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Financing Major Investments: Information about Capital Structure Decisions*

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Abstract. We evaluate US firms' leverage determinants by studying how firms paid for 2,073 very large investments between 1989 and 2006. This approach complements existing empirical work on capital structure, which typically estimates regression models of leverage for a broad set of firms. Because large investments are mostly externally financed, security issuances should provide information about managers' attitudes toward leverage. We find that issued securities move firms toward target debt ratios. Firms also tend to issue more equity following a share price run-up, consistent with both the tradeoff hypothesis and managerial efforts to time market sentiment. We find little support for the standard pecking order hypothesis.

JEL Classification: G14, G31, G32

1. Introduction

Much recent research has evaluated capital structure by estimating regressions across a broad range of corporations, seeking uniform behavior that conforms to one or another theory of capital structure determination. Many authors have argued that capital structure adjustment costs may interfere with estimating the true tendency of firms to adjust leverage (e.g., Fischer, Heinkel, and Zechner, 1989; Leary and Roberts, 2005). Firms may make large leverage adjustments only infrequently or only in connection with some

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other dimension of their operations (Strebulaev, 2007; Harford, Klasa, and Walcott, 2009; Uysal, 2011). Rather than estimating leverage models across all COMPUSTAT firms, this study approaches the capital structure question by examining the financing decisions associated with "major" investments.[1] The Statement of Cash Flows (SCF) indicates that these investments are financed with a substantial proportion of external funds. In the event year, our mean sample firm finances 67% of its capital expenditures and 83% of its acquisitions with externally raised funds. In contrast, the overall COMPUSTAT sample during the same period shows only 31% external funding for a set of smaller investments (Figure 1).[2] Thus, we study firms that can adjust their leverage at little marginal transaction cost by choosing between debt and equity issuance, both of which are recorded in the SCF.

Our event-based methodology complements studies that estimate capital structure regressions over a broad sample, and it also offers several advantages. First, because we study only firms confronting low marginal costs of adjusting leverage, financing choices should reflect the investing firms' attitudes toward leverage (Strebulaev, 2007; Faulkender *et al.*, 2012).[3] Second, we do not focus exclusively on changes in the leverage ratio, but rather use the SCF to identify the roles of debt, equity, internal cash flow, and "other" sources in financing large investments. This is important in part because equity issuance and retained earnings (from internal cash flow) affect leverage similarly while the pecking order hypothesis views internal and external finance quite distinctly. Finally, our focus on large investments mitigates econometric controversies associated with estimating partial adjustment models. Chetty (2012) observes (in the context of estimating labor supply elasticity) that small changes in the dependent variable are prominently affected by market frictions but large changes are more likely

[1] We define a "major" investment event as a firm-year with investment expenditures exceeding 30% of book assets and 200% of the firm's trailing investment expenditures (as a proportion of total assets).

[2] Figure 1 and Appendix 1 provide further details about external funding. Another indication of major investments' association with external financing comes from categorizing the funding for each sample investment as "predominantly" internal or external if more than 50% of the funds came from that source. In our sample, only 16.5% of large capital expenditures (4.5% of large acquisitions) are predominantly (though not necessarily exclusively) financed by internal funds.

[3] Non-transaction costs related to agency problems or asymmetric information may still affect issuance choices, which permits us to test some implications of the pecking order and market timing hypotheses.

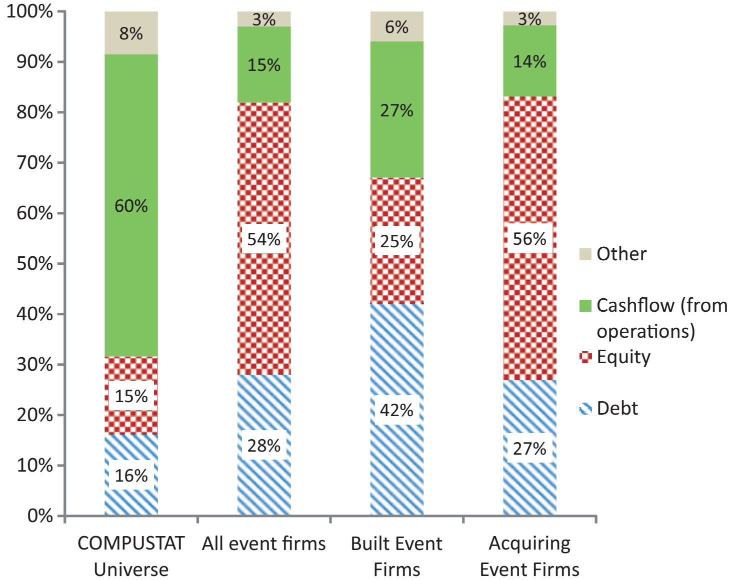

Figure 1. Mean financing proportions from Equation (1). The graph indicates how investments were financed at 1,801 firms with major investment (event firms), compared with the set of all restricted COMPUSTAT firms during the period 1989–2006.

to reveal information about underlying elasticities.[4] Moreover, if the partial adjustment model we use to estimate target leverage is noisy or error ridden, our tradeoff theory tests should be biased away from finding significant results.

The empirical approach encompasses three major capital structure theories. The *dynamic tradeoff hypothesis* asserts that each firm has an optimal capital ratio reflecting its specific characteristics. Under this hypothesis, a firm should raise external funds by issuing the type of security (debt or equity) that brings it closer to its target. Myers's (1984) exposition of the *pecking order hypothesis* contends that asymmetric information imposes costs on existing shareholders when a firm sells new risky claims to the public. Accordingly, firms prefer to finance investments with internally generated funds. When investment requirements exceed the available internal funds,

[4] Specifically, Chetty (2012, p. 970) observes that "pooling several small price changes – although useful in improving statistical precision – yields less information about the structural elasticity than studying a few large price changes." We thank Murray Frank for highlighting the implications of Chetty's work for studies on corporate capital structure.

firms hypothetically prefer to issue debt over equity.[5] Thus, the debt component of leverage should be inversely related to past profitability, *ceteris paribus* (Fama and French, 2002). Finally, capital structure may be subject to the *market timing hypothesis*, under which firms try to issue overpriced securities when they go to market (Asquith and Mullins, 1983; Korajczyk, Lucas, and McDonald, 1991; Loughran and Ritter, 1997; Baker and Wurgler, 2002; Huang and Ritter, 2009). Empirical research has not uniformly supported any one of these hypotheses over the other two, nor has it ruled out multiple influences on corporate leverage.[6] Further clouding inferences, researchers often test one capital structure hypothesis at a time (Strebulaev and Whited, 2012), rather than testing them concurrently. (Larkin (2010) is a notable exception.) For example, pecking order or market timing behaviors might be fully consistent with the dynamic tradeoff hypothesis over a longer time frame (Baker and Wurgler, 2002, p. 2). Our hypothesis tests are designed to consider all three leverage theories simultaneously.

Beyond the overall design of our analysis, we also contribute to the literature in differentiating between built and acquired major investments, and by treating the potential endogeneity of large investments seriously.

Some of the major events we identify involve "Built" investments, measured by COMPUSTAT SCF item 128 ("Capital Expenditures"). Other major events involve Acquired investments, measured by

[5] The usual pecking order preference for debt over equity derives from an assumption that managers and outside investors disagree about the value of firm assets (Myers and Majluf, 1984). However, Myers (1984) observes in a footnote (p. 584) that disagreement about the volatility of asset returns would cause shareholders to prefer to issue equity over debt when raising external funds.

[6] The literature includes significant debate about empirical support for each hypothesis. Much research supports the tradeoff hypothesis, but some researchers question the power of these tests (Strebulaev, 2007; Chang and Dasgupta, 2009; Iliev and Welch, 2010; Elsas and Florysiak, 2012). The pecking order receives support from Shyam-Sunder and Myers's (1999) observation that leverage is increasing in the internal financial deficit, but some studies question their conclusions (e.g., Chirinko and Singha, 2000). Hovakimian (2004) attributes this negative correlation to costly incomplete adjustment of target ratios, consistent with the tradeoff theory. Frank and Goyal (2011) conclude that this correlation is driven by the influence of profitability on leverage through the denominator (firm value), consistent with Strebulaev's (2007) simulations. Fama and French (2002) find a negative relationship between profitability and leverage (consistent with the pecking order), while Frank and Goyal (2011) find the opposite correlation. A firm's propensity to issue shares following a price run-up is consistent with the market timing hypothesis (Baker and Wurgler, 2002), but Hovakimian (2004) questions the long-term effect of opportunistic security issuances on observed leverage. Moreover, a credible alternative interpretation of the observed empirical regularity is that run-up reflects the arrival of growth opportunities, and therefore subsequent issuance of equity is consistent with the tradeoff theory.

COMPUSTAT SCF item 129 ("Acquisitions") supplemented by merger transaction data from Securities Data Company (SDC). We believe it advisable to evaluate Built and Acquired investments separately for several reasons. First, firms with large Built investments tend to be smaller, younger, less profitable, more reliant on tangible capital, and less likely to have a credit rating than those with large Acquisition investments. Any of these factors could affect access to specific types of capital or the firm's ability to adjust its leverage quickly. Second, Built and Acquired investments may affect desired leverage differently because Built investment projects seem more likely to represent the implementation of a firm's growth options. Converting growth options to assets-in-place reduces the firm's effective leverage, which should raise the balance sheet's optimal leverage (Berk, Green, and Naik, 1999; Carlson, Fisher, and Giammarino, 2006). Third, Acquisition financing involves some considerations about the medium of payment that are irrelevant for Built investments; yet the chosen medium of payment will affect leverage, at least initially. We discuss these considerations more extensively in Section 5.2, in which we show that firms adjust their leverage toward a target more aggressively for Built than Acquired investments.

Unusually large investments are unlikely to occur randomly. For example, Uysal (2011) shows that deviations from target leverage influence the likelihood of making an acquisition. In an extensive robustness test, we estimate Heckman (selectivity adjusted) versions of our main hypothesis tests to control for possible endogeneity. Controlling for selection bias using Heckman's method does not change our inferences.

Our multivariate regressions show that firms choose debt or equity issuance at least partly on the basis of their deviation from target leverage. We also find that more profitable firms finance major investments with a greater proportion of internal funds (operating cash flow), consistent with the pecking order hypothesis. However, in contrast with the usual pecking order story, these internal funds (retained earnings) primarily replace *equity* issuance, not debt (as the most common interpretation of Myers (1984) would predict). Substituting retained earnings for equity issuance leaves leverage unchanged, and thus profitability does not substantially affect leverage when firms undertake a large investment. Finally, we present evidence related to the market timing hypothesis. Firms experiencing recent share price run-up issue more shares. When the investment is Built, these share issues primarily replace internal funds, with (again) no net effect on leverage. When the investment is Acquired, the new equity displaces debt financing. These results are consistent with both the tradeoff and the market timing hypothesis.

The remainder of this article proceeds as follows. Section 2 defines "major" investments and describes the features of our sample firms. Section 3 estimates each firm's target leverage ratio and presents evidence on firms' adjustments toward their leverage targets when financing major investment projects. Multivariate regression models in Section 4 test the relevance of all three capital structure hypotheses simultaneously, finding support for the tradeoff and market timing hypotheses. In Section 5, we examine why major Built investments are associated with more aggressive convergence toward target leverage than Acquired investments. Section 6 reports some robustness results, and Section 7 concludes.

2. Identifying Major Investment Events

Our research design is based on the simple proposition that a firm is likely to finance large investments with external funds (see footnote 2) and that this financing pattern reflects its attitude toward leverage. Using an event-based approach, Strebulaev (2007) focuses on "prominent" refinancing points as key points at which capital structure theories can be tested without contamination from frictions. We thus anticipate that studying only large investment events empirically accompanied by significant external financing (i.e., "refinancing points") should provide enhanced information about the determinants of firms' capital structure preferences.

Theory provides no clear method for identifying "major" investment events. We therefore proceed with one plausible rule: an investment is "major" if it (1) exceeds 200% of the firm's past 3 years' average ("benchmark") investment and (2) is at least 30% of the firm's prior year-end total assets.[7] We compute separate investment levels for each firm-year's Built and Acquired capital expenditures.

Before identifying firms with major investments, we trimmed the universe of Center for Research in Security Prices (CRSP)/COMPUSTAT firms by excluding firm-years in which

- The firm's book value of equity is negative;
- Data are missing for capital expenditures *and* acquisitions (items #128 and #129) or for income before extraordinary items (item #123, used to calculate cash flows);

[7] Analysis based on a less restrictive, alternative rule (100% of trailing investment and 20% of total assets) yields similar results.

- The firm belongs to a regulated industry: two-digit NAICS industry codes equal to 22 (utilities), equal to 52 (finance and insurance), or exceeding 90 (public administration)[8]; and
- The CRSP security is not an ordinary share (which omits REITS, ADRs, and so on).

This screen leaves a restricted COMPUSTAT sample with 83,576 annual observations for 11,438 firms in the 1989–2006 period, in which we search for major investment events.[9] Subsequent comparisons between our sample of event firms and the "COMPUSTAT universe" refer to this restricted universe.

Prior studies most comparable to ours are Mayer and Sussman (2005), Harford, Klasa, and Walcott (2009), and Uysal (2011). Mayer and Sussman evaluate financing activity associated with 1-year "spikes" within a contiguous 5-year investment history, relying exclusively on SCF data. As we discuss subsequently, SCF data mis-measure the scale and financing composition of many acquisitions, which account for 48% of their sample. Moreover, Mayer and Sussman do not distinguish between Built and Acquired investments, while we find some notable differences. Harford *et al.* and Uysal share our contention that firms should be particularly aggressive in moving toward their leverage targets (if they have them) when deciding how to finance an acquisition. Their evidence confirms this hypothesis for acquisitions identified through SDC. Our Acquisition sample is larger than any of the prior works' because we combine SCF and SDC data. For example, we identify approximately 601 (of 1,780) acquisitions that do not appear in SDC.

2.1 DATA

Following the standardization of cash flow statements in 1988 (SFAS 95), COMPUSTAT reports the same SCF format for all firms. We omit events after 2006 to avoid the uncertain effects of the financial crisis on capital availability. For the 1989–2006 period, we aggregate the variables

[8] If we include the single large investment event by a firm with NAICS ≥90, our results are unaffected.

[9] Firms that chose to make large investments may differ from other COMPUSTAT firms. However, sample selectivity (Heckman) corrections described in our robustness analysis in Section 6 confirm our main conclusions.

listed in Appendix A into four exhaustive financing sources for each firm's investments:[10]

(1) DEBT_i is the *i*-th firm's debt issued less debt retired for cash (COMPUSTAT items 111 plus 114 less 301).
(2) EQUITY_i is the dollar value of the *i*-th firm's *net* issuance of common and preferred shares for cash (COMPUSTAT items 108–115).
(3) CASHFLOW_i is the *i*-th firm's operating cash flows, defined as after-tax income before extraordinary items plus depreciation and amortization less cash dividends and the increase in cash and cash equivalents (COMPUSTAT items $123 + 125 - 127 - 274$). Note that a firm that finances new investment by running down its accumulated cash balances has a higher CASHFLOW, *ceteris paribus*.
(4) $\underline{\text{OTHER}_i}$ aggregates all other SCF categories (assets less liabilities) for firm *i*.

SCF data must obey the following identity for each firm over any time interval:

$$\text{INVEST}_i = \text{DEBT}_i + \text{EQUITY}_i + \text{CASHFLOW}_i + \text{OTHER}_i, \tag{1}$$

where INVEST_i is the sum of firm *i*'s capital expenditures and acquired assets.[11]

Appendix A shows average values for each of the SCF items over several subsets of the data, measured in year-2000 dollars. The fourth column in Appendix A averages values across all COMPUSTAT firms in all sample years (1989–2006), while the fifth through seventh columns report averages for our sample firms in the years they implemented large investments. These numbers are plotted in Figure 1 to illustrate the financing proportions in each of these samples. The second column in Figure 1 shows that external funds (debt plus equity net issuances) provide the lion's share of financing for our sample of large investments, while the "OTHER" category is quite small (averaging 3% over all large investments). These financing proportions

[10] As we explain subsequently, we supplement the Acquisitions-related financing data with information from the SDC merger database.
[11] This accounting identity holds strongly in the data. Subtracting financing (DEBT + EQUITY + CASHFLOW + OTHER) from investment expenditures (capital + acquisition expenditures) has a median of 0 and a mean of –2.7e-6 for all firm-year observations in our sample.

are notably different from the restricted COMPUSTAT sample, in which mean internal funding consists of 60% and "other" comprises another 8% of investment spending. The importance of external finance for major investments contrasts with common wisdom that the typical investment is financed primarily with internal cash flow (Allen, Brealey, and Myers, 2011; Eckbo and Kisser, 2013). Although this may be true for normal-sized investments, it is demonstrably untrue for the major expenditures we study herein. The importance of external finance for major investments makes it more likely that firms' financing choices reflect their leverage preferences.

It is important to understand how each of the financing categories in (1) affects a firm's leverage. A Debt (Equity) issuance increases (decreases) leverage, *ceteris paribus*. Financing new assets from operating Cashflow increases retained earnings and thus reduces leverage. Consequently, substituting Cashflow for Equity financing leaves leverage unaffected. The effect of Other financing on leverage is ambiguous because this category combines asset and liability items.

The Built projects are adequately described by COMPUSTAT's SCF item 128, "capital expenditures." However, the SCF information does not fully record the value of all acquisitions. COMPUSTAT item 129, "acquisitions," recognizes only assets purchased with *cash* or by *assuming* the target's debt. Equity constitutes the most common non-cash payment in an acquisition, but some firms pay a target's shareholders with newly issued debt securities. Neither is recorded in the SCF:

> [If] one company acquired another at a cost of $10 billion, but only $1 billion of it was in cash, with the rest paid in the form of debt and equity instruments, the cash flow statement would show only the $1 billion cash amount paid as the cost of the acquisition. The other $9 billion would be relegated to a footnote (Weiss and Yang, 2007).

In other words, SCF data alone may under-represent the scale of acquisitions and mis-represent their financing. The potential importance of this adjustment is illustrated by one firm's merger activity reported by SDC but omitted using only SCF information: Texas Instruments acquired four companies in 2000 in return for $7.9 billion in shares (constituting a major investment according to our definition), while the company's SCF acquisitions were reported as 0.

We therefore augment the SCF data with information from Thomson Financial's SDC Mergers and Acquisitions Database. We identify all SDC transactions that specify the source(s) of at least 98% of the deal's required financing.[12] We then match SDC acquirers to our initial COMPUSTAT data set and adjust the acquirer's

- "acquisitions" amount (COMPUSTAT item 129) by adding the value of total shares and debt paid for the asset,
- "sale of common and preferred equity" (COMPUSTAT item 108) by adding the value of equity paid, and
- "issuance of long-term debt" (COMPUSTAT item 111) by adding the value of debt paid.

These adjustments increase the number of major acquisitions in our sample by 50.1%. SCF data alone identify 1,186 major acquisitions made by 914 firms, compared with the augmented data set's 1,780 major acquisitions by 1,316 firms. More important, including equity compensation substantially changes the acquiring firms' financing proportions. The SCF data alone indicate that the median debt financing proportion for acquisitions was 59.09%, while equity financed (in the median) only 1.43% in the event year. Incorporating the SDC information reduces the median debt portion to 42.1% and raises equity's share to 28.7%.

2.2 SAMPLE CHARACTERISTICS

Table I describes the selected events: 1,205 major Built investments at 787 firms and 1,780 major Acquisitions at 1,316 firms. To evaluate Built and Acquired events separately, we omit 114 firms with both types of major investments during the 1989–2006 sample period.[13] This yields 1,023 Built events and 1,616 Acquired events. When major investments occur in adjacent years, we combine them into a single "economic event," to identify pre- and post-event financing changes uncomplicated by additional large investments. This definition of economic events yields a main test sample of 728 Built events at 622 firms and 1,345 Acquired events at 1,179 firms.[14]

[12] The SDC file included 105,031 deals, only 34,426 of which recorded compensation equal to at least 98% of the acquired assets. We were able to identify 19,115 acquirers, 18,410 of which could be matched to COMPUSTAT gvkeys. If the full recorded compensation was less than 100% of acquired assets, we assumed that the remainder (never more than 2%) was paid for with equity (shares of stock).

[13] All results remain qualitatively unaffected when we incorporate the firms with both major Built investments and major Acquisitions.

[14] There are 380 economic events with multiple adjacent event periods, 319 of which have two, 53 three, 5 four, and 3 five adjacent event years. Omitting these multi-year events has no substantial effect on our results, as noted in Section 6.

Table I. Frequency distribution of major investments 1989–2006

The table shows the frequency distribution of major investments (built investments versus acquisitions). The filter rule used to identify these events requires that a firm's capital or acquisition expenditures exceed 200% of their benchmark expenditures (a 3-year trailing average), and that expenditures exceed 30% of total assets. Economic events (Panel C) are defined as major investments with adjacent event years, starting with a pre-event year and ending with a post-event year (e.g., a sequence in event time of [–1, 0, 0, +1] over 4 years).

Type of event	Number of firms	Events
Panel A: Initial sample		
With major built investment	787	1,205
With major acquisition	1,316	1,780
Overlap: events at firms with *both* built and acquired major investments	114	182 (built)/162 (acquired)
Panel B: Clean sample (firms that either built or acquired, but not both)		
With only major built investment(s)	673	1,023
With only major acquisition(s)	1,202	1,616
Panel C: Economic sample (successive event years are treated as one)		
Major built investment	622	728
Major acquisition	1,179	1,345

Table II compares the industry distribution of our sample firms with the distribution of the restricted COMPUSTAT population during the 1989–2006 period. Neither the Built nor the Acquired sample randomly represents COMPUSTAT's cross-industry distribution of firms. Built investments are particularly common in some Manufacturing segments (NAICS = 32, 33), in Mining (21), and in the Information (51) and Accommodation and Food Services (72) industries. Acquisition events are unusually frequent in Manufacturing (33) and Information (51).

Table III defines variables and compares *ex ante* firm characteristics between the two types of event firms. Panel A presents variable definitions. Because the Built and Acquired samples may be concentrated in different sample years, we industry-adjust the characteristic values. Panel B presents means, medians, and standard deviations of the industry mean–adjusted characteristic values, separately for the Built and Acquired samples. It also indicates whether the medians of these two sub-samples differ according to a Wilcoxon rank sum test. Many of the relevant variables are ratios, which can take an extreme value when the denominator is unusually small. We

Table II. Industry affiliation of event firms (1989–2006)

NAICS	Definition	Built investments: No. of firms	Built investments: Percentage of event firms (%)	Built investments: Percentage of all firms in industry (%)	Acquisitions: No. of firms	Acquisitions: Percentage of event firms (%)	Acquisitions: Percentage of all firms in industry (%)
11	Agriculture, forestry, fishing, and hunting	2	0.32	4.26	2	0.17	4.26
21	Mining	182	29.26	24.33	23	1.99	3.07
23	Construction	6	0.96	2.76	11	0.95	5.07
31	Manufacturing (food, beverages, etc.)	25	4.02	4.73	37	3.20	6.99
32	Manufacturing (wood, etc.)	66	10.61	4.44	133	11.51	8.95
33	Manufacturing (metal, etc.)	104	16.72	2.94	365	31.57	10.32
42	Wholesale trade	13	2.09	1.83	67	5.80	9.42
44	Retail trade	11	1.77	2.84	23	1.99	5.93
45	Retail trade	5	0.80	1.49	17	1.47	5.06
48	Transportation/warehousing	35	5.63	11.86	15	1.30	5.08
51	Information	46	7.40	2.54	204	17.65	11.28
53	Real estate and rental and leasing	22	3.54	6.09	13	1.12	3.60
54	Professional, scientific, and technical services	19	3.05	2.08	85	7.35	9.30
56	Admin. and support and waste mgmt and remediation services	14	2.25	3.17	53	4.58	12.02
61	Educational services	2	0.32	3.51	11	0.95	19.30
62	Health care and social assistance	14	2.25	3.66	62	5.36	16.19
71	Arts, entertainment, and recreation	9	1.45	7.09	5	0.43	3.94
72	Accommodation and food services	45	7.23	14.11	16	1.38	5.02
81	Other services (except public administration)	2	0.32	2.25	14	1.21	15.73
	Sum	622	100		1,156	100	

Table III. Descriptive statistics for event firms

The table shows variable definitions and summary statistics for event firms in the year preceding the investment event (event period: 1989–2006). All numbers reported are differences from industry means on a yearly basis, based on two-digit NAICS codes (Table II). Ratios have been multiplied by 100. The number of observations for each statistic may differ from the maximum number because of missing values. The columns headed "Wilcoxon test: equal medians?" report a *z*-statistic for a non-parametric rank sum test on differences in medians between built and acquired major investments. All estimates are based on economic events. *** denotes significance at the 1% significance level; n.s. denotes not significantly different.

A. Variable definitions		
Variable	Definition	Calculation (COMPUSTAT items)
Size [million $, year 2000]	Total assets, expressed in 2000 dollars	#6, deflated by the CPI
Age (years)	Number of years covered by COMPUSTAT	Linkdt
Profit [%]	Income before extraordinary items over total assets	#123/#6
Book debt ratio [%]	(Long-term debt and current debt) over (total assets)	(#9 + #34)/(#6)
Market debt ratio [%]	(Long-term debt and current debt) over (debt + equity's market value)	(#9 + #34)/(#9 + #34 + #199 * #25)
DEV [%]	Target debt ratio - market debt ratio	Partial adjust model similar to Flannery and Rangan (2006), estimated using Blundell–Bond GMM estimator, see Section 3.
Equity ratio [%]	Common and preferred equity over total assets	(#60 + #130)/#6
Investment Ratio [%]	Capital expenditures over total assets [t – 1]	#128/(#6[t – 1])
Acquisition ratio [%]	Acquisition expenditures over total assets [t – 1]	#129/(#6[t – 1])
Fixed Asset Ratio [%]	Property, plant, equipment (net, total) over total assets	#8/#6
Rated [%]	Dummy indicating S&P rated company	#280
R&D [%]	R&D expenditures (set to 0 if missing) over total assets	#46/#6
Q	Market value equity/book value equity	(#199 * #25)/#60
Growth [%]	Percentage change in total assets	(#6(t) – #6(t – 1))/(#6(t – 1))

Table III. Continued

B. Characteristics of major investment firms, adjusted for industry means

	Firms with built investment (max. 728 events)				Firms with acquisitions (max. 1,345 events)		
	Mean	Median	Std.Dev	Wilcoxon test: equal medians?	Mean	Median	Std.Dev
Size [million $, year 2000]	−1,006.48	−1,077.70	1,566.62	***	129.23	−1,040.75	6,789.17
Age [years]	−1.77	−3.73	7.50	***	1.12	−2.44	10.32
Profit	−0.01	0.06	0.28	***	0.09	0.11	0.18
Book debt ratio [%]	−4.03	−8.93	18.79	***	−0.18	−3.69	17.63
Market debt ratio [%]	−7.71	−12.27	17.50	***	−3.53	−8.11	16.43
DEV (target - MDR) [%]	7.12	4.23	17.54	n.s.	5.69	3.35	16.58
Equity ratio [%]	6.06	7.57	21.39	***	0.55	0.65	20.41
Investment Ratio [%]	7.20	3.15	23.97	***	−1.23	−1.87	5.72
Acquisitions ratio [%]	−4.91	−4.80	20.06	***	4.47	−3.05	36.61
Fixed Asset Ratio [%]	5.83	6.61	20.38	***	−2.26	−5.56	15.32
Rated	−0.10	−0.16	0.31	***	0.05	−0.14	0.41
R&D [%]	0.48	−0.13	8.67	***	−1.81	−1.47	7.54
Q	1.43	−0.42	5.58	***	0.40	−0.79	4.52
Growth [%]	7.57	−7.40	99.05	n.s.	13.01	−6.19	111.54

therefore winsorize ratios reported in Table III at the 0.5% and 99.5% levels and concentrate our discussion on the *median* values.

The predominance of statistically different median values in Table III illustrates that firms undertaking large Built investments differ in many ways from those making large Acquisitions. The Built sample firms are smaller, younger, and less leveraged; have more fixed assets; and are less likely to have a bond rating. They also have slightly (though significantly) higher research and development (R&D), higher Q, and lower profit. Finally, we note that both samples of large investment event firms show similar deviations from target leverage on an industry-adjusted basis.

2.3 UNIVARIATE RESULTS: FINANCING PROPORTIONS AND DYNAMICS

Table IV provides univariate measures of the investment events' size and financing proportions. Panel A reports mean (dollar) expenditures, and Panels B and C report median financing proportions.

The left side of Panel A demonstrates that the average Built expenditure is larger in the event year than in adjacent years, though Built expenditures in years $\tau = -1$ and (especially) $\tau = +1$ are also quite large. Built investments thus seem to occur within a continuing growth process, even though the year 0 investment exceeds 200% of the past 3-years' average. Note further that the typical firm makes some (relatively small) acquisitions even during its "major" Built event year. Similarly, the right side of Panel A shows some modest Built investments even in years with a major Acquisition. In contrast with Built events, Acquisition events show a more distinct "spike": event-year Acquisitions are roughly ten times larger than Acquisitions in adjacent years.

Panel B of Table IV describes each financing source's median proportional contribution to investment spending in the event year alone ($\tau = 0$). For each firm-year observation, we calculate the ratio of each financing source (EQUITY, DEBT, CASHFLOW, OTHER) to the sum of Built and Acquired investment expenditures during that firm-year and report the median of these ratios. (Note that the medians need not sum to 100% of required financing.) New external finance provides the largest share of funds for our major Built projects: the median project is funded with 36.8% new DEBT and 6.72% new EQUITY. Operating CASHFLOW pays for 22.67% of Built investments, and the OTHER category finances only 4.47%. Acquisitions are financed even more heavily by external funds, presumably reflecting their larger size. Acquisitions also entail much more equity funding than Built investments—a median of 30.84% versus 6.72% for Built investments—consistent with the asymmetric information or tax motives for paying a target with the acquirer's shares.

Table IV. Financing patterns associated with major built and acquired investments

We report financing patterns for the event year itself ($\tau = 0$) and the individual years on either side of the event year. Average investment amounts are reported in millions of year-2000 dollars (Panel A). The next four rows report median values for each financing source, expressed as the respective cash flow divided by the event year total investment expenditures (Panel B). Panel C reports median financing shares for separate event years, standardized by the overall period's investment expenditures, that is, total expenditures in $\tau = [-1, +1]$. All calculations are based on economic events, which are defined as major investments with adjacent event years, starting with a pre-event and ending with a post-event year (e.g., a sequence in event time of [–1, 0, 0, +1] over 4 years).

	Built events			Acquisition events		
Event window:	$\tau = -1$	$\tau = 0$	$\tau = +1$	$\tau = -1$	$\tau = 0$	$\tau = +1$
A. Mean expenditure amounts (year-2000 dollars, millions)						
Built investments [$]	58.49	145.95	115.05	92.65	143.67	165.01
Acquisitions [$]	3.03	37.19	9.42	85.01	1,104.01	159.15
Observations	723	723	613	1,300	1,300	1,149
B. Median financing proportions during event year (%, $\tau = 0$)						
Equity [%]	–	6.72	–	–	30.84	–
Debt [%]	–	36.80	–	–	40.57	–
Cashflow [%]	–	22.67	–	–	14.04	–
Other [%]	–	4.47	–	–	1.06	–
C. Median financing proportions during the period (%, $-1 \leq \tau \leq +1$)						
Equity [%]	0.72	3.81	0.54	0.51	22.47	0.61
Debt [%]	0.00	20.38	1.04	−0.03	28.71	−0.65
Cashflow [%]	6.37	13.16	11.81	6.97	10.59	12.07
Other [%]	1.01	2.45	2.75	−0.56	0.77	0.41

Figure 2 shows a breakdown of median financing ratios when event firms are sorted each fiscal year into size terciles (on the basis of their total assets). External funds (debt plus equity) are prominent in financing major investments across all size classes. However, the smallest firms finance their projects with less CASHFLOW and much more new EQUITY than larger firms, especially if the project is an acquisition. This pattern appears to contradict the usual pecking order exposition, in which smaller firms suffer greater lemons costs when issuing equity and thus rely on CASHFLOW or DEBT to finance their growth.

2.4 FINANCING ADJUSTMENTS OUTSIDE THE EVENT YEAR

A firm's ultimate financing choices need not be manifested during the investment year (Mayer and Sussmann, 2005). Dudley (2012) finds that firms

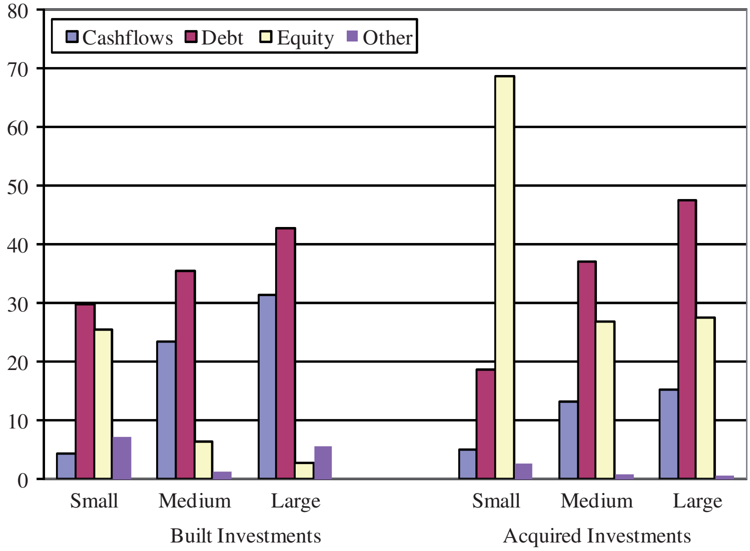

Figure 2. Financing patterns for firms with built and acquired investment differentiated by size. The figure shows the median financing proportions in the event year ($\tau = 0$) for small, medium, and large firms defined according to total assets of the universe of COMPUSTAT firms at the end of each fiscal year. Financing categories are defined in the Appendix.

making large capital expenditures adjust financing over the course of a multi-year investment project, and Harford, Klasa, and Walcott (2009) show that acquiring firms soon retire much of the debt they issue to finance an acquisition.

Suppose that a firm's cash flow statements indicate a large decline in cash balances accompanying a large capital expenditure. This could mean that the firm financed its investment through accumulated retained earnings or that it issued Equity or Debt in year $\tau = -1$ and held the proceeds as cash until investment bills came due. Another possible multi-year financing is that a firm borrows in year $\tau = 0$ to finance an acquisition and then issues shares in year $\tau = +1$ to repay the loan. In this case, the event-year values in (1) would mistakenly indicate a Debt-financed investment. Other examples can be readily constructed. The general point is that a firm might make advance arrangements to fund a planned large investment, or it might use a temporary source of funds while intending to obtain permanent financing later.

We investigate the possible dynamics of investment financing in Panel C of Table IV, which illustrates the extent to which financing proportions change over time. For each year, we report the median funding proportions, expressed as a percentage of total Built plus Acquired investments over the widest event window, $\tau=[-1, +1]$.[15] DEBT and EQUITY issuances are heavily concentrated in the event year for both Built investments and Acquisitions. OTHER financing manifests large proportional fluctuations, but it constitutes a small component of total financing. Only CASHFLOW shows substantial contributions outside the event year. The median major investment—Built *or* Acquired—is roughly 30% funded by CASHFLOW over the widest event window ($\tau=[-1, +1]$). These financing patterns are consistent with DeAngelo H., DeAngelo L., and Whited's (2011) model of capital structure dynamics with endogenous investment, which predicts that Built investment "spikes" are financed almost entirely by "transitory" DEBT issues. In particular, the fact that DEBT funds the largest share of major investments in our sample mirrors their evidence of significant debt issuance at investment spikes. Also consistent with DeAngelo *et al.*, our firms use a substantial amount of cash flow over a wider event window.

3. Estimating Target Leverage

To compare the tradeoff hypothesis with the pecking order or market timing hypotheses (which specify no target leverage ratio), we need estimates of each firm's target leverage. We define leverage as

$$\mathrm{LEV}_t = \frac{D_t}{D_t + E_t} \tag{2}$$

where $\boldsymbol{D_t}$ denotes the book value of interest-bearing debt (COMPUSTAT items 9 plus 34) at time t and $\boldsymbol{E_t}$ is the firm's equity value. We present the results based on the market value of equity (price per share times the number of shares outstanding) in Tables V and VII; similar results obtain when we use equity's book value.

The notion that firms encounter costs of adjusting their capital structure suggests a partial adjustment model to describe firms' leverage changes:

$$\mathrm{LEV}_{i,t} - \mathrm{LEV}_{i,t-1} = \lambda\left(\mathrm{LEV}_{i,t}* - \mathrm{LEV}_{i,t-1}\right) + \tilde{\delta}_{i,t}. \tag{3}$$

According to this specification, the typical firm annually closes a proportion λ of the deviation between its desired ($\boldsymbol{LEV_{i,t}^{*}}$) and its actual ($\boldsymbol{LEV_{i,t-1}}$)

[15] Financing proportions thus differ for $\tau=0$ between Panels B and C because they reflect different deflators.

Table V. Adjustment toward the target debt ratio

This table reports the tendency of event firms to adjust leverage toward computed target ratios by estimating with OLS

$$LEV_{i,t} - LEV_{i,t-1} = \lambda_1 \widehat{DEV}_{i,t} + \sum_{\gamma=0,1,2} (D - Event_{t-\gamma} * \widehat{DEV}_{i,t-1}) + \beta(D - Built * D - Event * \widehat{DEV}_{it}) + \tilde{\delta}_{it}$$

for a variety of firm-year samples. "Events firms" are those with a 1-year-long investment period to ensure well-defined target ratios. The "COMPUSTAT universe" includes all COMPUSTAT firm-years that we searched for major investment events. Reported standard errors are bootstrapped to account for the generated regressor, **DEV**$_{i,t}$, which is the i-th firm's estimated target for the end of year t less its actual leverage at the end of year $t-1$. **D-Event** equals unity in a firm's event year and 0 otherwise. **D-Event**$_{t-\tau}$ equals unity in the τ-th year before a firm's event year and 0 otherwise. **D-Built** equals unity if a firm had a built investment and 0 otherwise. p-values are in parentheses. ***$p<0.01$, **$p<0.05$, *$p<0.1$.

	(1) Event firms at $\tau=0$	(2) All available years for event firms	(3) COMPUSTAT universe incl. all event firms	(4) COMPUSTAT universe incl. acquiring event firms only	(5) COMPUSTAT universe incl. built event firms only	(6) COMPUSTAT universe incl. all event firms	(7) COMPUSTAT universe incl. all event firms
$\widehat{DEV}_{i,t}$	0.43***	0.27***	0.29***	0.29***	0.30***	0.29***	0.30***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D-Event$_t$ * DEV$_{i,t}$ $\widehat{DEV}_{i,t}$	–	0.36***	0.35***	0.38***	0.26***	0.26***	0.32***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D-Event$_t$ $\widehat{DEV}_{i,t}$* D-Built	–	–	–	–	–	–0.12**	–
						(0.01)	
D-Event$_{t-1}$* $\widehat{DEV}_{i,t-1}$	–	–	–	–	–	–	–0.13***
							(0.00)
D-Event$_{t-2}$* $\widehat{DEV}_{i,t-2}$	–	–	–	–	–	–	–0.04
							(0.19)
Firm fixed effects?	No	Yes	Yes	Yes	Yes	Yes	Yes
N	1,615	14,680	61,175	56,998	50,672	61,175	61,175
R^2	0.274	0.65	0.60	0.61	0.61	0.61	0.61

Table VI. Target leverage evolution

The table shows post-event firm characteristics and univariate significance tests for changes from event time $\tau = -1$ (pre-event period) to $\tau = +1$ (post-event period). "prob[Δ(Built) = Δ(Acq)]" denotes the *p*-value from a Wilcoxon rank sum test of the equality of median changes for Built and Acquired investments. **Depreciation/TA** is depreciation and amortization (item 14) over total assets. Other variable definitions are defined in Table III. Note that the number of observations is smaller for Built (max. 626) and Acquired (max. 1,144) than in Table III, because calculation of changes requires that each economic event considered has observations available at $\tau = -1$ and $\tau = +1$. * and *** indicate significance at the 10% and 1% confidence level, respectively.

		Mean	Median	Std.Dev	Mean	Median	Std.Dev	Mean change	Median change	prob[Δ(Built) = Δ(Acq)]
	Panel A	Built $\tau = -1$			Built $\tau = +1$			Built		
1.	Tobin's *Q*	4.63	2.62	5.70	3.37	2.17	4.31	−1.26***	−0.49***	–
2.	Size	4.14	4.07	1.76	4.90	4.82	1.73	0.76***	0.60***	–
3.	Depreciation/TA	7.12	6.09	4.71	7.74	6.55	5.04	0.62***	0.19***	–
4.	Fixed Asset Ratio	50.67	51.56	24.98	61.45	64.30	22.18	10.78***	8.86***	–
5.	R&D	3.50	0.00	9.55	2.92	0.00	8.54	−0.58***	0.00***	–
6.	Rated	0.09	0.00	0.29	0.16	0.00	0.36	0.07***	0.00***	–
7.	Profit	−0.05	0.04	0.28	−0.08	0.01	0.27	−0.03***	−0.02***	–
8.	Target debt ratio	26.23	21.63	23.56	31.04	26.08	25.08	4.81***	3.92***	–
9.	Market debt ratio	13.93	6.94	17.79	26.53	20.71	24.55	12.6***	8.76***	–
	Panel B	Acquisitions $\tau = -1$			Acquisitions $\tau = +1$			Acquisitions		
10.	Tobin's *Q*	4.10	2.69	4.58	2.99	2.01	3.49	−1.11***	−0.51***	0.73
11,	Size	5.56	5.47	1.82	6.26	6.23	1.78	0.70***	0.60***	0.92
12.	Depreciation/TA	4.57	3.92	3.13	4.92	4.07	3.59	0.35***	0.07***	0.06*
13.	Fixed Asset Ratio	22.25	17.01	18.06	20.68	15.87	16.90	−1.57***	−1.18***	<0.001***
14.	R&D	4.14	0.00	7.83	3.88	0.00	7.34	−0.26***	0.00***	0.65
15.	Rated	0.22	0.00	0.42	0.35	0.00	0.48	0.13***	0.00***	<0.001***
16.	Profit	0.03	0.06	0.17	−0.03	0.03	0.22	−0.06***	−0.02***	0.10*
17.	Target debt ratio	26.37	21.95	22.94	31.80	27.18	25.02	5.43***	3.41***	0.59
18.	Market debt ratio	15.48	10.43	17.08	27.18	22.17	23.64	11.67***	7.20***	0.42

leverage. The desired (target) leverage is typically expressed as a linear combination of lagged firm characteristics ($X_{i,t-1}$), giving the estimable model

$$\text{LEV}_{i,t} = (\lambda\beta)X_{i,\,t-1} + (1-\lambda)\text{LEV}_{i,\,t-1} + \tilde{\delta}_{i,\,t}. \tag{4}$$

In line with previous research, the vector X includes earnings, depreciation, fixed assets, and R&D expenditures (all as a proportion of total book assets); the assets' market-to-book ratio; the log of (real) total assets; a dummy variable indicating whether the firm has a credit rating; and firm fixed effects.The estimated coefficients ($\hat{\beta}$, $\hat{\lambda}$) are then used to compute a target debt ratio ($\widehat{LEV}^*_{i,t-1}$) for each firm at the end of each year. We define each firm's deviation from its target leverage as

$$\widehat{\text{DEV}}_{i,t} = \widehat{\text{LEV}}^*_{i,t-1} - \text{LEV}_{i,t-1} = \hat{\beta}X_{i,t-1} - \text{LEV}_{i,t-1}. \tag{5}$$

We can estimate a modified version of (3) with ordinary least squares (OLS):

$$\text{LEV}_{i,\,t} - \text{LEV}_{i,t-1} = \lambda_1(\widehat{\text{DEV}}_{i,t}) + \delta_{it}. \tag{3a}$$

If our target proxy is sensible, we should find $\lambda_1 > 0$.

3.1 EVIDENCE ON ADJUSTMENT TOWARD ESTIMATED TARGET DEBT RATIOS

The adjustment speed in (3) reflects a balance between adjustment costs and the (presumed) offsetting benefits of moving toward target leverage. To construct the leverage targets in (5), we estimate the panel regression (4) with the Blundell–Bond system generalized method of moments (GMM) estimator for the restricted COMPUSTAT universe of firms during the 1971–2006 period. Appendix B reports the results, which are consistent with existing literature (e.g., Lemmon, Roberts, and Zender, 2008). In particular, the coefficient of 0.77 on the lagged market debt ratio implies an annual adjustment speed of 23%.

Because our event firms are likely to be seeking external funds, they have unusually low costs of adjusting leverage and should find it cost-effective to issue securities that reduce $|\text{DEV}_{i,t}|$. Table V reports estimates of regression (3a) as a means of learning about the relationship between large investment events and leverage adjustments. The results come from a two-step procedure. The first step computes target leverage and DEV from the coefficients and fixed effects estimated in Appendix B. In step two, we estimate (3a) using OLS with bootstrapped standard errors to compensate for the generated regressor. We include only economic events with a single event year so that the leverage change occurs in the same time interval for all events. Column (1) of Table V estimates (3a) using only event firm-years, which occur in the 1989–2006 sample period. The significant positive coefficient on $\widehat{DEV}_{i,t}$ indicates that firms with major investments move 43% of the way toward the targets we have estimated—substantially faster than the adjustment speeds estimated from a broad population of firms. More important for our purposes, this rapid estimated adjustment speed is consistent with the hypothesis that we have estimated target leverage ratios that are relevant to sample firms.

Recall, however, that our sample firms are not distributed across industries similarly to the restricted COMPUSTAT universe. Therefore, an examination of adjustment speeds must countenance the possibility that different industries have different optimal adjustment speeds. If so, the results in column (1) of Table V may reflect the sample's industrial composition rather than the effect of financing large investments. To investigate this possibility, we augment (3a) to distinguish between event and non-event years:

$$\mathrm{LEV}_{i,\,t} - \mathrm{LEV}_{i,\,t-1} = \lambda_1(\widehat{DEV}_{i,\,t}) + \lambda_2(\mathrm{D} - \mathrm{Event}_i,\, t * \widehat{DEV}_{i,\,t}) + \delta_{it}, \quad \text{(3b)}$$

where $\mathbf{D\text{-}Event}_{i,t} = 1$ if the i-th firm has a large investment during year t and 0 otherwise. In addition, λ_1 measures these firms' typical adjustment speed, and λ_2 measures the incremental adjustment associated with large investments. Column (2) of Table V reports results from estimating (3b) using all the event firms' available data. The coefficient on $\widehat{\mathbf{DEV}}_{i,t}$ indicates that these firms have a 27% speed of adjustment (SOA) in non-event years—at the high end of the range typically reported in other studies. Column (3) reports the same regression estimated over the restricted COMPUSTAT universe and yields a similar adjustment speed (29%) in the non-event years. In other words, the firms with major investments do not have a substantially different SOA during non-event years, and the adjustment speed more than doubles during event years.

Columns (4) and (5) in Table V differentiate between Built and Acquired event firms. Event-year adjustment is substantially faster for either type of investment, though the Built firms *apparently* adjust less rapidly during the event year (0.26) than the Acquiring firms (0.38). This is further confirmed in column (6), which reports a separate event-year adjustment coefficient for firms with Built investments, which close 12% less of their leverage gaps in the event year. We return to this issue in Section 5.

Finally, column (7) of Table V examines how event firms converge toward their target leverage in the 2 years *preceding* large investments. Event firms manifest no differential adjustment speed 2 years before the event, but in the immediately preceding year, event firms move significantly away from target leverage. This finding is consistent with the notion that adjustment costs are substantial, and firms anticipating a near-term entry to external capital markets worry less (than other firms) about their current leverage.

Overall, we conclude from Table V that our computed leverage targets are meaningful. Firms reliably move toward our estimates of their target leverage. Moreover, firms move particularly rapidly toward their targets in the years when they need to finance large investments.

3.2 LEVERAGE TARGET EVOLUTION

Studying large investments sharpens our focus on how firms select their capital structures. However, such large investments may also change a firm's characteristics quite substantially and, thus, its target leverage (Gomes and Schmid, 2010). So far, our results have computed targets from lagged (pre-investment) firm characteristics. Yet managers may be able to predict how some determinants of target leverage (e.g., fixed assets, size, depreciation) will change as a result of the pending investment. If the investment will change target leverage substantially, we should incorporate this fact into our estimations. Subsequently, we address whether these changes affect our conclusions about the determinants of capital structure. (They do not.) Here, we explore how substantially target leverage ratios change as a result of sample investments.

Table VI summarizes how large Built (Panel A) and Acquired (Panel B) investments affect the determinants of target leverage and (thus) the firm's estimated target leverage. We measure these changes between the end of the year preceding the event ($\tau=-1$) and the end of the year following the event ($\tau=+1$).[16] It is not surprising that ***Q*** falls after a major investment (see row 1) or that **Size** rises (row 2). Predictably, the **Fixed Asset Ratio** rises for Built investments, presumably because these constitute the exercise of real growth options. In contrast, the **Fixed Asset Ratio** falls slightly for Acquisitions, consistent with targets having fewer assets-in-place than acquirers. Perhaps the most surprising result in Table VI is that the proportion of sample firms with an S&P issuer rating (**Rated = 1**) rises substantially, from 9% (22%) to 16% (35%) for Built (Acquired) investments (rows 6 and 15). This is

[16] We measure event-driven changes in firm characteristics over the two-year period from $\tau=-1$ to $\tau=+1$ to evaluate r, a well-defined post-event period. Using changes from $\tau=-1$ to $\tau=0$ instead would not have yielded unique post-event periods, because several economic events comprise multiple successive event years.

consistent with the idea that firms increase their reliance on external, market-based funding to finance major investments. The mean and median changes in each of these variables differ significantly from 0, indicating that the sample investments prominently affect firm characteristics.

In computing a forward-looking leverage target, simply combining the coefficient estimates from (4) with $\tau = +1$ data inappropriately includes some information that was unknown to managers when they made the investment. Specifically, they would not know their full-year earnings or the year-end value of ***Q***. Conversely, managers should be able to estimate post-merger values for **Size**, **Depreciation**, **Fixed Asset Ratio**, **R&D**, and **Rated**. We therefore continue to use $\tau = -1$ values of earnings and Q to compute forward-looking leverage targets.

The firms' characteristic changes raise the typical target debt ratio from an initial median of approximately 22% to 27% after the investment has been implemented (rows 8, 17). The mean Market Debt Ratio (rows 9, 18) nearly doubles, from approximately 14–15% to 6–27%. The net effect is that firms close their **DEV** substantially when they make large investments: Built firms' mean absolute **DEV** falls from 12.3% of assets (= 26.33 – 13.93) before the investment event to 4.51% (= 31.04 – 26.53) after. Acquiring firms reduce mean absolute **DEV** from 10.9% to 4.62%. In other words, Table VI indicates that major investments significantly affect target leverage ratios and that firms approach their forward-looking targets when choosing how to finance their large investments.

4. Testing Capital Structure Theories in a Unified Framework

To assess the relevance of the alternative capital structure hypotheses, we estimate a set of four seemingly unrelated regressions (SURs) to explain how firms pay for their major investments.

4.1 METHOD

We estimate

$$\begin{aligned} F_{ijt} = {} & a_i + \beta_1 \widehat{DEV}_{j,t-1} + \beta_2 \text{Profit}_{j,t-1} + \beta_3 \text{Runup}_{j,t-1} + \beta_4 \text{Q}_{j,t-1} \\ & + \beta_5 \text{Investment Ratio}_{j,t} + \beta_6 \text{Fixed Asset Ratio}_{j,t-1} \\ & + \beta_7 \text{Size}_{j,t-1} + \beta_8 \text{Rated}_{i,t-1} + \sum_{y=1989}^{2005} \delta y + \tilde{\varepsilon}_{ijt}, \end{aligned} \tag{6}$$

Where F_{ijt} = the proportion of the *i*-th firm's new investment financed by each of the four funding sources (*j* = EQUITY, DEBT, CASHFLOW, OTHER) during period *t*.

$\mathbf{DEV}_{i,t} = \widehat{\mathrm{LEV}}^{*}_{i,t-1} - \mathrm{LEV}_{i,t-1}$, which proxies for the *i*-th firm's deviation from target leverage at the end of period $t - 1$.[17]

$\mathbf{Profit}_{i,t-1}$ = net annual income before extraordinary items, as a proportion of book assets. Under the pecking order hypothesis, firms should issue DEBT when internal CASHFLOW cannot finance available investment projects.

$\mathbf{Runup}_{i,t-1}$ = the stock's excess return over the market, during a 12-month period preceding the start of the event period.[18] Firms tend to issue stock following a share price run-up (Korajczyk, Lucas, and McDonald, 1991).

$\boldsymbol{Q}_{i,t-1}$ = the ratio of the firm's equity market value to the book value of equity. ***Q*** may measure several factors that influence corporate investment and financing behavior: It is commonly treated as a proxy for the firm's investment opportunity set. It may also pick up stock mis-pricing. We discuss our results with both possible interpretations in mind.

$\mathbf{Investment\ Ratio}_{i,t}$ = the ratio of (Built to Acquired) investments during the event window to book total assets at the end of the year preceding the event window. A relatively larger investment may require more external financing, or firms may save more cash in anticipation of a larger future investment.

$\mathbf{Fixed\ Asset\ Ratio}_{i,t-1}$ = the firm's year-end book value of fixed assets (item #8) as a proportion of total assets. Larger amounts of fixed assets generate larger internal cash flows through depreciation, which reduces the need for external financing. In contrast, greater fixed assets increase debt capacity. $\mathbf{Size}_{i,t-1}$ = log of the *i*-th firm's book assets, measured in year-2000 dollars.

$\mathbf{Rated}_{i,t-1}$ = a dummy variable indicating whether a firm has a long-term issuer rating from S&P.

Dy = 1 in year ***y*** (*y* = 1989, 2005) and 0 otherwise (coefficients not reported in Table VII).

Our primary interest lies with the first four explanatory variables, which capture the three alternative capital structure hypotheses. The remaining

[17] These results use lagged firm characteristics to construct target leverage. Similar results occur with the forward-looking targets described in Table VI.

[18] For event windows beginning in year 0, we compute this return over the months [–24,–12] relative to the start of the event fiscal year. For the event window [–1, +1], we compute this excess return over the months [–36,–24] relative to the start of the event's fiscal year.

Table VII. SUR estimates

We estimate four equations of the form:

$$F_{ijt} = a_i + \beta_1 \widehat{DEV}_{j,\,t-1} + \beta_2 \mathrm{Profit}_{j,\,t-1} + \beta_3 \mathrm{Runup}_{j,\,t-1} + \beta_4 Q_{j,\,t-1} + \beta_5 \mathrm{Investment\ Ratio}_{j,\,t} + \beta_6 \mathrm{Fixed\ Asset\ Ratio}_{j,\,t-1} + \beta_7 \mathrm{Size}_{j,\,t-1} + \beta_8 \mathrm{Rated}_{i,\,t-1} + \sum_{y=1989}^{2005} \delta y \tilde{\varepsilon}_{ijt}, \quad (6)$$

where $\mathbf{F}_{it}$ = the proportion of the net new investment financed by each of the four funding sources: (i = Equity, Debt, Cashflow, and Other) during the event window t.

a_i = Constant of regression i ($i = 1, \ldots, 4$), reflecting the average financing share of each financing source at a given event window, after controlling for the average effect of all explanatory variables (needs to add up to 100%).

DEV = the deviation from target leverage: the firm's estimated target debt ratio (based on a partial adjustment model and estimated by the Blundell–Bond system GMM estimator) less its actual market debt ratio before the event window (at $\tau = -1$ if event window is 0, [0, 1] and $\tau = -2$ if event window is [–1, 1]).

Profit = net annual income as a proportion of year-end total assets.

Runup = the stock's excess return, relative to the market, measured over 12 months in the fiscal year preceding the event window under consideration. Thus, if the event window starts at $\tau = 0$, *Runup* is measured over the months [–24, –12]; if it starts at $\tau = -1$, *Runup* is measured over the months [–36, –24]. Firms tend to issue stock following a run-up in the price (Korajczyk, Lucas, and McDonald, 1991).

Q = the ratio of the firm's equity market value to the book value of equity at the year-end preceding the event window. ***Q*** measures the firm's investment opportunity set.

Investment Ratio = the ratio of investment expenditures (built plus acquired) during the event window to book total assets at the year-end preceding the event window. Larger investments may be financed differently.

Fixed Asset Ratio = a measure of "debt capacity": the firm's year-end book value of fixed assets as a proportion of total assets.

Size = log of the firm's year-end book assets, measured in 2,000 dollars.

Rated = Dummy variable, indicating that the firm is rated by S&P.

Dy represents a set of year dummy variables, covering 1989–2005.

Within each event window, the system of equations is estimated using restrictions (i) that each independent variable's four coefficients sum to 0 and (ii) that constants need to add up to 100% across the four equations. The regressions are based on economic events, defined as major investments with adjacent event years, starting with a pre-event and ending with a post-event year (e.g., a sequence in event time of [–1, 0, 0, +1] over 4 years). p-values are in parentheses. * indicates statistical significance at least at the 10% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Event window: $\tau = 0$				Event window $\tau = [0, +1]$				Event window: $\tau = [-1, +1]$			
Dependent variable	Debt	Equity	Cashflow	Other	Debt	Equity	Cashflow	Other	Debt	Equity	Cashflow	Other
A. Market leverage measure, Built investments												
$\widehat{DEV}_{j,\,t-1}$	0.88*	−1.27*	0.43	−0.04	0.94*	−1.11*	0.22	−0.05	1.00*	−0.68*	−0.05	−0.27
	(0.00)	(0.00)	(0.11)	(0.87)	(0.00)	(0.00)	(0.36)	(0.80)	(0.00)	(0.01)	(0.85)	(0.18)
Profit	0.01	−3.01*	3.09*	−0.09	0.07	−3.19*	3.44*	−0.31*	0.16	−3.16*	3.33*	−0.34*
	(0.92)	(0.00)	(0.00)	(0.66)	(0.53)	(0.00)	(0.00)	(0.05)	(0.13)	(0.00)	(0.00)	(0.07)
Runup (12 months pre-ceding event window)	0.00	0.37*	−0.27*	−0.10*	0.02	0.24*	−0.18*	−0.08*	−0.01	0.22*	−0.14	−0.07
	(0.99)	(0.00)	(0.00)	(0.06)	(0.54)	(0.00)	(0.00)	(0.07)	(0.76)	(0.02)	(0.17)	(0.33)
Q	0.24	1.70	−0.47	−1.46	1.04*	1.11	−1.45	−0.71	0.53	2.20*	−1.67	−1.05
	(0.66)	(0.24)	(0.66)	(0.15)	(0.05)	(0.28)	(0.14)	(0.39)	(0.33)	(0.07)	(0.20)	(0.26)

(continued)

Table VII. (Continued)

	(1)	(2) Event window: $\tau = 0$	(3)	(4)	(5)	(6) Event window $\tau = [0, +1]$	(7)	(8)	(9)	(10) Event window: $\tau = [-1, +1]$	(11)	(12)
Dependent variable	Debt	Equity	Cashflow	Other	Debt	Equity	Cashflow	Other	Debt	Equity	Cashflow	Other
Investment Ratio	0.00	−0.03*	0.02*	0.00	−0.00	−0.02*	0.02*	0.00	0.00	−0.01*	0.01*	−0.00
	(0.59)	(0.03)	(0.02)	(0.74)	(0.73)	(0.01)	(0.00)	(0.86)	(0.58)	(0.00)	(0.01)	(0.68)
Fixed Asset Ratio	−0.18*	−0.93*	0.60*	0.51*	−0.19*	−1.01*	0.68*	0.52*	−0.16*	−1.16*	1.11*	0.21
	(0.08)	(0.00)	(0.00)	(0.01)	(0.07)	(0.00)	(0.00)	(0.00)	(0.07)	(0.00)	(0.00)	(0.17)
Size	−1.81	6.21	−1.55	−2.86	−3.09*	3.89	−0.12	−0.68	−3.40*	−2.65	6.06	−0.01
	(0.28)	(0.16)	(0.65)	(0.37)	(0.07)	(0.22)	(0.97)	(0.79)	(0.04)	(0.47)	(0.13)	(1.00)
Rated	14.96*	−32.40	11.40	6.05	15.95*	−17.25	−5.27	6.58	18.19*	−7.01	−18.86	7.68
	(0.09)	(0.17)	(0.52)	(0.72)	(0.07)	(0.30)	(0.75)	(0.63)	(0.03)	(0.71)	(0.37)	(0.61)
Const.	70.18*	39.60	−9.57	−0.21	51.09*	87.35*	−22.34	−16.10	56.39*	160.41*	−93.48*	−23.32
	(0.00)	(0.36)	(0.75)	(0.99)	(0.00)	(0.00)	(0.43)	(0.49)	(0.00)	(0.00)	(0.01)	(0.46)
Nobs	689	689	689	689	689	689	689	689	658	658	658	658
R^2	0.10	0.33	0.39	0.07	0.12	0.47	0.48	0.06	0.14	0.41	0.36	0.04
B. Market leverage measure, Acquired investments												
$\widehat{DEV}_{j,\ t-1}$	0.70*	−0.61*	−0.02	−0.07	0.73*	−0.60*	−0.11	−0.02	0.77*	−0.54*	−0.23*	−0.00
	(0.00)	(0.00)	(0.83)	(0.33)	(0.00)	(0.00)	(0.23)	(0.76)	(0.00)	(0.00)	(0.02)	(0.98)
Profit	0.20*	−0.98*	1.37*	−0.59*	0.15*	−1.14*	1.74*	−0.74*	0.13*	−1.06*	1.55*	−0.62*
	(0.01)	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)
Runup (12 months preceding event window)	−0.05*	0.16*	−0.02	−0.09*	−0.03*	0.15*	−0.06*	−0.07*	−0.03*	−0.01	0.06	−0.02
	(0.00)	(0.00)	(0.36)	(0.00)	(0.07)	(0.00)	(0.01)	(0.00)	(0.09)	(0.76)	(0.10)	(0.59)
Q	−0.10	2.20*	−1.75*	−0.36	−0.02	1.83*	−1.86*	0.05	−0.02	3.40*	−3.37*	−0.02
	(0.73)	(0.00)	(0.00)	(0.25)	(0.93)	(0.00)	(0.00)	(0.87)	(0.95)	(0.00)	(0.00)	(0.96)
Investment Ratio	−0.00	0.00	−0.00	0.00	−0.00	0.00	−0.00	0.00	−0.00	0.00	−0.00	0.00
	(0.21)	(0.58)	(0.37)	(0.15)	(0.22)	(0.36)	(0.20)	(0.13)	(0.30)	(0.14)	(0.14)	(0.29)
Fixed Asset Ratio	0.32*	−0.42*	0.10	−0.00	0.13*	−0.41*	0.23*	0.04	0.08	−0.42*	0.22*	0.13
	(0.00)	(0.00)	(0.23)	(1.00)	(0.03)	(0.00)	(0.01)	(0.58)	(0.17)	(0.00)	(0.03)	(0.11)
Size	−3.79*	0.61	1.40	1.79*	−3.20*	−0.28	1.43	2.05*	−2.62*	−2.90*	1.83	3.70*
	(0.00)	(0.61)	(0.15)	(0.03)	(0.00)	(0.77)	(0.16)	(0.02)	(0.00)	(0.01)	(0.15)	(0.00)
Rated	10.72*	−8.34*	−0.26	−2.13	11.22*	−7.88*	0.40	−3.74	12.70*	−6.59	−1.43	−4.68
	(0.00)	(0.08)	(0.95)	(0.54)	(0.00)	(0.04)	(0.92)	(0.30)	(0.00)	(0.13)	(0.78)	(0.25)
Const.	44.39*	53.87*	−5.74	7.48	46.97*	59.97*	−1.07	−5.87	43.51*	45.13*	18.97*	−7.61
	(0.00)	(0.00)	(0.66)	(0.32)	(0.00)	(0.00)	(0.93)	(0.62)	(0.00)	(0.00)	(0.07)	(0.44)
Nobs	1233	1233	1233	1233	1233	1233	1233	1233	1157	1157	1157	1157
R^2	0.16	0.24	0.26	0.08	0.16	0.32	0.32	0.12	0.20	0.33	0.31	0.11

explanatory variables (**Size**, **Investment Ratio**, and **Fixed Asset Ratio**) control for heterogeneous investment and firm characteristics that might influence financing choices.

The accounting identity (1) imposes two cross-equation constraints on the equation system (6):

(i) All investments must be financed, requiring that the four regressions' intercept terms sum to 100%.
(ii) Slope coefficients in (6) measure the (*ceteris paribus*) impact of the associated regressors on the firm's use of each type of financing. Because these funding shares always sum to unity, the regressors' coefficients must sum to 0 across funding sources for any time interval.

SCF data should obey these constraints by construction (see footnote 11). We estimate the four versions of (6) with SUR and impose these two constraints on the coefficients. The data fail to reject the imposed constraints, implying that the accounting is correctly done. The OLS estimates of (6) are virtually identical to the constrained SUR estimates reported in Table VII.

To allow for systematic revisions to financing patterns outside the event year, we estimate variants of (6) over three different event windows:

$\tau = 0$, the event year;

$\tau = [0, 1]$, the event year and one successive year; and

$\tau = [-1, +1]$, a 3-year period centered on the event year.

Consistent with the limited issuance of DEBT and EQUITY outside the event year (Table IV, Panel C), estimation results vary little across the alternative event windows.

Because **DEV**iation is measured as the target less actual debt ratio, the tradeoff hypothesis implies that **DEV** should carry a positive (negative) coefficient in the DEBT (EQUITY) regression. For example, an over-leveraged firm has **DEV** < 0 and moves toward the target by financing with EQUITY. Under the pecking order hypothesis, higher profits should be accompanied by less external financing and particularly less debt financing (Fama and French, 2002). *Across* equations, the standard pecking order hypothesis further implies that the coefficients on profit in the DEBT and CASHFLOW regressions should have opposite signs. **Runup** and ***Q*** may capture opportunistic equity issuances, as in the market timing hypothesis. Alternatively, they may indicate an abundance of investment opportunities that, with the tradeoff hypothesis, implies a preference for low leverage and, thus, for equity financing. ***Q*** should target leverage because it proxies for investment opportunities (and indeed it carries a significantly negative coefficient in Appendix B) and therefore should have no tradeoff-related effect in (6).

However, we purposefully omit **Runup** from target leverage because it represents only a transitory phenomenon. To the extent that **Runup** reflects a particularly prominent set of investment opportunities, it might have a tradeoff interpretation in (6).

4.2 RESULTS

Table VII presents the results of estimating (6) separately for Built and Acquired investments, using a market-value-based measure of the **DEV**iation from target leverage. *p*-values for the hypothesis that a coefficient equals 0 appear in parentheses below each coefficient. Note that space limitations lead us to indicate significance at the 1% confidence level unconventionally, with a single asterisk. Although we present results for three event windows, our discussion emphasizes the narrowest event window ($\tau = 0$, in columns (1)–(4)) because the wider event windows yield qualitatively similar conclusions about the main hypotheses.

Panel A of Table VII reports results for firms with major Built investments. The positive coefficient on **DEV** in the DEBT regression (column (1)) indicates that under-leveraged firms (**DEV** > 0) use more debt financing, consistent with the tradeoff hypothesis. The negative coefficient on **DEV** in the EQUITY regression (column (2)) also supports tradeoff behavior, and the similar-sized coefficients on **DEV** in the DEBT and EQUITY regressions suggest an approximate symmetry in leverage adjustments. A one standard deviation increase in **DEV** (6.34 percentage points) raises the proportion of DEBT funding in the event year by 5.58% (= 0.88 * 6.34) of the investment amount and reduces EQUITY funding by 8.05%. The tradeoff hypothesis thus receives significant support.

The estimated coefficients on **Profit** for $\tau = 0$ indicate that more profitable firms finance more of their major investments with internal CASHFLOW. (Recall that CASHFLOW includes changes in the firm's cash balances.) That is, more profitable firms prefer internal to external funding, consistent with the pecking order hypothesis. But this is not the end of the story. The usual pecking order story asserts that adverse selection costs lead firms to issue DEBT when CASHFLOW is insufficient to finance their desired investments. Here, the negative (0) coefficient on **Profit** in the EQUITY (DEBT) regression indicates that CASHFLOW substitutes primarily for *EQUITY* issuance, leaving leverage approximately unaffected by firm profitability. This substitutability between internal funds and equity is consistent with a pecking order hypothesis in which outside investors believe the firm's asset returns are riskier (volatile) than managers believe is warranted (Myers, 1984, p. 584). Substituting equity for internal funds, however, has no effect on leverage and is not consistent with the pecking order hypothesis as it is usually presented.

The significantly positive coefficient on **Runup** in column (2) of Table VII indicates that firms with higher recent stock returns finance their Built investments with more EQUITY. If **Runup** indicates temporarily over-valued EQUITY, this substitution is consistent with the market timing hypothesis. In contrast, if greater **Runup** signals the arrival of more growth opportunities, its positive coefficient in column (2) is consistent with the tradeoff hypothesis because firms issue equity to reduce debt overhang concerns. **Runup** has no significant effect on DEBT, but it depresses the firm's use of internal CASHFLOW, leaving only a limited impact of **Runup** on leverage. The non-significant coefficient estimates for ***Q*** in columns (1)–(4) do not support the market timing hypothesis for Built investment financing. The investment's relative size and firm asset composition also affect funding. The estimated coefficients on the **Investment Ratio** indicate that larger investments are financed with more CASHFLOW and less new EQUITY, consistent with anticipatory saving. The coefficients on the **Fixed Asset Ratio** indicate that firms with more tangible assets rely less on external financing (particularly EQUITY) and more on internally generated funds (CASHFLOW and OTHER), consistent with tangible assets generating greater depreciation-related cash flows. The insignificant coefficients on firm **Size** indicate that funding choices for major Built investments are not closely related to firm size. Finally, the coefficient on **Rated** is significantly positive in the DEBT regression, consistent with Faulkender and Petersen's (2006) evidence that public debt market access is associated with increased leverage.

Panel B of Table VII presents estimation results for firms making major Acquisitions. We again limit the discussion to the event year's financing ($\tau = 0$) while also reporting results for two wider event windows: $\tau = [0, +1]$ and $\tau = [-1, +1]$. The impacts of **DEV** on DEBT and EQUITY (columns (1) and (2)) again support the hypothesis that firms with large financing needs pursue outside financing that moves them toward their target leverage ratios (Harford, Klasa, and Walcott, 2009). As with Built investments, **DEV** carries similar-sized coefficients on Debt and Equity, suggesting symmetry in the implied leverage adjustments. The effect of **Profit** again contradicts the usual pecking order story. More profitable firms use CASHFLOW to replace new EQUITY, not DEBT. Indeed, new DEBT issuance is *positively* related to profitability (consistent with Frank and Goyal (2011) and Harford, Klasa, and Walcott (2009)).

Runup now significantly increases EQUITY issuance and reduces DEBT issuance and OTHER. As in Panel A of Table VII, the net effect of **Runup**

is to reduce leverage, which is consistent with either the market timing or the tradeoff hypothesis. Higher ***Q*** increases EQUITY for Acquisitions and reduces CASHFLOW financing. These offsetting effects again leave leverage relatively unaffected. This effect of ***Q*** is consistent with the market timing hypothesis if we interpret a higher ***Q*** as implying more over-priced shares (Baker and Wurgler, 2002).

Among the control variables' coefficients in Panel B of Table VII, the size of the investment (**Investment Ratio**) has no significant effect on financing patterns, and firms with more tangible assets (**Fixed Asset Ratio**) tend to finance major Acquisitions with more DEBT and less EQUITY, consistent with fixed assets increasing a firm's debt capacity. Larger firms tend to finance Acquisitions more with internal (OTHER) funds and less DEBT. Finally, we again find that a credit rating encourages DEBT use and, in this case, also significantly discourages EQUITY issuance. We discuss the differences between Built and Acquired financing patterns further in Section 5.

Several broad conclusions emerge from Table VII. The tradeoff hypothesis receives strong support: DEBT and EQUITY financing proportions reflect firms' deviations from their target leverage ratios. Higher profits lead firms to finance more with internal funds, consistent with the usual pecking order hypothesis. However, the internal CASHFLOW replaces EQUITY issuance, not DEBT issuance. This substitution leaves leverage unchanged and contradicts the hypothesis that firms generally choose to issue debt over equity claims. When outsiders have a more positive assessment of the firm's value, as indicated by higher **Runup**, new EQUITY tends to be issued, consistent with the market timing and tradeoff hypotheses. *Q* does not affect leverage for either Built or Acquired investments, but it does cause CASHFLOW to replace EQUITY in financing Acquisitions, consistent with the idea that a high *Q* is associated with over-valued shares.

Before concluding this section, we revisit the idea that large investments are likely to affect target leverage. Recall that in Table VI we showed that major investments influence target leverage. We therefore replicated Table VII using the forward-looking target debt ratios described in Section 3.2 and found similar estimates of the coefficients on the main variables of interest for capital structure theories. We conclude that our results are robust to the possibility that target leverage reflects some post-investment characteristics.

5. Leverage Adjustments for Built versus Acquired Investments

One of the potential contributions of our work is to highlight differences in financing behavior across investment *types* (Built versus Acquired). Thus far, however, it is unclear from the results whether leverage adjustment speeds indeed differ for Built and Acquired. Comparison of columns (4) and (5) in Table V indicates that Built investments have *smaller* leverage adjustment speeds. Yet Table VII estimates suggest that Built firms adjust their DEBT and EQUITY issuances *more aggressively* in response to **DEV**. For example, the coefficient on **DEV** in the DEBT regression of Table VII, Panel A, is 0.88 for Built investments versus 0.70 in Panel B for Acquisitions (both results measured for $\tau = 0$). Likewise, **DEV** carries a coefficient of -1.27 (–0.61) in the EQUITY regression for Built (Acquiring) firms. In the Built and Acquired results, the **DEV** coefficients in the DEBT and EQUITY regressions differ reliably from each other at the 1% confidence level.[19] Can these two (apparently conflicting) observations be reconciled? We attempt to do so here.

First, we define leverage (L) as

$$L = D/(D + E)$$

where $D =$ the dollar value of pre-investment debt outstanding and $E =$ the dollar value of pre-investment equity outstanding.

Then

$$\frac{\partial L}{\partial D} = \frac{E}{(E + D)^2}, \qquad \frac{\partial L}{\partial E} = \frac{-D}{(E + D)^2},$$

and the change in leverage when financing a major project can be written as

$$dL = \frac{\partial L}{\partial D}\frac{\partial D}{\partial \mathrm{DEV}} d\mathrm{DEV} + \frac{\partial L}{\partial E}\frac{\partial E}{\partial \mathrm{DEV}} d\mathrm{DEV}. \quad (7)$$

Table VII estimates the impact of **DEV** on the proportions of new financing raised from a specific source. Therefore,

$$\frac{\partial D}{\partial \mathrm{DEV}} = \frac{\partial\left(\frac{D}{\mathrm{INV}}\right)}{\partial \mathrm{DEV}} * \mathrm{INV}, \quad (8a)$$

where INV = the dollar amount of investment.

From Table VII, $\frac{\partial(\frac{D}{\mathrm{INV}})}{\partial \mathrm{DEV}} = 0.88$ (0.70) for Built (Acquired) investments. Likewise,

[19] In unreported regressions (available on request), we re-estimated the system of equations in Table VII for the pooled sample of Built and Acquired events. We ran two versions of this regression: one in which we permitted all the right-hand-side variables to take different coefficients for Built versus Acquired events and one in which we permitted only the intercept and the slope on DEV to differ between the two investment types. In both cases, the absolute slope on DEV was significantly larger ($p < 0.01$) for Built investments.

$$\frac{\partial E}{\partial \mathrm{DEV}} = \frac{\partial \left(\frac{E}{\mathrm{INV}}\right)}{\partial \mathrm{DEV}} * \mathrm{INV}, \tag{8b}$$

where $\frac{\partial \left(\frac{E}{\mathrm{INV}}\right)}{\partial \mathrm{DEV}} = -1.27$ (–0.61) for Built (Acquired) investments.

The effect of a new investment on a firm's leverage depends on the relative sizes of the investment and the firm. Consider a standardized firm with assets of \$100 and leverage equal to 15% (which is about the mean for our sample firms). The average event investment constitutes 62% of asset size, or \$62 for our standardized firm. Substituting estimated coefficients and assumed firm features into (7), (8a), and (8b) yields the following:

$$\begin{aligned} &\text{Built}: && dL = \frac{85 * 0.88 * 62 + 15 * 1.27 * 62}{(100)^2} = 0.58 \\ &\text{Acquisitions}: && dL = \frac{85 * 0.70 * 62 + 15 * 0.61 * 62}{(100)^2} = 0.43. \end{aligned} \tag{9}$$

In other words, the typical investment will change leverage by 58% (43%) of a firm's **DEV** for Built (Acquiring) firms. These adjustments differ significantly ($p < 0.05$).

These estimated adjustment proportions appear to be inconsistent with the 12% slower estimated adjustment speed for Built firms in Table V. The resolution comes from recognizing that Table V estimates an adjustment per dollar of DEV, while Equation (6) estimates a leverage adjustment per dollar of INV. Built INV are smaller than Acquired INV, averaging 52% of total assets versus 69%. The typical Built project closes less of its **DEV** gap because it requires less external finance than that required for the typical acquisition. Dollar for dollar, however, Built projects are accompanied by more aggressive changes toward target leverage.

Why? As discussed in the introduction, financing an Acquisition may involve more complex considerations than financing a Built investment because the medium of payment is often important in an acquisition. In particular, prior research suggests that asymmetric information, target shareholders' taxes, and corporate governance all influence acquisition financing.

Many acquisitions are financed entirely with equity because a stock swap enables target shareholders to postpone realizing taxable capital gains (Brown and Ryngaert, 1991).[20] In contrast, a cash deal (which Harford,

[20] Myers and Majluf (1984) predict, and Brown and Ryngaert (1991) find, that acquisition financing is bi-modal, offering predominantly equity or predominantly cash. Betton, Eckbo, and Thorburn (2008, p. 322) report that all-equity bids were particularly common during the 1990s: "the percentage of all-stock offers in initial merger bids was approximately 55%

Klasa, and Walcott (2009) show is likely to be largely debt financed) requires target shareholders to realize a taxable gain. This tax effect tends to reduce the merger premium paid (Wansley, Lane, and Yang, 1983; Travlos, 1987). Risk sharing under asymmetric information may also lead shareholders to prefer equity payments in a merger (Hansen, 1987). If the target is overvalued, paying with bidder shares spreads the loss across both sets of shareholders. Faccio and Masulis (2005) provide evidence consistent with Hansen (1987). On the other side, an acquirer may prefer to pay with cash to avoid creating a large blockholder among the resulting owners (Faccio and Masulis, 2005).

For any of these reasons, large Acquisitions may yield different leverage changes than similar-size Built investments, at least initially. Building a new investment is comparatively simple: design the project, locate the required building material, and pay for the material with cash. Our evidence indicates that Built investments afford a less constrained opportunity to adjust toward target leverage ratios.

6. Robustness

6.1 SAMPLE SELECTIVITY

Major investments occur in only a small proportion of COMPUSTAT firm-years: 2,985 of 83,576 firm-years during our 17-year sample period. It seems unlikely that they occur randomly. As with any event study, it could be argued that conditioning on the event biases the estimated coefficients reported in Table VII. In other words, can we extrapolate our conclusions about the determinants of capital structure to the COMPUSTAT universe from this selected sample? The danger is that unobservable firm features might affect both the propensity to make a large investment and the means of financing that investment. For example, if over-leveraged firms are less inclined to make large investments (as in Uysal's (2011) study of acquisitions), our sample may under-represent firms wanting to reduce their leverage. Conversely, if under-leveraged firms are more likely to invest large amounts, our sample may over-represent firms wanting to raise their leverage by issuing additional debt. Alternatively, firms might accumulate cash balances in advance of making large investments, in which case our regressions may over-estimate the use of CASHFLOWS in investment financing.

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in both periods." This period overlaps with a substantial proportion of our sample: 73.5% (64.5%) of our Built (Acquired) investments occurred between 1990 and 2000.

If such selectivity issues are substantial, observing only completed investments might give the wrong impression about financing preferences.

The resulting "selectivity bias" can be viewed as an omitted variables problem of specification (6), in which the regression's true residual ($\tilde{\varepsilon}_{ijt}$) has a non-zero mean. Uncorrected OLS estimation would yield inconsistent coefficients and mis-stated standard errors (Greene, 2008, p. 883). We apply Heckman's (1979) solution to the problem: we estimate a probit model describing the likelihood of undertaking a major investment. Under certain circumstances (Greene, 2008, pp. 916–917), including the inverse Mills ratio (IMR) in the financing regressions eliminates the omitted variables bias of selectivity in (6).

As usual, the crucial step in estimating a sample-selectivity model is finding variables that affect the decision to invest but do not affect the choice of how to pay for investments. We select different variables to predict the decision to Build or to Acquire a large investment. For Built investments, the variable we expect to influence investment but not financing decisions is the firm's industry's capacity utilization: **Industry Capacity**$_{k,\,t\text{-}1}$ is industry k's percentage capacity utilization at $t-1$, based on the Federal Reserve Board of Governors capacity utilization tables. Higher capacity utilization should encourage firms in the industry to expand productive capacity. Capacity utilization data are available only for mining and manufacturing firms (NAICS industries 21, 31, 32, and 33), which reduces the number of observations for Built investments from 689 in Table VII to 418.

Turning to an instrument for the occurrence of Acquisition events, we note that mergers are known to occur in waves. Recent research highlights the importance of industry shocks to technology or regulation for the propagation of merger waves (Mitchell and Mulherin, 1996; Harford, 2005). Harford (2005) develops an economic shock index as the first principal component from seven industry-level variables: net income scaled by sales, asset turnover, R&D over assets, capex over assets, employee growth, return on assets, and sales growth. Each of these variables is measured as the median absolute change within the industry's firms for a given year. We construct Harford's economic shock index for each industry in our restricted COMPUSTAT sample and include its lagged value as a regressor in the selection equation. We label this variable **Industry Shock Factor**$_{k,\,t\text{-}1}$.

Another identifying variable follows from Uysal's (2011) hypothesis that large investments are easier for under-leveraged firms to undertake. (His evidence applies only to Acquisitions, but we can make an equally plausible argument that leverage deviations affect Built investments.) Specifically, we include in the selection equation two variables that measure a firm's absolute deviation from target leverage:

(1) **DEV(–)** equals absolute target deviation for an over-leveraged firm (when DEV < 0) and 0 otherwise.

(2) **DEV(+)** equals absolute target deviation for an under-leveraged firm (when DEV ≥ 0) and 0 otherwise.

Although the firm's *signed* deviation from target appears in the financing regressions, these two absolute deviation measures provide some element of identification.

Finally, we also use exclusion restrictions to help identify the Heckman model by omitting from the selection equation several variables that affect financing proportions but seem unlikely to influence the likelihood of undertaking a large investment: the dummy **Rated**, the **Investment Ratio**, and the **Fixed Asset Ratio** (for definitions, see Table VII). The **Investment Ratio** is conditional on the investment decision being made, rather than the other way around. The **Fixed Asset Ratio** seems most likely to affect investment decisions if it differs markedly from their industry's norm, and we tend to pick up industry investment concerns with our capacity instrument.

Columns (1)–(5) of Table VIII report the estimated coefficients for the sample-selectivity model of Built investments in the manufacturing industries. **Industry Capacity** in column (1) carries a significantly positive coefficient, as hypothesized. When an industry is operating closer to capacity, large capital expenditures are more likely. We also show that over-leveraged (under-leveraged) firms (as measured by **DEV(–)** and **DEV(+)**) are significantly less (more) likely to build large investments. This finding extends Uysal's (2011) results in two ways. First, we find that his result about over-leveraged firms applies to both built investments and acquisitions. Second, we find support for the complementary hypothesis (unexamined by Uysal (2011)) that under-leveraged firms are *more* likely to build. The other coefficients in column (1) indicate that large Built investments are more likely at firms with a recent stock price **Runup**, firms with higher ***Q***, and smaller firms. (These three variables also affect financing proportions.)

The results in columns (2)–(5) are comparable to the OLS results reported in columns (1)–(4) of Table VII, Panel A. (Note that we add the IMR to the independent variables in Table VII.) The main conclusions from Table VII, Panel A, are not affected by the selectivity adjustments in Table VIII. Debt and Equity financing still tend to close leverage deviations from target (**DEV**), profitability causes the firm to substitute CASHFLOW for equity issuance, and **Runup** encourages the issuance of equity to replace internal

Table VIII. Selectivity-adjusted financing regressions

The table shows regression results for major investment financing (at $\tau = 0$ in event time) based on simple OLS and a Heckman selection model. The sample is limited to firms from the mining and manufacturing industries (NAICS 21, 31, 32, and 33). Unlike Table VII, we impose no cross-equation constraints on the coefficient estimates. We control for possible sample selectivity in the investment decision by estimating a two-step Heckman model. A probit regression, reported in column (1), predicts the incidence of a major Built investment (the selection regression is the same for each type of financing). Columns (2)–(5) show estimates of the determinants of financing for the subset of firm-years with major Built investment, controlling for the IMR. Regressions for each financing source (i.e., DEBT, EQUITY, CASHFLOW, OTHER) are estimated separately, without cross-equation restrictions. Columns (6)–(10) repeat this structure for Acquisitions.

We use several restrictions to identify the system of equations. We exclude the dummy variable **Rated**, the **Investment Ratio**, and the **Fixed Asset Ratio** from the selection equation (variables are defined in Table III). Additional identifying variables only included into the selection model are:

Industry Capacity$_{j\,k,-1}$ equals the percentage of capacity that industry j is operating at $t-1$, based on the capacity utilization tables at the Federal Reserve Board of Governors. Capacity data are available for NAICS industries 21, 31, 32, and 33.

Industry Shock Factor$_{k,t-1}$ is the Harford (2005) industry's k shock factor based on the first principal component of seven economic shock variables at year $t-1$. These factors are based on the 19 NAICS industries relevant for our sample (Table II).

We also include a firm's absolute deviation from its target debt ratio into the selection equation. **DEV(+)** measures absolute deviation if DEV is positive (i.e., a firm is under-leveraged), and **DEV(–)** measures absolute deviation if DEV is negative (i.e., a firm is over-leveraged).

Other variable definitions are provided in Table III. Note that all regressions include (unreported) year dummies. Standard errors are clustered by firm and are based on 100 bootstrap replications. p-values are reported in parentheses, where *, **, ** denotes statistical significance at the 10%, 5%, or 1% level, respectively.

Dependent variable	Selection (Built) (1)	Financing (Heckman Selectivity, Built investments with NAICS 21, 31, 32, and 33)				Selection (Acquisitions) (6)	Financing (Heckman, all Acquisitions)			
		(2) Debt	(1) Equity	(4) Cashflow	(5) Other		(7) Debt	(8) Equity	(9) Cashflow	(10) Other
DEV	–	0.83***	−1.50**	0.44	0.24	–	1.07***	−0.64**	0.20	−0.66***
		(0.00)	(0.01)	(0.26)	(0.48)		(0.00)	(0.03)	(0.45)	(0.01)
Profit	0.00	0.00	−2.50***	2.58***	−0.09	0.01***	0.41**	−0.90***	1.49***	−1.02***
	(0.11)	(0.98)	(0.00)	(0.00)	(0.85)	(0.00)	(0.05)	(0.00)	(0.00)	(0.00)
Runup	0.00***	−0.03	0.35**	−0.24*	−0.08	0.00***	0.01	0.15**	0.02	−0.18***
	(0.00)	(0.49)	(0.02)	(0.08)	(0.54)	(0.00)	(0.91)	(0.04)	(0.72)	(0.00)
Q	0.02***	0.56	4.31	−1.34	−3.53	0.02***	0.17	2.29*	−1.27	−1.26
	(0.00)	(0.49)	(0.23)	(0.47)	(0.21)	(0.00)	(0.79)	(0.09)	(0.31)	(0.15)

(continued)

Table VIII. (Continued)

Dependent variable	Selection (Built) (1)	Financing (Heckman Selectivity, Built investments with NAICS 21, 31, 32, and 33)				Selection (Acquisitions) (6)	Financing (Heckman, all Acquisitions)			
		(2) Debt	(1) Equity	(4) Cashflow	(5) Other		(7) Debt	(8) Equity	(9) Cashflow	(10) Other
Investment Ratio	–	0.00	−0.11**	0.09***	0.01	–	−0.00	0.00	−0.00	0.00
		(0.90)	(0.02)	(0.00)	(0.66)		(0.76)	(0.87)	(0.87)	(0.59)
Fixed Asset Ratio	–	−0.07	−0.59	0.35	0.32	–	0.31***	−0.40***	0.06	−0.02
		(0.68)	(0.26)	(0.35)	(0.34)		(0.00)	(0.00)	(0.27)	(0.79)
Size	−0.08***	−0.21	−7.97	11.91**	−4.21	0.04***	−0.48	−2.75*	3.53***	−0.48
	(0.00)	(0.92)	(0.37)	(0.04)	(0.42)	(0.00)	(0.76)	(0.10)	(0.01)	(0.77)
Rated	–	4.77	8.54	−17.01	5.17	–	7.48*	0.19	−3.71	−2.90
		(0.53)	(0.69)	(0.30)	(0.73)		(0.06)	(0.96)	(0.22)	(0.27)
DEV(–) "over-leveraged"	−0.02***	–	–	–	–	−0.01***	–	–	–	–
	(0.00)					(0.00)				
DEV(+) "under-leveraged"	0.01***	–	–	–	–	0.01***	–	–	–	–
	(0.00)					(0.00)				
Industry Capacity	0.06***	–	–	–	–	–	–	–	–	–
	(0.00)									
Industry Shock Factor	–	–	–	–	–	0.07***	–	–	–	–
						(0.00)				
Constant	−7.04***	17.60	92.85	−42.49	28.86	−2.33***	−72.31	43.00	−60.39	202.64***
	(0.00)	(0.51)	(0.25)	(0.43)	(0.53)	(0.00)	(0.35)	(0.67)	(0.42)	(0.01)
IMR	–	4.26	14.26	−11.42	−6.59	–	43.23	−0.73	25.31	−72.65**
		(0.60)	(0.59)	(0.53)	(0.60)		(0.13)	(0.98)	(0.37)	(0.01)
N	29,837	418				55,805	1,278			

funds. None of the IMR coefficients are significant, indicating that selectivity does not have important effects on the financing of Built investments.

Column (6) of Table VIII reports the selectivity (probit) model estimation for major Acquired investments. One of our main identifying variables, the **Industry Shock Factor**, carries the predicted, significantly positive coefficient. Both **DEV(–)** and **DEV(+)** again carry significant coefficients. In addition to providing identification of the Heckman system, these coefficients reinforce Uysal's (2011) conclusion about the effect of leverage on Acquisitions. More profitable and larger firms are more likely to make large acquisitions, as are firms with a recent stock price **Runup** or higher ***Q***. The sample-selectivity corrected financing regressions appear in columns (7)–(10), which again correspond closely to the OLS results in Table VII, Panel B.

We conclude that sample selectivity does not substantially affect our hypothesis tests in Table VII.

6.2 OTHER ROBUSTNESS TESTS

We conduct a series of robustness tests that vary the sample selection and estimation methodology. These exercises yield qualitatively similar results to those reported in Tables V and VII.

Defining "Major" Investments. Our definition of "major" firm investments is essentially arbitrary though, in our opinion, intuitively appealing. One potential issue with our filter criterion is that requiring major investments to constitute at least 30% of a firm's pre-event total assets introduces some selection toward smaller firms. However, the Heckman selectivity analysis in the preceding analysis controls for this size effect and demonstrates the robustness of our results. As an additional check, we used an alternative filter, in which "major" investments exceed only 100% of the trailing years' average investment and 20% of the firm's prior year-end assets. Our main conclusions remain unchanged.

Sample Composition. Our main test sample includes firms with either Built or Acquired investments, but not both. For robustness, we added into the sample firms with both types of events. We also analysed just the sub-sample of firms without multiple events. Changing any of these sample features affected the number of observations but did not affect our qualitative results.

Book Leverage Measure. The *DEV*iation variable assumes that firms target *market*-valued leverage ratios. Some researchers prefer to measure leverage with book values, though extant research often reports similar findings for the two leverage measures. Our results are robust to defining leverage in book-value terms and constructing book-value targets.

Measuring Target Leverage. We compute firms' target debt ratios from the partial adjustment model suggested by Flannery and Rangan (2006), estimated using the Blundell–Bond "system" GMM estimator for dynamic panels (Lemmon, Roberts, and Zender, 2008). As a robustness exercise, we also used the fixed effects instrumental variable estimator suggested by Flannery and Rangan (2006). This leads to a faster estimated SOA for all sample firms on average (35% versus 23% using Blundell–Bond), but we continue to observe a strong systematic adjustment toward target leverage for event firms. We also investigated whether computing leverage targets on the basis of event-year characteristics (at $\tau = 0$ rather than $\tau = -1$) substantially affects the coefficients on DEV. It does not.

Errors-in-Variables. The **DEV** variable in our main regressions is a generated regressor, which can bias the estimated coefficient standard errors unless the measurement errors in **DEV** are uncorrelated with the regression residuals. We therefore conduct two robustness checks. First, we estimate the same set of regressions individually using two-stage least squares, in which we treat **DEV** as an endogenous variable (we use lagged **DEV** as the instrument). Second, we employ a bootstrap procedure to estimate the true distribution of coefficient errors. Neither of these approaches alters the main conclusions.

7. Summary and Conclusions

We studied US firms that made relatively large capital expenditures or acquisitions during the 1989–2006 period. Such investments are typically accompanied by external funding, and a firm's security choices can affect its leverage. Even with fixed costs of accessing capital markets (Fisher, Heinkel, and Zechner, 1989), these financing decisions should reflect managerial attitudes toward the firm's overall capital structure. We use these financing events to test three views of leverage determination: the tradeoff, pecking order, and market timing hypotheses.

Evidence consistent with target adjustment behavior for our sample firms is strong. First, we find that the type of securities issued to finance a large investment significantly depends on the deviation between a firm's target and actual leverage. Over-leveraged firms issue less debt and more equity when financing large projects, and vice versa. This result holds for a variety of methods for estimating leverage targets. Second, we demonstrate that firms making large investments converge unusually rapidly toward target leverage ratio.

The multivariate regression results in Table VII support the tradeoff hypothesis of capital structure and the possibility that managers behave strategically in selling shares to the public. Managers issue more equity after a share price run-up occurs. In the case of Built investments, the effect on leverage is substantially muted because these new shares do not replace debt financing. Rather, a greater reliance on shares corresponds to using less operating cash flows (Cashflow). A higher run-up preceding large Acquisitions also encourages equity finance, at the expense of new debt and the residual category (Other). The net effect is to raise leverage for Acquisitions while leaving it unchanged for Built investments.

In general, the pecking order hypothesis asserts that firms prefer internal to external funds and debt to equity. Our multivariate regressions for Built investments confirm the first part of this hypothesis: higher profitability leads firms to replace external financing with internal funds. However, profitability primarily affects the choice between internal funds and issuing new equity. This substitution is consistent with a non-standard version of the pecking order hypothesis (Myers, 1984, p. 584), but it has little effect on firm leverage. For large acquisitions, more profitable firms issue less equity (as expected, given a preference for inside funds) but *more* debt (which again is inconsistent with the standard pecking order story). Overall, our results offer little support for the most common interpretation of pecking order.

We do find some results consistent with DeAngelo H., DeAngelo L., and Whited's (2011) model of transitory debt: investment spikes are financed with a lot of debt that is subsequently paid off with internal cash flow. However, their interpretation is that debt finance generally moves firms away from their leverage targets, while we find that financing decisions tend to move firms toward their targets. They also conclude that leverage converges toward the target more rapidly when large investments are *not* being undertaken, while we conclude the opposite.

We find that the extent of leverage adjustments differs between Built and Acquired investments. A dollar of large capital expenditures generates more convergence to target leverage than a dollar of acquisitions. We conjecture that this difference reflects the relative complexity of acquisition financing. Whereas a Built investment can be financed exclusively to maximize the investing firm's shareholder value, Acquisition financing must also take into account information asymmetries, corporate control issues and the target shareholders' preferences and tax obligations. Apparently, Acquisitions involve some substantial constraints on financing choices.

Further research may help pinpoint the nature and importance of these considerations.

The analysis here suggests one additional avenue for further research, related to the potentially distinct effects of public versus private debt on corporate decisions. Because private debt includes more complex covenants, it may also engender more effective external monitoring and differential leverage adjustment behavior (particular for over-leveraged firms). Understanding how private debt is used to finance large investments may yield important further insights into the markets for external financing.

In summary, our analysis adds to the evidence that large leverage adjustments accompany other firm actions. Therefore, simply estimating a single model of capital structure across all COMPUSTAT firms is unlikely to yield an accurate description of optimal leverage adjustments.

Appendix A: Construction of investment financing measures

The following table defines our expenditures and four financing categories using data items from COMPUSTAT's "Statement of Cash Flows" (chapter 4 of the 2001 User's Manual, pp. 15–16). We assign zero values for missing data when a more aggregated item is consistent with such a substitution. For example, if there is a missing value for change in inventories (item 303), but the higher aggregate of operating activities—net cash flow (item 308) has a non-missing value, we infer a zero value for change in inventories. We also check for each firm-year that the accounting identity INVEST = DEBT + EQUITY + CASHFLOW + OTHER holds.

Because the Statement of Cashflows information on acquisitions recognizes only acquired assets purchased with cash (Weiss and Yang, 2007), we add acquisition expenditures from payments in own stock or by assuming debt to equity and debt financing, respectively, and acquisition expenditures. Merger-and-acquisition transactions and financing are collected from SDC. We only include transactions for which SDC provides information on 98% of a transaction's financing. See Section 2.

The last four columns show average item means in millions of year-2000 dollars. Avg. Value shows means for all firms in the sample, from 1989 to 2006. The final three columns show item means for built, acquisitions, and both types of events combined, respectively, measured at the event period ($\tau = 0$).

Source (+) or Use (–) of cash	Definition	COMPUSTAT data item	Avg. Value (1989–2006)	Built at $\tau=0$	Acq. at $\tau=0$	Built and Acq. at $\tau=0$
Invest			*173.41*	*183.14*	*1,247.68*	*868.04*
–	Capital expenditures (“Built”)	128	106.97	145.95	143.67	144.49
–	Acquisitions (“Acquired”)	129	33.86	17.93	369.35	244.32
–	Acquisitions paid in own stock	(SDC)	30.21	18.88	669.06	436.92
–	Acquisitions paid in debt	(SDC)	2.37	0.38	65.60	42.31
Debt			*28.12*	*77.05*	*336.69*	*243.80*
+	Issuance of long-term debt	111	142.11	130.59	466.25	346.23
–	Retirement of long-term debt	114	117.56	53.92	233.27	169.29
+	Change in current debt	301	1.21	0.00	38.11	24.54
+	Acquisition financing paid in debt	(SDC)	2.37	0.38	65.60	42.31
Equity			*26.64*	*45.53*	*701.09*	*467.03*
+	Sale of common and preferred equity	108	26.33	30.58	67.25	54.14
–	Re-purchase of equity	115	29.91	3.93	35.22	24.04
+	Acquisition financing paid in own stock	(SDC)	30.21	18.88	669.06	436.92
Cashflow (from operations)			*103.77*	*49.34*	*176.57*	*131.13*
+	After-tax income before extraordinary items	123	61.45	22.67	83.35	61.69
+	Depreciation and amortization	125	79.19	35.89	136.54	100.58
–	Cash dividends	127	26.67	3.07	40.73	27.27
–	Increase in cash and equivalents	274	10.19	6.16	2.59	3.87
Other			*14.66*	*10.84*	*33.70*	*25.53*
+	Sale of property, plant, equipment (book value)	107	8.50	8.18	4.51	5.82
+	Sale of investment	109	118.56	9.14	74.12	50.90
+	Loss (gain) on sale of PPE and investments	213	−5.79	−1.32	−23.52	−15.59
+	Accounts payable and accrued liabilities	304	7.04	8.87	11.72	10.72
+	Income taxes—accrued	305	0.58	0.14	0.59	0.43
+	Equity in net loss (earnings)	106	0.19	0.14	−0.44	−0.23
+	Extraordinary items	124	0.81	−0.03	4.31	2.76
+	Other funds from operations	217	23.18	5.49	57.81	39.13
+	Exchange rate effect	314	−0.00	−0.12	−0.17	−0.15
+	Change in receivables	302	−11.57	−7.95	−25.42	−19.25
+	Deferred tax	126	1.73	2.78	3.63	3.33
+	Change in other assets and liabilities	307	1.40	−0.18	−2.21	−1.50
+	Other financing	312	−1.21	3.92	−0.34	1.16
+	Other investment	310	9.45	−0.55	20.74	13.22
–	Increase in investment	113	129.98	10.58	81.52	56.17
+	Increase in short-term investment	309	−1.60	−2.59	2.05	0.41
+	Change in inventory	303	−6.81	−4.56	−12.37	−9.61
+	Excess tax benefit of stk. opts. (since 2007)	(txbcof)	0.18	0.05	0.20	0.15

Appendix B: Estimating SOA and target debt ratio

This table reports the results of estimating

$$\mathrm{LEV}_{i,t} = (\lambda\beta)X_{i,\,t-1} + (1-\lambda)\mathrm{LEV}_{i,\,t-1} + \tilde{\delta}_{i,t}, \tag{4}$$

using the method of Blundell and Bond (1998) for data from 1971 to 2006. The estimated annual SOA is (1-coeff. on LEV($t-1$)). The numbers reported in parentheses below the coefficients are p-values. Regression results are used to estimate firms' target debt ratio TDR and DEV (the deviation of the actual market-debt-ratio MDR from target, which is target less actual debt ratio). *** indicates significance at the 1% level.

Variable (Dependent: MDR)	Coefficient (p-value)
LEV (t – 1)	0.77***
	(0.00)
Profit	–0.01
	(0.27)
Q	–0.08***
	(0.00)
Depreciation/TA	–0.29***
	(0.00)
Size	1.19***
	(0.00)
Fixed Asset Ratio	0.11***
	(0.00)
R&D	–0.05***
	(0.00)
Rated	–0.64
	(0.10)
Constant	–0.93
	(0.19)
Test for 2nd order Correlation	1.44
	(0.15)
Nobs	117,884
	(12,570 firms)

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