and 1980s, is consistent with the view that mergers are an effective means for industries with excess capacity to rationalize and induce exit. In addition, we find that within these contracting industries, acquirers tend to be the firms with better performance, perhaps even better management, and lower leverage and capacity utilization, suggesting that this industry rationalization and asset reallocation results in improved efficiency.

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[27] See Healy et al. (1992) on operating performance, as well as Jarrell et al. (1988) and Andrade et al. (2001) for a review of the literature on announcement returns and long-term profitability.

Table A1
Value Line sample by year and industry classification. Includes all firms on Value Line from 1970 to 1994 which had data on COMPUSTAT and were not classified as: (1) foreign industries, (2) ADR's, (3) REIT's, (4) investment companies or funds, (5) "Unassigned." Industries are based on actual industry classifications from Value Line, with some modifications to adjust for changes in Value Line coverage, such as additions, deletions and mergers of industries and reclassifications of subsets of industries in different years (see Appendix A for details)

Industry Number	Industry Name	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1	Advertising, Publishing and Newspaper	24	27	27	31	32	36	36	38	39	38	38	40	40	41	39	40	40	38	34	34	35	37	37	36	36
2	Aerospace and Defense	21	22	21	20	20	24	24	27	26	26	30	31	30	32	33	33	33	30	31	31	32	29	32	35	34
3	Air Transport	16	16	15	15	15	17	17	17	19	23	23	25	24	25	24	24	20	19	17	14	14	11	11	11	11
4	Apparel and Shoe	35	40	38	39	38	38	39	40	38	36	34	37	39	38	35	34	30	30	26	29	25	25	24	22	23
5	Auto and Truck	5	5	6	6	6	5	5	6	6	6	6	6	7	6	6	9	8	7	6	5	4	4	4	4	4
6	Auto Parts	29	32	32	33	31	31	31	30	26	25	25	25	24	24	23	21	23	22	23	21	19	19	18	18	19
7	Bank and Thrift	46	48	48	60	63	64	65	70	71	71	71	74	73	70	67	78	86	82	81	84	90	89	85	82	80
8	Beverage	21	21	22	24	23	24	24	23	22	22	23	19	16	14	13	11	10	9	9	10	9	10	10	11	13
9	Broadcasting and Cable TV	7	6	6	6	5	8	8	8	8	7	7	11	15	16	15	16	14	12	12	11	10	10	10	10	10
10	Brokerage, Leasing and Financial Services	15	27	28	25	25	24	22	23	22	20	18	17	16	27	26	27	28	32	37	35	34	36	40	42	41
11	Building Materials, Cement, Furniture and Homebuilding	53	61	62	70	64	67	74	74	72	73	68	66	68	66	65	68	70	76	68	64	59	59	57	57	54
12	Chemical	43	44	45	45	46	47	52	52	48	49	49	53	52	54	55	52	53	53	56	58	65	64	62	62	63
13	Coal and Alternate Energy	8	7	7	6	6	9	9	11	11	10	12	12	11	11	10	10	9	11	9	7	8	7	7	5	4
14	Computer	8	18	18	19	19	19	23	25	25	27	30	34	40	50	52	50	57	59	61	54	55	58	62	66	72
15	Diversified	27	39	37	39	38	36	37	34	35	35	39	43	44	42	44	45	44	53	56	51	52	52	51	49	49
16	Drug	20	20	20	21	23	21	21	22	20	20	19	20	20	21	21	20	23	24	24	21	19	19	22	27	27
17	Drugstore	5	12	12	14	14	16	17	15	15	15	14	10	10	12	10	8	8	7	7	9	9	9	9	9	10
18	Electrical Equipment and Home Appliance	41	45	44	45	46	49	49	48	49	46	46	45	43	43	43	41	34	32	30	27	25	25	25	25	24
19	Electronics and Semiconductor	30	31	30	29	28	32	34	32	34	39	45	46	51	46	47	51	52	49	53	55	54	54	52	54	52
20	Food Processing	54	56	57	56	57	62	66	67	64	61	60	59	57	55	53	50	48	46	45	45	46	45	44	44	41
21	Food Wholesalers and Grocery Stores	20	25	26	27	27	25	25	24	23	25	25	29	32	34	30	29	29	28	30	25	30	30	28	28	29
22	Hotel and Gaming	7	8	8	12	12	14	13	14	15	14	12	12	12	13	14	14	13	14	15	15	15	15	15	16	15
23	Household Products	7	9	8	8	8	8	10	12	11	10	10	10	10	9	11	11	12	11	10	10	10	11	11	12	12

24	Industrial Services (Including Environmental)	5	10	10	17	16	19	18	18	16	18	19	19	22	20	20	23	24	23	29	35	38	41	42	41	38
25	Insurance	20	25	26	33	33	41	42	45	47	47	46	47	43	41	41	42	41	43	46	49	49	48	49	49	50
26	Machine Tool	15	15	15	17	17	18	17	17	16	16	15	15	14	14	14	13	11	15	11	11	9	8	9	7	7
27	Machinery	67	67	64	70	70	74	73	72	71	70	69	67	69	64	60	60	53	46	45	46	47	45	46	45	47
28	Manufactured Housing and Recreational Vehicles	8	7	8	9	9	8	10	11	11	11	11	11	9	9	9	8	10	8	9	8	7	7	7	8	8
29	Maritime	7	7	8	9	8	7	9	8	8	7	8	7	8	8	12	12	8	6	6	6	5	5	5	5	5
30	Medical Services	0	0	0	3	3	4	5	3	4	9	9	8	10	10	9	11	10	10	12	9	10	11	12	15	14
31	Medical Supplies	11	14	13	14	12	12	15	18	18	21	26	25	23	25	24	23	27	32	33	36	39	45	43	42	42
32	Metal Fabricating	20	20	20	21	21	21	18	19	19	19	20	20	18	18	18	20	18	19	16	16	14	14	14	14	13
33	Metals and Mining	43	43	43	45	44	44	43	40	36	34	36	33	33	33	32	31	31	28	28	28	28	30	29	28	27
34	Natural Gas	43	48	48	46	44	47	48	50	51	50	54	50	53	52	53	54	50	50	49	48	47	48	47	47	47
35	Office Equip. and Supplies	12	12	12	14	15	17	17	16	18	15	15	15	15	15	14	15	17	19	20	21	21	21	21	21	22
36	Oilfield Services and Equipment	10	12	13	15	14	19	19	19	23	29	27	32	34	33	34	32	26	21	19	20	19	17	18	18	17
37	Packaging and Container	19	21	21	26	26	26	27	27	23	22	22	23	25	24	19	19	17	17	16	18	17	17	17	13	13
38	Paper and Forest Products	18	19	19	20	19	22	25	26	26	27	28	27	25	25	28	29	25	28	30	30	29	29	29	29	30
39	Petroleum	41	46	43	46	49	54	58	64	62	63	64	63	61	54	47	45	45	45	46	42	42	44	42	42	42
40	Precision Instrument	23	27	28	28	28	31	31	32	36	35	22	23	27	26	26	24	26	26	25	25	24	23	22	22	20
41	Railroad	19	18	17	16	16	16	17	17	17	17	14	14	13	13	11	10	10	11	11	11	10	10	10	9	12
42	Real Estate	5	8	8	14	14	13	12	13	13	11	12	12	10	9	12	15	14	14	11	10	8	6	5	0	0
43	Recreation	15	17	19	22	21	24	22	21	21	22	20	18	20	18	18	19	21	22	22	21	19	19	20	20	19
44	Restaurant	3	4	4	4	4	13	19	19	19	17	16	16	15	16	16	16	21	20	21	18	17	17	17	19	19
45	Retail (Special Lines)	8	11	12	13	13	16	16	17	16	17	18	15	18	20	23	26	32	36	43	49	54	53	54	53	52
46	Retail Store	33	38	37	40	39	41	38	38	36	42	42	38	33	32	35	36	32	31	29	26	25	24	24	27	27
47	Steel	31	30	29	28	27	31	32	31	31	30	31	31	29	29	26	25	24	20	20	24	26	26	24	22	25
48	Telecommunications	11	12	12	12	12	13	13	14	14	14	16	18	20	22	30	32	34	36	34	35	36	33	33	33	35
49	Textile	19	19	20	22	22	21	21	18	19	20	19	17	14	15	12	9	8	9	11	10	9	9	9	9	11
50	Tire and Rubber	10	10	10	11	11	12	12	12	12	12	12	12	13	13	11	11	11	8	4	4	4	4	4	4	5
51	Tobacco	11	11	10	10	10	9	9	9	9	9	8	8	7	7	7	8	8	8	9	8	8	9	9	9	9
52	Toiletries and Cosmetics	14	12	12	11	11	12	13	14	15	15	15	15	16	16	15	14	11	12	11	10	9	9	10	10	9
53	Toys	6	8	8	8	8	7	7	8	10	11	10	10	6	6	5	6	6	5	6	7	7	6	7	6	4
54	Trucking and Transportation Leasing	16	18	17	20	20	21	21	23	23	18	21	17	13	12	11	12	14	17	12	12	12	12	12	11	12
55	Utilities	91	94	94	95	95	97	96	98	98	97	96	97	97	96	95	97	97	97	101	102	103	101	101	101	100
	Total	1196	1322	1317	1409	1397	1486	1524	1549	1537	1543	1545	1547	1547	1544	1523	1539	1526	1526	1525	1510	1511	1509	1507	1504	1504

Table A2
Mergers by acquirers in Value Line during the 1970 – 1994 period. Includes all deals where target was in CRSP and a transaction value could be estimated. Mergers are assigned to the industry of the acquirer in the year of completion. This sample is a subset of the CRSP Merger Database, including all mergers between CRSP-listed firms in the 1958 – 1994 period. Industries are based on actual industry classifications from Value Line, with some modifications to adjust for changes in Value Line coverage and classification, such as additions, deletions and mergers of industries, as well as reclassifications of subsets of industries in different years (see Appendix A for details)

Industry Number	Industry Name	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Total
1	Advertising, Publishing and Newspaper	0	1	0	2	1	0	0	3	4	7	1	1	0	0	3	1	1	3	2	0	2	0	1	1	0	34
2	Aerospace and Defense	0	1	0	0	1	0	2	3	3	2	5	0	0	2	3	3	4	2	0	2	1	1	0	0	0	35
3	Air Transport	1	1	0	1	0	0	0	0	0	2	2	0	1	0	0	3	6	5	4	0	0	0	0	0	0	26
4	Apparel and Shoe	0	1	1	1	1	2	1	0	1	3	1	1	0	0	3	0	1	1	0	0	0	0	0	1	1	20
5	Auto and Truck	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	2	0	4	2	1	1	0	0	0	0	13
6	Auto Parts	2	0	1	0	2	2	2	0	5	3	3	2	3	0	0	1	2	1	0	1	0	0	0	1	0	31
7	Bank and Thrift	2	0	0	3	3	2	1	0	1	0	1	1	12	9	8	8	24	18	14	12	13	10	23	31	21	217
8	Beverage	2	0	2	3	1	0	1	4	3	1	0	1	3	2	0	1	1	0	2	0	0	1	0	0	0	28
9	Broadcasting and Cable TV	0	0	0	0	1	1	0	1	2	1	0	0	3	1	0	0	2	0	2	1	0	0	1	0	2	18
10	Brokerage, Leasing and Financial Services	0	0	1	1	1	1	1	2	2	3	4	1	1	0	0	1	3	1	5	2	3	1	2	0	0	36
11	Building Materials, Cement, Furniture and Homebuilding	1	1	0	0	0	1	0	3	5	4	4	4	1	2	3	3	2	3	3	0	0	0	1	0	0	41
12	Chemical	3	2	1	2	3	1	1	4	5	3	4	8	3	7	1	6	2	4	3	3	1	0	0	1	0	68
13	Coal and Alternate Energy	0	0	0	0	3	0	0	0	2	1	0	1	0	0	0	0	0	1	2	0	0	0	0	0	0	10
14	Computer	0	0	0	0	0	1	2	2	3	1	3	2	2	0	3	1	1	4	4	3	1	4	2	5	0	44
15	Diversified	3	5	3	4	5	6	8	11	8	4	3	3	2	4	5	12	10	3	6	2	3	1	2	0	0	113
16	Drug	3	1	0	0	0	0	2	2	3	3	3	2	1	2	0	0	3	3	1	2	0	0	0	3	0	34
17	Drugstore	0	0	1	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	6
18	Electrical Equipment and Home Appliance	3	1	1	1	1	5	3	2	4	5	5	3	1	2	0	3	2	3	4	6	2	0	0	2	0	59
19	Electronics and Semiconductor	0	1	0	1	0	1	2	1	3	0	3	0	4	0	2	0	0	3	0	2	0	0	0	0	1	24
20	Food Processing	0	2	0	5	5	3	2	5	14	4	4	4	3	1	3	4	2	2	0	5	2	1	0	1	0	72
21	Food Wholesalers and Grocery Stores	0	0	0	0	1	0	1	0	0	2	1	0	1	2	2	2	2	0	2	0	0	0	1	0	0	17
22	Hotel and Gaming	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	1	2	0	0	1	0	1	0	0	0	8
23	Household Products	0	1	1	2	0	0	1	1	0	1	0	0	0	1	0	1	1	2	0	0	3	0	2	1	0	18
24	Industrial Services (Including Environmental)	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	3	2	1	3	2	1	1	0	15

25	Insurance	1	0	0	2	0	2	5	1	2	9	8	5	10	1	2	2	2	4	2	2	3	1	3	0	1	68
26	Machine Tool	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	6
27	Machinery	0	2	1	1	2	2	5	4	9	10	4	4	2	1	2	2	3	4	0	1	1	0	0	0	0	60
28	Manufactured Housing and Recreational Vehicles	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
29	Maritime	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
30	Medical Services	0	0	0	0	0	0	0	0	2	1	0	1	2	2	1	3	3	0	0	0	0	0	0	2	1	18
31	Medical Supplies	0	0	0	2	1	0	0	2	1	2	0	3	3	2	1	3	0	2	1	2	3	0	1	3	0	32
32	Metal Fabricating	0	0	0	0	0	0	2	1	2	1	0	1	0	0	2	0	0	1	0	2	0	0	0	0	0	12
33	Metals and Mining	1	2	1	2	1	0	0	2	1	0	1	1	0	0	4	2	0	3	0	0	0	2	1	1	0	25
34	Natural Gas	1	3	1	1	0	0	1	5	5	0	1	2	0	2	4	7	4	2	4	1	1	0	0	0	0	45
35	Office Equip. and Supplies	0	0	0	0	0	0	1	0	0	2	0	0	0	1	1	0	0	0	1	0	0	2	0	0	0	8
36	Oilfield Services and Equipment	0	0	1	0	0	1	0	0	0	2	2	1	2	0	2	0	0	0	1	0	0	0	0	0	1	13
37	Packaging and Container	1	0	1	0	0	0	1	3	3	3	3	0	3	3	2	1	1	0	0	0	0	0	1	3	0	29
38	Paper and Forest Products	0	0	0	0	1	2	1	3	1	2	2	1	1	1	2	0	3	3	0	0	1	1	0	0	0	25
39	Petroleum	0	1	1	0	2	3	1	6	3	6	4	7	4	1	3	0	4	0	3	0	0	2	1	1	0	53
40	Precision Instrument	0	0	0	1	0	1	4	1	0	2	2	3	0	0	0	2	1	1	1	0	1	1	1	1	0	23
41	Railroad	2	1	1	2	1	0	0	1	4	3	1	0	1	3	0	2	2	0	2	0	0	0	0	1	0	27
42	Real Estate	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
43	Recreation	1	0	0	1	2	1	0	5	2	2	0	1	0	0	0	1	0	0	1	0	0	0	2	0	0	19
44	Restaurant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	3
45	Retail (Special Lines)	0	1	0	1	0	0	0	0	1	0	1	1	1	0	1	3	0	0	0	2	2	3	0	0	0	17
46	Retail Store	2	0	2	3	0	0	1	3	5	2	3	5	2	0	2	5	3	2	1	2	0	1	1	0	1	46
47	Steel	1	0	0	0	0	0	1	0	0	1	3	0	2	0	1	1	0	0	0	1	0	0	0	0	1	12
48	Telecommunications	0	0	0	1	0	1	0	0	0	5	3	1	4	3	1	2	3	2	4	4	7	6	2	3	2	54
49	Textile	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2	1	0	1	0	0	0	0	2	0	8
50	Tire and Rubber	1	0	1	0	0	0	0	2	2	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	9
51	Tobacco	2	0	0	0	0	1	1	1	1	3	0	0	1	1	1	2	0	1	2	0	0	0	0	0	0	17
52	Toiletries and Cosmetics	0	0	0	1	0	1	1	0	1	1	2	0	1	0	1	1	1	1	0	0	0	0	0	0	0	12
53	Toys	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	2	1	1	1	2	0	10
54	Trucking and Transportation Leasing	2	0	0	0	0	0	1	0	2	0	1	0	0	0	0	1	1	0	1	1	0	0	0	1	0	11
55	Utilities	0	0	0	1	1	0	0	0	1	0	1	0	2	1	0	2	3	1	2	2	2	1	3	2	2	27
	Total	35	28	23	46	41	42	57	87	118	111	92	73	86	58	71	99	108	94	88	67	57	43	54	70	34	

Appendix A. Procedure for Creating Industries

Value Line industry classifications have not remained static since 1970, with industries dividing or merging over time. In order to create a single set of industries that could be followed continuously from 1970 to 1994, we generate a subset of 55 industry classifications, to which firms in Value Line are allocated.

We include each firm in our sample up to 3 years before its addition, in which case, the firm is included in the industry where it first appears, and up to 3 years after its exclusion, with the firm remaining in the last industry to which it belonged. This procedure mitigates some of the problems caused by increases in overall Value Line coverage in the early 1970s, which can be seen in the first few columns of Table A1.

For most cases, the following guidelines are followed in transforming Value Line industries into "our" industries:

- Most industries which exist in the same form throughout the entire 1970–1994 period, i.e., no other industries are merged into them or split off from them, are kept intact.
- Industries which differ merely by geographic classifications (e.g., "Utilities (East)" and "Utilities (West)"), or where the product lines seem particularly similar (e.g., "Auto Parts (OEM)" and "Auto Parts (Replacement)"), are merged.
- Some industries that are separate as of 1994, but are merged in earlier periods, and where re-classification is straightforward (e.g., "Computers" and "Office Equipment"), are split up in the early periods. Companies which existed both pre- and post-split are assigned to their post-split industry, while for companies that only exist pre-split, a description of the firm's product line from Value Line is used for classification.
- There are some subsets of firms that Value Line includes in different industries at various points in time (e.g., "Forest Products" firms are first included in "Building" and later become part of the "Paper and Forest Products" industry). In these cases, we transfer firms from their early period classifications to their later ones (e.g., all "Forest Products" firm are classified with "Paper Products" firms for the entire sample period). This also requires reading descriptions of firms which only exist in the early years, and deciding where to allocate them.
- In total, 60 firms are allocated manually after reading their descriptions on Value Line.

Appendix B. Procedure for assigning industries to merger targets

In an attempt to assign an industry to all the targets in mergers where the acquirer belonged to the sample, a total of 1711 transactions, we follow these steps in order:

(1) Check if the target is in Value Line, and assign it's corresponding industry. This results in 572 classifications.

(2) Create a conversion table of SIC codes to our industry classifications. This is based on our reading the descriptions of all four-digit SIC codes from the Standard Industrial Classification Manual (1987). For most cases, the appropriate industry assignment is obvious, but in case of doubt, we classify the four-digit code as "missing."

(3) Using the conversion table, assign industries to the remaining targets on the basis of both their CRSP and Compustat SIC codes. If the industries match, assign the target to it, which results in 456 additional classifications

(4) Hand-collect primary SIC codes for remaining unclassified targets from Dun and Bradstreet's Million Dollar Directory. Using the conversion table, assign industries to the targets found in the Directory. This results in 537 additional classifications.

Appendix C. Compustat data items

The following Compustat data items were used to construct the industry-level and firm-level variables in Sections 3 and 4:

Variable name	Compustat data item number
Advertising	45
CAPX	128
R&D	46
Cash	1
Sales	12
Total assets	6
Book equity	60
Market equity	199 × 25
EBITDA	13
Debt in current liabilities	34
Long-term debt	9
Preferred stock—redemption value	56

References

Andrade, G., Mitchell, M., Stafford, E., 2001. New evidence and perspectives on mergers. Journal of Economic Perspectives 15, 103–120.

Blanchard, O., Lopez-de-Silanes, F., Shleifer, A., 1994. What do firms do with cash windfalls? Journal of Financial Economics 36, 337–360.

Brealey, R., Myers, S., 1996. Principles of Corporate Finance, 5th edn. McGraw-Hill, New York, NY.

Fama, E., 1976. Foundations of Finance. Basic, New York.

Gibbons, J., 1985. Nonparametric Statistical Inference, 2nd edn. Marcel Dekker, New York, NY.

Gort, M., 1969. An economic disturbance theory of mergers. Quarterly Journal of Economics 83, 624–642.

Greene, W., 1993. Econometric Analysis, 2nd edn. Macmillan, New York, NY.

Guenther, D., Rosman, A., 1994. Differences between Compustat and CRSP SIC codes and related effects on research. Journal of Accounting and Economics 18, 115–128.

Healy, P., Palepu, K., Ruback, R., 1992. Does corporate performance improve after mergers? Journal of Financial Economics 31, 135–175.

Heaton, J.B., 1999. Managerial optimism and corporate finance. University of Chicago Working Paper.

Jarrell, G., Brickley, J., Netter, J., 1988. The market for corporate control: the empirical evidence since 1980. Journal of Economic Perspectives 2, 49–68.

Jensen, M., 1986. Agency costs of free cash flow, corporate finance and takeovers. American Economic Review 76, 323–329.

Jensen, M., 1993. The modern industrial revolution, exit, and control systems. Journal of Finance 48, 831–880.
Kahle, K., Walkling, R., 1996. The impact of industry classifications on financial research. Journal of Financial and Quantitative Analysis 31, 309–335.
Kaplan, S., Zingales, L., 1997. Do financing constraints explain why investment is correlated with cash flow? Quarterly Journal of Economics 112, 169–215.
Kovenock, D., Phillips, G., 1997. Capital structure and product market behavior: an examination of plant exit and investment decisions. Review of Financial Studies 10, 767–803.
Lang, L., Stulz, R., Walkling, R., 1989. Managerial performance, Tobin's *q*, and the gains from successful tender offers. Journal of Financial Economics 24, 137–154.
Maddala, G., 1983. Limited Dependent and Qualitative Variables in Econometrics. Cambridge Univ. Press, New York, NY.
Maksimovic, V., Phillips, G., 2001. The market for corporate assets: who engages in mergers and asset sales and are there efficiency gains? Journal of Finance 56, 2019–2065.
Mitchell, M., Mulherin, J., 1996. The impact of industry shocks on takeover and restructuring activity. Journal of Financial Economics 41, 193–229.
Mitchell, M., Stafford, E., 2000. Managerial decisions and long-term stock price performance. Journal of Business 73, 287–329.
Morck, R., Shleifer, A., Vishny, R., 1988. Characteristics of targets of hostile and friendly takeovers. In: Auerbach, A.J. (Ed.), Corporate Takeovers: Causes and Consequences. University of Chicago Press/NBER, Chicago, IL.
Morck, R., Shleifer, A., Vishny, R., 1990. Do managerial objectives drive bad acquisitions? Journal of Finance 45, 31–48.
Mulherin, J., Boone, A., 2000. Comparing acquisitions and divestitures. Journal of Corporate Finance 6, 117–139.
Myers, S., 1977. Determinants of corporate borrowing. Journal of Financial Economics 5, 147–175.
Nelson, R., 1959. Merger Movements in American Industry, 1895–1956. Princeton Univ. Press/NBER, Princeton, NJ.
Song, M., Walkling, R., 2000. Abnormal returns to rivals of acquisition targets: a test of the "acquisition probability hypothesis". Journal of Financial Economics 55, 143–172.