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CORPORATE DELEVERAGING

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ABSTRACT

Proactive deleveraging from all-time peak market leverage (ML) to near-zero ML and negative net debt is the norm among 4,476 nonfinancial firms with five or more years of post-peak data. ML is 0.543 at the historical peak and 0.026 at the later trough for the median firm in this sample, with a six-year median time from peak to trough. These deleveraging episodes are largely proactive, with debt repayment and earnings retention accounting for 93.7% of the peak-to-trough decline in ML for the median firm. Attenuated deleveraging, with ML staying well above zero, is the norm at 3,118 firms that are delisted due to financial distress within four years of peak. Leverage is path dependent, with the key to explaining whether ML is high or low at the post-peak trough being how high it was at the peak and prior trough and whether the firm has had only a short time to deleverage, e.g., due to distress-related delisting. The findings are consistent with proactive deleveraging to avoid distress and to restore financial flexibility, and are hard to reconcile with materially positive target leverage ratios.

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1. Introduction

What role does deleveraging generally play in corporate financial policy? Given that deleveraging is central to capital structure dynamics, this issue is of first-order importance for corporate finance research where the Holy Grail is an empirically credible theory of capital structure. This issue is also important for macroeconomics where there is a need to understand corporate deleveraging in more normal times to have a baseline for gauging its hypothesized major role in generating periods of serious economic torpor such as the Great Depression, Japan's Lost Decades, and the Great Recession.

In this paper, we examine corporate deleveraging using a firm-level longitudinal approach, and reach sharply different conclusions from prior studies, whose findings suggest that firms with high leverage tend to deleverage only modestly. For most of the paper, we analyze deleveraging from each firm's all-time peak market-leverage ratio to its later trough. With the sample constructed so that leverage declines for all firms that survive at least one year past peak, we can focus on gauging the magnitude of deleveraging and the importance of managerial decisions in reducing leverage. Firms at all-time peak leverage are likely to be troubled and therefore to exit the sample early due to a distressed delisting or a rescue acquisition by another firm. We accordingly condition our analysis on how long firms remain listed after peak, and we assess the extent of attenuated deleveraging associated with early sample exits. Our sample contains all firms at their leverage peaks, and so we can gauge whether the path to high leverage makes a difference in deleveraging outcomes, i.e., whether post-peak leverage troughs differ at firms that chose to lever up versus firms that reached peak mainly through a fall in equity value.

We find that most nonfinancial firms go through large-scale deleveraging episodes at some point in their histories, and that these episodes are typically much larger and far more focused on attaining low leverage than prior studies indicate. We also find that the extent of deleveraging from firms' all-time peak market-leverage ratios reflects, to a remarkable degree, managerial decisions to repay debt and retain earnings. For our sample, passive deleveraging episodes – defined as cases in which leverage ratios fall, but not because of actions by managers – are the exception, not the rule. Deleveraging from all-time peak to subsequent trough generally plays out over a multi-year horizon, often after a recession.

Financial trouble is pervasive among firms at their historical leverage peaks and there is considerable heterogeneity in subsequent deleveraging outcomes, with attenuated deleveraging linked to financial distress. Almost 22% of firms are delisted due to distress at peak or in the next four years. Firms that are delisted in the four years after peak, whether due to distress or acquisition, typically have leverage ratios throughout their brief post-peak periods that are well above the leverage ratios at the post-peak trough of firms that are not delisted. Most of the latter firms deleverage to safe financial condition, restoring ample financial flexibility in terms of low leverage, high cash balances, and negative net debt.

Market leverage (debt/(debt + equity market value)), which we abbreviate as ML, is 0.543 at the all-time peak and 0.026 at the later trough for the median among 4,476 nonfinancial firms with at least five years of post-peak data on Compustat. For these firms, deleveraging from peak to trough takes a median of six years, with about one third (33.2%) paying off all debt they had at peak ML and well over half (60.3%) deleveraging to negative net debt. The scale of these deleveraging episodes is also large in terms of book leverage (debt/total assets) and the net-debt ratio ((debt minus cash)/total assets), and when the sample includes firms with as few as one year of post-peak data on Compustat. For the latter all-inclusive sample of 9,866 deleveraging firms, median ML is 0.491 at the peak and 0.088 at the later trough.

Large-scale deleveraging is the norm across the spectrum of peak ML ratios, including among those firms that have the very highest peak levels of ML. Figure 1 shows that, in a sorting by peak-ML deciles of firms with five or more years of post-peak data, median ML at the post-peak trough is, for every decile group, well below the median ML ratio that prevailed at peak. The peak-to-trough decline in median ML in Figure 1 is less dramatic for groups with lower peak ML, but that is because ML ratios are bounded below at 0.000 and reach that bound, of course, when the firm has paid off all debt.

We also document a broad-based tendency, evident in Figure 2, for firms to deleverage to zero-debt and negative-net-debt capital structures after having reached peak ML. Firms that have relatively low peak ML ratios exhibit an especially strong tendency to pay off all debt and accumulate large cash balances, with a correspondingly high incidence of deleveraging to a negative-net-debt capital structure.

We distinguish between passive and proactive deleveraging, with the former denoting ML decreases due to exogenous shocks that increase equity value and the latter denoting ML decreases due to decisions made by managers. The managerial passivity view is suggested by Fischer, Heinkel, and Zechner (1989), who show that even small leverage-adjustment costs can lead to wide drifts in debt ratios when firms experience exogenous shocks to leverage and any rebalancing would only modestly raise firm value.

Our data strongly reject the view that managerial passivity is the main driver of large-scale corporate deleveraging. Decisions to repay debt, retain earnings, and issue shares together account for a remarkable 94.5% of the peak-to-trough decline in market leverage (ML) for the median among firms that have five or more years of post-peak data. Debt repayment and earnings retention account for 93.7%. Few of our sample firms passively experience large declines in their ML ratios simply because their shares run up significantly in value without a material deleveraging contribution from debt repayment, earnings-retention, or share-issuance decisions.

Deleveraging from peak ML is also typically accompanied by decisions to increase cash holdings, with the median cash-to-total assets (Cash/TA) ratio increasing from 0.050 to 0.132 over the deleveraging episode for firms with at least five years of post-peak data. Among the 33.2% of these firms that repay all debt, median Cash/TA increases from 0.110 (when peak ML is 0.287) to 0.303 (when the ML trough of 0.000 is reached), thereby driving Net Debt/TA deeply negative.

We document a strong empirical connection between deleveraging and decisions to retain rather than pay out earnings. The importance of earnings retention (and the internally generated equity capital that it provides) stands out especially clearly for the 17.9% of deleveraging firms that reduce ML while increasing the dollar amount of debt. For the median firm in this subsample, the increase in retained earnings over the deleveraging episode is 79.0% of the value of debt plus equity at peak ML. Other things equal, such an increase in internally generated equity almost doubles the denominator of the ML ratio, thus by itself nearly cutting the ratio in half and accounting for a large portion of the actual peak-to-trough decline in ML at these generally highly levered firms.

Our findings highlight the importance of the time-series impact of *cumulative* earnings *retention* on ML as opposed to the cross-sectional relation between contemporaneous earnings and leverage, which many prior studies analyze (see Danis, Rettl, and Whited (2014) and studies cited therein). For firms with debt outstanding, earnings retention is proactive deleveraging and, when cumulative retention is large, such proactive deleveraging can be – and, in our sample, is – substantial, especially for firms that initially have high to moderate ML ratios and/or that increase their outstanding debt.

The role of earnings-retention decisions in deleveraging is not clear from prior studies in part because the literature commonly treats security issuance/retirement decisions as the sole choice variables managers use to alter capital structure. The latter assumption plays a particularly important role in the influential study by Welch (2004), which focuses on distinguishing proactive from exogenous variation in ML ratios. Welch ignores earnings-retention decisions and separates ML changes due to security issuance and retirement decisions from those due to stock market rates of return. He interprets total stock market rates of return and the equity-value changes they imply as mechanistically (exogenously) affecting ML ratios, and therefore as fully separate from the proactive component of capital structure.

This interpretation is problematic because it treats as exogenous the incremental amount of internally generated equity capital chosen by managers through their decisions to retain earnings. Importantly, even when the retention/payout mix has no impact on the total (dividend plus capital gain) rate of return in the stock market, the decision to retain earnings implies a higher total equity value – hence a lower ML ratio – than if the retained earnings had been paid out. Moreover, the decision to pay out a given fraction of earnings is identical to the decision to retain one minus that fraction, and this payout/retention choice is jointly endogenous with (and not separable from) the choice of leverage.

The cumulative effect of earnings retention on ML is substantial, especially from initially high to moderate ML ratios and when firms increase debt while moving from peak ML to trough. We also find that large-scale deleveraging is usually a slow process, which reflects the fact that retention, which can occur no faster than earnings arrive, is an important contributor to ML reductions. These facts indicate one cannot understand capital structure dynamics without taking into account a firm's retention policies.

Our data also indicate that deleveraging is not the sole concern of managers, given that almost one fifth of sample firms borrow more as ML declines from peak to trough. Firms that increase debt are not focused solely on reducing ML. The same is true of the many firms that accumulate larger cash balances and increase dividends while deleveraging. These firms proactively reduce ML, but at slower rates and, unless they eventually pay off all debt, to a lesser degree than would otherwise be possible.

Firm leverage is highly path dependent. We find that a simple model with a firm's peak ML and ML at the prior trough has roughly twice the power to explain ML at the post-peak trough than a model with industry ML, firm profitability, and other variables traditionally used to explain leverage. The R^2s are 36% and 19% respectively, and the gap becomes larger still with an R^2 of 52% for the simple model augmented by information about whether a firm has had only a short time to deleverage, e.g., due to distress-related delisting soon after peak. The implication is that the key to explaining whether ML at the outcome of deleveraging is relatively high or low is knowledge of how high ML was at the peak and at the prior trough and whether the firm has had time to work its leverage back down.

The deleveraging episodes we study often occur after firms attain peak ML ratios because of financial troubles associated with a business-cycle recession. The outcomes of deleveraging episodes that begin during recessions are statistically indistinguishable from those that begin in non-recessionary periods.

Although many firms proactively increase ML in the peak year, as with the ML increases studied by Denis and McKeon (2012), most of our sample firms reach peak ML due to an equity-value decrease in that year. There is a statistically significant, but economically immaterial, difference in ML at the post-peak trough of firms that proactively increase ML in the peak year and those that do not.

Our finding that the typical firm deleverages from all-time peak to a near-zero ML ratio differs sharply from the relatively muted leverage reductions reported in four prior studies that examine deleveraging over long horizons. Among prior studies, the largest deleveraging magnitude is reported by Denis and McKeon (2012), who find that the cross-firm average market-leverage ratio declines by 0.133 from almost 0.550 to just above 0.400 over the seven years after large proactive leverage increases. Harford, Klasa, and Walcott (2009) find an average leverage decline of about 0.060 in the five years after debt-financed acquisitions. For firms with leverage in the top quartile of the cross section, Lemmon, Roberts, and Zender (2008) and DeAngelo and Roll (2015) report that, over the next two decades, the cross-firm average leverage ratio decreases by about 0.100 and remains well above zero.

An important reason for the large difference in our findings about the size of deleveraging is that these prior studies do not use a longitudinal approach. They first calculate average leverage ratios for a set of firms at each point in (event) time, and then assess the extent of reductions (over event time) in the cross-firm average leverage ratio. DeAngelo and Roll (2015, p. 392) point out that analyzing trends in cross-sectional average leverage ratios can be misleading because large-sample averaging masks the substantial time-series volatility in the leverage of most firms that they document. For the study of deleveraging, the problem with comparisons of event-time averages is bias, not the masking of volatility. We show that such comparisons underestimate the size of the typical firm's deleveraging when, as is true in our data, the length of deleveraging episodes differs across firms and the leverage ratios of individual firms do not stabilize near their post-peak leverage troughs.

We use the longitudinal approach to examine the roughly one third of sample firms whose movements to peak satisfy the Denis and McKeon (2012) conditions for large proactive increases in ML. We find that, even though these firms chose to lever up to a median ML ratio near 0.500, most reversed course after levering up and deleveraged to near-zero ML, just as we find for our sample as a whole.

We also examine the behavior of ML following attainment of high leverage defined as an ML ratio in the top quartile of the ML cross-section. As with our analysis of deleveraging from all-time peak, the longitudinal approach indicates that these firms typically have much lower ML at deleveraging outcomes than is apparent from examination of the event-time trend in sample average ML.

Viewed broadly, our findings are consistent with firms deleveraging to replenish financial flexibility, and are hard to reconcile with materially positive leverage targets as in traditional (corporate tax/distress cost) tradeoff theories of capital structure. At the same time, our findings point to an empirically important role for the distress-cost side of the tradeoff in the latter theories. We discuss the basis for these interpretations of the evidence in sections 8 and 9 of the paper.

The paper is organized as follows. Section 2 describes our sample and presents basic facts about firms' propensity to deleverage. Section 3 documents the scale of deleveraging episodes. Section 4 analyzes the economic significance for deleveraging of managerial decisions to repay debt, retain earnings, and issue shares. Sections 5 and 6 analyze heterogeneity in deleveraging. Section 7 explains why we find that deleveraging episodes are much larger than prior studies indicate, and presents evidence on the scale of deleveraging from high, but not necessarily peak, ML. Section 8 discusses implications of our findings for theories of capital structure. Section 9 summarizes key findings and implications.

2. Sample construction and a first look at deleveraging

This section describes our sampling procedure and presents evidence on year-to-year changes in leverage that motivates our longitudinal long-run perspective for studying deleveraging.

2.1 Sample construction

We begin by identifying 15,703 publicly held nonfinancial firms that are in the CRSP/Compustat file at some point over 1950 to 2012. Firms in this sample are required to be incorporated in the US and to have CRSP security codes of 10 or 11 and SIC codes outside the ranges 4900 to 4949 (utilities) and 6000 to 6999 (financials). Firm-year observations are included if they have non-missing values on Compustat of the market value of equity (common stock) and the book values of total assets and cash balances. Total debt is the sum of the book values of short- and long-term debt, and a firm-year observation is included only if at least one of these two debt components is non-missing, with the other component set to zero if it is missing. We arrive at our *baseline* sample of 14,196 firms after exclusion of 962 firms with only one year of data and 545 firms that always have zero debt while on Compustat.

Of the 14,196 firms in the baseline sample, 9,866 firms have data on Compustat for at least one year after reaching their historical peak market-leverage ratio. These firms are the central focus of our deleveraging analysis. For the other 4,330 firms, there are no post-peak data that would allow us to gauge the nature and extent of deleveraging. The latter firms enter our analysis in section 5, which investigates the link between high leverage and early sample exits due to financial distress and mergers.

In constructing an appropriate sample for our study, a potential problem arises because many firms have just a few years of data on Compustat, yet there is good reason to think that deleveraging commonly takes seven years or more (Denis and McKeon (2012)). The concern is that only an attenuated portion of deleveraging episodes may be detectable. Such attenuation can occur in samples that include firms that (i) do not deleverage at any point during the brief time their data are on Compustat or that (ii) deleverage at some point, but only part of the deleveraging episode is captured by Compustat. DeAngelo and Roll (2015) show that Compustat's "short-sample" property can mask large leverage instability because of the inclusion of many firms with attenuated measures of leverage changes.

For our study, the important concern is that any sampling rule that is tilted toward many firms with a limited number of years of data can inject a downward bias into estimates of the magnitude of corporate deleveraging. This problem is potentially important in all Compustat-based samples, including our baseline sample where only 4,476 (45.4%) of the 9,866 firms with observable deleveraging episodes have five or more years of post-peak data on Compustat. This potential "short-sample" bias suggests that a sample-inclusion requirement that firms have data available for an extended period may be essential for an informative analysis of deleveraging.

On the other hand, such a sampling requirement has its own possible bias, namely that firms that have survived for an extended period may differ in empirically relevant ways from those with limited data available. For example, a plausible worry is that, if we require firms to have data available for an extended period, we would exclude many firms that reach a high ML ratio and are then delisted early due to financial distress. Firms that reach a high ML ratio because distress has eroded equity value likely have the extent of their deleveraging attenuated as managerial attempts to reduce ML are thwarted by the distress itself. The general concern, therefore, is that a sample restricted to firms with many years of data would be informative about deleveraging by successful firms. It would fail to present a complete picture by materially under-representing firms whose financial troubles led them to disappear from the public arena before they had logged enough years of data to qualify for such a sample.

We address these issues by analyzing subsets of the baseline sample in which firms have successively larger numbers of years of data available. We also gauge the extent of attenuated deleveraging associated with early sample exits, e.g., due to delisting by distressed firms. This approach enables us to make empirically informative statements about deleveraging episodes *conditional* on the amount of time firms have leverage data in the public domain. That is the best one can do when studying leverage dynamics because firm survival is necessary for researchers to have the data to gauge leverage changes over time.

2.2 Annual deleveraging propensities

We focus throughout the paper on deleveraging in terms of market-leverage ratios, but we also report book leverage as well as cash and net-debt ratios when relevant. Market leverage (ML) is the book value of total debt divided by book debt plus the market value of equity. Book leverage (BL or Debt/TA) is total debt divided by total assets in book terms. The cash ratio (Cash/TA) is cash plus marketable securities divided by total assets. The net-debt ratio (Net Debt/TA) is Debt/TA minus Cash/TA.

Table 1 reports annual leverage changes using our baseline sample and adding back firms with zero debt in all years. For this study, the most important regularity in the table is that, when leverage is high, it tends to decrease in the next year, with the typical reduction modest in size. Specifically, when ML, BL, and Net Debt/TA exceed 0.500, there is roughly a 60.0% probability of a leverage decrease in the next year, with each leverage measure showing a median change around -0.020 (row 1). When these leverage measures exceed 0.400 or 0.300, the probability of a leverage decrease is lower and the median changes remain negative, but are closer to zero (rows 2 and 3). The tendency for leverage to decrease is weaker at lower levels of ML, BL, and Net Debt/TA and there is a slight tendency for ML and Net Debt/TA to increase when they are currently low (rows 4 to 6). The overall pattern of year-over-year leverage changes is consistent with the weak mean reversion reported in prior studies.[1]

2.3 Long-horizon longitudinal analysis of deleveraging

These findings suggest that large-scale deleveraging tends to play out in small-to-moderate steps over multi-year horizons. This in turn suggests – and section 3 strongly confirms – that focusing on year-to-

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[1] For evidence of weak to moderate year-to-year mean reversion in leverage, see Fama and French (2002), Welch (2004), Leary and Roberts (2005), Flannery and Rangan (2006), Kayhan and Titman (2007), Huang and Ritter (2009), and Hovakimian and Li (2011). Welch (2004) concludes that firms do not issue or repurchase securities to counteract the mechanistic influence of stock price changes on market-leverage ratios. Hovakimian and Li (2011) critique the literature and conclude that the best available estimates imply weak mean reversion in leverage. See also Frank and Goyal (2008), Parsons and Titman (2008), and Graham and Leary (2011).

year leverage changes tends to miss their cumulative effect at firms that are going through material deleveraging, and therefore often fails to identify such episodes.

We accordingly adopt a long-horizon longitudinal approach that, for each sample firm, analyzes deleveraging from all-time peak ML to subsequent trough. We have a total of 14,196 observations, one for each firm in the baseline sample. We focus primarily on the 9,866 firms that have post-peak data available on Compustat. In section 5's analysis of attenuated deleveraging, we also consider the 4,330 firms that have no post-peak data, e.g., due to distress-related delisting in the peak year.

This broad-based sample includes (i) firms that attain peak ML proactively, (ii) firms that attain peak as a result of exogenous shocks that increase ML, and (iii) all cases regardless of the size of the ML increase in the year a firm reaches peak. Conditions (ii) and (iii) imply that our sample contains many observations that are not included in the sample of Denis and McKeon (2012), who study deleveraging by firms that increase leverage by large amounts (in a given year) to a high (but not necessarily peak) level. At the same time, our sample does include 3,000 firms whose movements to peak ML satisfy Denis and McKeon's definition of a proactive ML increase. Sections 5 and 6 analyze the difference in deleveraging outcomes when peak was attained because managers chose to lever up rather than because exogenous shocks increased ML.

While the longitudinal approach reveals substantial heterogeneity across firms in the time between all-time peak ML and subsequent trough, it is also the case that a large majority of these deleveraging episodes play out over a relatively compact period of a decade or less. The time from peak to trough is 10 years or less for 90.2% of the 9,866 firms with at least one year of post-peak data available on Compustat and for 78.4% of the 4,476 firms with at least five years of post-peak data available.

3. Deleveraging episodes: The scale of deleveraging over extended time horizons

Table 2 analyzes deleveraging episodes that begin with each firm's all-time peak market leverage (ML) ratio and that conclude with its subsequent ML trough. The first column reports results for our all-inclusive baseline sample, i.e., for all 9,866 firms with at least one year of post-peak data on Compustat.

Moving sequentially from left to right, the remaining columns report results for subsets of the baseline sample with firms that have a minimum of two years of post-peak data (second column) up to a minimum of ten years of post-peak data on Compustat (far-right column).

Table 2 indicates that deleveraging from historical peak to subsequent trough plays out over an extended period, and transforms the typical firm from a capital structure with far more debt than cash to one with low leverage and much higher cash balances. These leverage and cash-balance changes characterize the baseline sample and all subsets thereof, with the typical scale of deleveraging greater when the sample excludes firms with just a few years of post-peak data on Compustat. Median ML is 0.543 at the peak and 0.026 at the later trough for the sample with at least five years of post-peak data, whereas the comparable figures are 0.491 and 0.088 for the baseline sample, which includes many firms with few years of post-peak data available (rows 1 and 2). Remarkably, 33.2% of the former firms and 22.8% of the firms in the baseline sample pay off all debt, while 60.3% and 49.1% of firms in the two samples deleverage to a negative net debt capital structure (row 3).

The pervasive deleveraging to a negative net debt capital structure reflects the fact that firms typically increase cash balances by a non-trivial amount while deleveraging from peak ML. Among firms with five or more years of post-peak data, the median Cash/TA ratio almost triples from 0.050 at the ML peak to 0.132 at the later trough (rows 4 and 5). In the baseline sample, the analogous figures are 0.056 and 0.109 for a near doubling of Cash/TA. For all samples in the columns of Table 2, a comparison of peak and trough median ML (rows 1 and 2) with median Cash/TA (rows 4 and 5) is strongly suggestive of a counter-cyclical relation between leverage and cash balances at the individual-firm level.

As with market leverage, the book leverage (BL) and Net Debt/TA ratios in Table 2 also indicate that our sample firms typically deleverage to conservative capital structures (rows 8 and 10). At the peak, median BL and Net Debt/TA are lower than ML (compare rows 1, 7, and 9) so that, on net, the typical magnitude of deleveraging is larger when measured in ML terms. The straightforward explanation is that, as detailed later, firms often reach peak ML through a sharp drop in the market value of equity and, of course, BL and Net Debt/TA ratios include no adjustment for market value changes.

In Table 2, the median peak-to-trough change in ML is -0.244 for the baseline sample and -0.395 for firms with five or more years of post-peak data (row 11). The difference reflects the fact that the baseline sample contains quite a few firms that are delisted shortly after peak either because of financial distress or because they were acquired soon after attaining peak (see section 5). Since these firms have little or no time to deleverage, their inclusion in the baseline sample naturally dampens the median decline in ML relative to the median among firms that have a minimum of five years to deleverage.

Among firms with five or more years of post-peak data, the median deleveraging takes six years (row 12, Table 2), which is near the seven-year deleveraging horizon analyzed by Denis and McKeon (2012). In contrast, for our baseline sample, the median time from ML peak to trough is only two years. This brief deleveraging time is quite misleading because it is mechanically driven by the fact that the baseline sample has many firms with just a few years of post-peak data. More than half (54.6%) of firms in the baseline sample have four or fewer years of post-peak data, while about a third (33.8%) have one or two years of data (row 13). It is therefore impossible for the median deleveraging time to be longer than four years, and difficult for it to be longer than two years.

A closely related important regularity, evident in Figure 3, is that the scale of deleveraging is more muted among firms with just a few years of post-peak data. Panel A of the figure plots ML medians at the peak and the later trough (previously reported in Table 2) juxtaposed for each sample against the ML median at the trough that prevailed *before* the peak. Panel B of the figure reports ML medians at the pre-peak trough, the peak, and the post-peak trough for the incremental sets of firms that are excluded from the baseline sample as we move step by step to the right in Table 2 and in panel A of Figure 3, i.e., for firms with *exactly* one year of post-peak data, *exactly* two years of post-peak data, and so on.

Panel B of Figure 3 indicates that firms with exactly one year of post-peak data reduce leverage to a median ML above 0.200, while firms with exactly two, three, or four years of data deleverage to median ML ratios above 0.100. For each of these short-horizon samples, median ML at the post-peak trough is far higher than the median ML that had prevailed at the trough before the peak. In sharp contrast, among firms with five or more years of data, median ML ratios at the post-peak trough are both well below 0.100

and close to the median ML that prevailed at the pre-peak trough.

Why do firms with just a few years of data tend to deleverage by smaller amounts than firms with more years of post-peak data on Compustat? One reason is that deleveraging typically plays out over multiple years, not through a one-time rebalancing of capital structure. Consequently, for many firms that have just a few years of post-peak data on Compustat, we can observe only a truncated portion of the full deleveraging. Another reason is that quite a few firms are delisted due to financial distress soon after reaching peak ML, and so their modest deleveraging magnitudes are plausibly the result of distress and high leverage per se. We return to this issue in section 5 where we also document material attenuated deleveraging by a nontrivial subset of firms that are acquired soon after attaining peak ML.

Finally, we note that for the baseline sample and all subsamples in panel A of Figure 3, median ML at the trough before the peak is close to zero, just as it is at the trough after peak. Symmetrically, median Cash/TA ratios are considerably higher at both troughs than at peak ML (panel A of Figure 4). More than half of firms in the baseline sample have negative net debt at the trough before the peak, as do roughly half of firms in all subsamples (panel B of Figure 4). In short, substantial financial flexibility – low ML coupled with high Cash/TA – is the norm at the ML troughs both before and after peak ML.

4. Economic significance of decisions that reduce leverage

The evidence in this section establishes that, within our sample, passive deleveraging is by far the exception, not the rule, with decisions to repay debt, retain earnings, and issue stock accounting for a remarkably large portion of observed peak-to-trough declines in ML. At the same time, the data also show that managers of most firms are not focused exclusively on reducing ML, as the rate and scale of deleveraging are often dampened by managerial decisions to accumulate larger cash balances and to increase equity payouts. At the broadest level, the findings in this section indicate there is a close empirical connection among deleveraging, cash-balance, and equity-retention versus payout decisions.

4.1 Decisions to repay debt, retain earnings, and issue shares

Table 3 gauges the size of the contributions of debt repayment, earnings retention, and share issuance decisions to the deleveraging episodes for the sample of 4,476 firms that have five or more years of post-peak data (panel A) and for the baseline sample of 9,866 firms with at least one year of post-peak data (panel B). We focus the discussion on the panel A results because they give a more accurate picture of the nature of complete deleveraging episodes. The reason is that the baseline sample includes many firms with just a few years of data and so the observable deleveraging by these firms is often incomplete. [We analyze attenuated deleveraging in section 5.] The main difference between panels A and B is that the results in panel B show somewhat smaller impacts on deleveraging of managers' decisions to repay debt, retain earnings, and issue shares (compare rows 9 to 11 of the two panels).

Table 3 reports findings for all 4,476 sample firms and for subsamples of firms that, over the period from ML peak to trough, repay all debt (1,488 firms); repay some, but not all, debt (2,186 firms); and increase debt, or in a few cases, leave it unchanged (802 firms). Firms in the first group obviously end their deleveraging episodes with ML = 0.000, while those in the latter two groups deleverage to low but positive ML ratios (row 2, panel A, Table 3). For firms in the third group, increases in the total market value of equity outweigh the increase in debt, and so their ML ratios decline.

Table 3 reveals considerable heterogeneity across the three groups in the magnitude of their ML reductions (rows 1, 2, and 8; panel A). Among firms that repay all debt, median ML declines from 0.287 at the peak to 0.000 at the later trough. The median ML ratio declines by larger amounts at firms that repay some, but not all, debt and at firms that increase debt. The former firms show an analogous decrease of 0.534 (i.e., 0.612 at the peak minus 0.078 at the trough), while the latter firms show a decrease of 0.483 (i.e., 0.652 minus 0.169). The median peak-to-trough change in ML is somewhat smaller than the change in the median ratio, but it is nonetheless substantial for all debt categories (compare the differences between rows 1 and 2 with the corresponding entry in row 8, Table 3).

The ML figures in Table 3 materially understate the size of deleveraging for firms that repay all debt. The reason is that ML ratios are bounded below at 0.000, and this limit is binding when firms repay all debt. Firms that pay off all debt can nevertheless continue to deleverage simply by accumulating larger cash holdings. They do so with a vengeance, with the median firm almost tripling Cash/TA from 0.110 to

0.303 as ML moves from peak to trough (rows 3 and 4, panel A).

The important point is that a nontrivial subset of firms repays all debt and accumulates large cash balances. In so doing, these firms drive their net-debt ratios deep into negative territory. This is not random or passive down-drifting of ML and net-debt ratios. The reason is that paying down debt and building cash balances are decisions of the firm, not exogenous shocks.

Table 3 further shows that the median firm in the full sample repays 80.2% of the debt outstanding at peak ML, retains additional earnings equal to 24.3% of the total value of debt and equity at peak ML, and increases the number of outstanding shares by 15.2% (row 7, panel A). In terms of leverage-reducing impact on the denominator of the typical ML ratio, the 24.3% retained earnings increase has roughly three-and-a-half times the impact of the 15.2% increase in the number of outstanding shares. [The reason is that the former is reported relative to firm value at peak, while the latter is reported relative to an equity base that is only about 46% of the capital structure at peak.] This comparison indicates that increases in internally generated equity are typically much more important than externally raised equity as proactive tools for reducing ML at our sample firms.

We focus here on debt repayment, earnings retention, and share issuance because each of these proactive managerial decisions directly affects the ML ratio. Debt repayment reduces both the numerator and denominator of the ratio, while increases in internally and externally generated equity increase the denominator. While both types of equity increases typically provide cash that could be used for debt repayment, they both reduce ML even when there is no repayment of debt. Our analysis here takes into account only the *direct* impact of equity expansions on the denominator of the ML ratio. Debt repayment is taken into account regardless of the source of the funds for the repayment.

Many sample firms sell substantial amounts of assets (row 7, panel A, Table 3), but their receipt of asset sale proceeds does not directly affect any element of their ML ratios. Asset-sale proceeds provide the firm with cash that could be, but is not necessarily, used to repay debt. Suppose the firm does not repay debt and instead invests the proceeds elsewhere. Leaving aside any value change from the asset disposal itself or from the new investment, the firm's total (debt plus equity) value is unchanged, as its debt. Hence, its ML ratio is unchanged by the asset sale. We accordingly do not treat asset-sale proceeds as an element of proactive managerial deleveraging that is distinct from debt repayment. Rather, we treat asset sales simply as a source of cash that makes it possible for firms to repay debt.

At the same time, of course, the fact that many sample firms undertake large asset sales around the time of peak ML is fully compatible with, and strongly suggestive of, material proactive deleveraging. In other words, many firms sell assets because managers intend to use the proceeds to repay debt. See Lang, Poulsen, and Stulz (1995, appendix) for evidence of pervasive use of asset sales to fund debt repayment.

Quite a few sample firms also free up cash by reducing dividends during their deleveraging episodes. Consistent with section 5's evidence of a nontrivial incidence of financial distress at sample firms, we find that, 33.2% of firms cut dividends while deleveraging (row 7, panel A, Table 3). Since dividend cuts are reflected in the net amount of retained earnings, we simply treat them as a source of cash and not as an additional element of proactive deleveraging by management.

The important bottom line from row 7 of Table 3 is that, because the magnitudes of debt repayments, earnings retention, and share issuance are nontrivial, these proactive managerial decisions could plausibly be responsible for a significant portion of sample firms' large-scale deleveraging.

4.2 The portion of observed deleveraging due to managerial decisions

To measure the contribution of these managerial actions to the scale of deleveraging, we adopt an approach similar in spirit to Welch's (2004) analysis of the extent to which actual variation in ML is due to security issuance and retirement decisions. We first assess for each firm what ML would be at the trough after peak if the specific actions in question are the only things that change from the time the firm was at peak ML. We use the symbol HML to distinguish hypothetical from actual ML values. The portion of the firm's actual deleveraging explained by the action(s) in question is then the percentage equivalent of [ML(peak) – HML(trough)] ÷ [ML(peak) – ML(trough)]. This ratio is bounded by 0.0% and 100.0% by the algorithm that generates values of HML(trough), which is described in the Appendix.

Two of the assumptions of the algorithm are sufficiently important to merit highlighting here. First, the algorithm assumes that earnings retention translates dollar-for-dollar into a higher market value of equity. This assumption means that we ignore agency costs and taxes and make no upward adjustment to future equity value for future earnings on resources that were retained after peak but before the firm reached its post-peak ML trough. Second, the net share-issuance effect excludes any impact on the ML ratio from issuing shares at a share price that differs from the price at peak. It instead captures the appropriately split-adjusted change (over the time from peak ML to trough) in the net number of shares outstanding valued at the share price that prevailed at the time the firm was at its peak ML.

Table 3 indicates that decisions to repay debt, retain earnings, and issue shares together account for 94.5% of the actual deleveraging by the median firm in the full sample (row 8). Debt repayment alone accounts for 71.3% of the median firm's deleveraging, while debt repayment and earnings retention account for 93.7%. A comparison of the 71.3% and 93.7% figures indicates that, as with decisions to repay debt, decisions to retain earnings account for a substantial portion of the typical deleveraging episode in our sample. A comparison of the 94.5% and 93.7% figures indicates that net share issuance typically accounts for only a small increment to deleveraging above debt repayment and retention.

Decisions to repay debt, retain earnings, and issue shares collectively account for 100.0% of the observed deleveraging for 38.0% of sample firms (row 9, panel A, Table 3). The three decisions together account for at least 50.0% of the deleveraging for 83.7% of firms, and they are responsible for less than 10.0% of the actual deleveraging for only 3.4% of firms (row 9).

These decisions also account for a large portion of cross-firm variation in deleveraging. The adjusted R^2 is 75% for a regression in which the dependent variable is the actual ML at the post-peak trough and the right-hand side variables are constant and the ML that would hypothetically prevail at the trough due solely to debt repayment, earnings retention, and share issuance (row 11, Table 3).

Although debt repayment accounts for 71.3% of the deleveraging at the median sample firm, it plays no role whatsoever for the 17.9% of firms that increase debt while deleveraging (row 9, Table 3). If the ML ratio decreases despite an increase in the dollar amount of debt, then obviously total equity value must have increased. What is not obvious is whether total equity value increased because managers took actions to increase equity capital and, if managers in fact took such actions, how much of the resultant

ML decrease reflects decisions to increase internally generated equity (through earnings retention) as opposed to increase externally generated equity (through new share issuance).

Table 3 indicates that, among firms that increase debt while deleveraging, earnings retention accounts for 36.6% of the median firm's peak-to-trough decline in ML, while retention plus share issuance together account for 46.0% (row 9). Thus, although decisions to increase equity capital account for almost half the total decline in ML at the median firm, net share issuance plays a relatively modest role. Rather, the bulk of the proactive deleveraging through equity increases comes from internally generated equity obtained through decisions to retain rather than pay out earnings.

4.3 Financial flexibility, increased equity payouts, and muted deleveraging

The main carry-away from Table 3 is that that three decisions – repay debt, retain earnings, and issue shares – together account for a very large portion of the deleveraging at most sample firms. Empirically, passive deleveraging is the exception. Proactive deleveraging is, by far, the norm.

However, our data also show that managers are less intensely focused on reducing ML ratios than it might seem from the fact that a large portion of actual ML reductions reflect managerial decisions. The reason is that we often observe other decisions – especially those related to cash balances and equity payouts – that work to increase ML, and thus effectively dampen the rate and/or size of deleveraging. We conclude that deleveraging is not the sole financial policy concern of managers.

We find that large increases in cash balances typically accompany the deleveraging episodes we study (rows 3, 4, and 7; Table 3). This cash accumulation increases financial flexibility and, in this sense, is a complement to ML reductions, which give firms greater unused debt capacity than they would otherwise have. However, cash accumulation and debt repayment decisions are also substitutes because excess cash holdings could be used to pay down debt. If firms had used the excess cash accumulated during deleveraging to pay down debt, the median firm's ML at the trough after peak would have been 0.000 rather than 0.026 (row 12). Thus, the typical sample firm could have had a zero-debt capital structure had it not accumulated as much in cash balances and instead paid down more debt.

The latter observation suggests that a desire to build financial flexibility is a plausible common motive shaping these firms' financial policies. The underlying reason is that cash balances and unused debt capacity are substitute sources of financial flexibility, with a given amount of cash balances actually providing greater assured access to capital than the same amount of unused debt capacity. At the same time, however, stockpiling cash will not strictly dominate paying down debt (replenishing debt capacity) in the presence of taxes, agency costs, and/or a market premium (an interest-rate discount on liquid asset holdings) that prices out the advantage that cash balances have as a reliable source of capital.

More importantly for the issues that are central to this study, the view that managers simply want to bolster financial flexibility does not fully explain what we observe. The reason is that, at 41.6% of our firms, managers increase dividends during the period of deleveraging (row 7, Table 3).[2] The incremental cash that was paid out could have been used to increase the speed and size of deleveraging without upsetting shareholders by reducing dividends. The result would have been greater financial flexibility for the firm in terms of a larger untapped capacity to issue debt. Revealed preference thus indicates that a desire to deliver increased payouts to shareholders is an important consideration that leads managers to mute the rate and size of deleveraging through payout-policy decisions that dampen the rate and size of earnings retention.

4.4 Earnings retention and deleveraging

Prior empirical studies ignore the fact that decisions to retain earnings endogenously affect ML ratios through their impact on the total market value of equity. Instead, the literature's approach has been to treat security issuance and retirement decisions as the managerial decision variables that alter leverage, with equity-value changes interpreted as exogenous shocks to ML ratios. For example, Welch (2004) analyzes whether firms issue/retire securities to counteract changes in ML ratios, which he assumes are mechanistically induced by equity-value changes that are fully exogenous to managers.

This treatment, which pervades the empirical literature, rests on the faulty premise that, aside from

[2] Denis and McKeon (2012, p. 1915) similarly report a tendency for firms to increase payouts after taking on a large amount of debt. They also find, as we do, that firms often (at least temporarily) increase the dollar amount of debt while deleveraging (row 7, Table 3). The latter finding reinforces the equity-payout-based point (emphasized in the text above) that managers do not focus exclusively on reducing leverage ratios when their firms are in the middle of a deleveraging episode.

share issuances and retirements, changes in the value of equity are 100% exogenous shocks to ML ratios. The premise is faulty because of the impact of earnings-retention decisions on total equity value. Earnings arrive and some portion of a given earnings realization may include an unanticipated exogenous component. However, whatever the amount of any positive earnings realization, earnings *retention* per se is a choice. The "earnings-retention decision" refers to managers' current period choice about how much of currently earned resources to keep inside the firm versus how much to pay out to shareholders. The chosen level of earnings retention determines the amount of internally generated equity capital that is added to the equity component of the firm's debt-equity mix.

Although retention decisions are usually classified as elements of payout policy, they are also capital structure decisions: Earnings retention is proactive deleveraging for a levered firm. Retention generates a higher total market value of equity and, therefore, also a lower ML ratio. The resultant ML decline is the endogenous consequence of a choice – retain rather than pay out resources and thereby reduce the ML ratio – made by managers. It is not an exogenous shock to the firm's market-leverage ratio.

The problem in the literature arises from not distinguishing between (i) the total (dividend plus capital gain) rate of return on equity in the stock market and (ii) changes in the total market value of equity. For example, under frictionless conditions, a firm's total rate of return is independent of its current retention versus payout decision. However, under frictionless conditions and, in fact, in any other rational setting in which retention does not result in 100% waste or theft of retained resources, a decision to retain earnings implies a higher total market value of equity and a lower ML ratio.[3]

The implication is that decisions to issue and retire debt and equity securities are not the only decisions that alter ML. Retention/payout decisions also affect ML, with ML declining by larger amounts

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[3] To illustrate the distinction, consider a levered firm that has perpetual debt and $1 in riskless earnings (operating cash flow minus interest) at dates t = 1, 2, etc. in perpetuity. If the relevant market discount rate is 10%, equity value at t = 0 is $10 ($1/0.10). With $1 of earnings at t = 1, the total stock market value of equity increases to $11. The $11 equity value is the sum of (i) the $1 of retained earnings, which we assume is placed in a value-neutral financial investment, and (ii) the $10 value as of t = 1 of $1 (operating cash flow minus interest) at t = 2, 3, etc. Retention of the $1 of earnings at t = 1 increases total equity value and thereby implies lower ML at t = 1 than prevailed at t = 0. [If instead the earnings were paid out at t = 1, there would be no change in ML. The total market rate return on equity would still be 10%, with the $1 payout now providing the full 10% return.] The ML decline is due entirely to the decision to retain the $1 of earnings in the firm, which translates to $1 in equity-value appreciation. It has nothing to do with an exogenous shock to the firm's stock market value.

when managers bolster equity capital by choosing higher levels of earnings retention.

Moreover, the literature's approach involves an arbitrary and unwarranted asymmetry in the treatment of security issuance/retirement and retention decisions. If a firm repurchases equity, the literature rightly classifies this security retirement action as a decision to increase ML. Symmetrically, a decision not to repurchase equity and, instead, to retain earnings should be classified as a decision to decrease ML. Payouts raise ML. Non-payouts (retention) reduce ML. It therefore makes no sense to treat stock repurchase (payout) decisions as a vehicle through which managers alter a firm's ML ratio and, at the same time, ignore the ML impact of retention.

The upshot is that the empirical literature has misclassified (as exogenous disturbances) the impact of decisions to retain earnings on equity values and therefore on ML ratios. To be clear, we are not saying that all equity-value changes are due to managerial decisions. Obviously, some equity-value changes are the result of exogenous shocks. However, not all such changes are. Importantly, those equity-value changes that result from decisions to retain earnings definitely are not. Hence the ML impact of retention should be classified as endogenous to managers, not as due to an exogenous shock to ML.

The resultant misclassification is especially problematic when, as in our study, the research question concerns gauging the impact of managerial decisions on ML changes over multiple years. The reason is that the cumulative multi-year impact of retained earnings on ML can be quite large.

The latter fact stands out most clearly for our subsample of 17.9% of firms that reduce ML while simultaneously increasing the dollar amount of outstanding debt. During its deleveraging episode, the median firm in this subsample adds retained earnings equal to 79.0% of the total value of debt plus equity that prevailed at peak ML (row 7, last columns, Table 3). This incremental earnings retention translates to a 79.0% increase in the denominator of the ML ratio which, other things equal, cuts the median firm's ML ratio almost in half from the 0.652 ratio that prevailed at peak.

This increase in internally generated equity also looms large relative to the external equity financing raised during the typical deleveraging episode. The median firm in this subsample issues new shares equal to 30.5% of those outstanding at peak (row 7, Table 3) while deleveraging. For a firm that has 35%

of its capital structure as equity, an increase in retained earnings of 79% of total (debt plus equity) value is equivalent to issuance of new shares that have a value equal to 226% of equity value at the time of peak ML. The typical magnitude of earnings retention for this subsample is thus almost eight times the size of the typical share issuance during the deleveraging episode.

Although Table 3 shows that the deleveraging impact of retention is economically material in our sample, its impact is largely felt when firms have high to moderate ML ratios, and it is rare to find that retention alone drives a firm to a low leverage capital structure.[4] Among the 9,866 firms in our baseline sample, 5,121 have ML below 0.100 at the post-peak trough. Only 0.7% (38 of these firms) deleveraged to an ML ratio below 0.100 with positive earnings retention (between peak and trough) and with no debt pay down and no share issuance (not tabulated).

5. Heterogeneity in deleveraging: Basic findings

Although the standout feature of the data is that most firms proactively deleverage from peak to near-zero ML, we also find that a nontrivial minority of firms do not reach low leverage. This section reports basic findings on heterogeneity in deleveraging, especially heterogeneity related to financial distress at peak ML and delisting due to distress (or merger) soon after a firm reaches peak.

5.1 Some basic facts about deleveraging and financial trouble

Although low leverage coupled with ample cash balances is the typical outcome of sample firms' deleveraging episodes, Table 4 shows that most firms face financial trouble when those episodes begin. The table reports Altman Z-scores that gauge the extent of financial trouble for the baseline sample, and for subsamples of 4,476 firms with five or more years of post-peak data on Compustat and 5,390 firms with one to four years of post-peak data. Z-scores below 1.81 are generally interpreted as indicating a

[4] Because retention increases equity value in the denominator of ML, the impact of retention (or any increase in equity value) on ML is nonlinear and declines monotonically as the beginning level of ML declines. A given large amount of retention generates a large reduction in ML when ML is initially high, with the ML impact of the equity increase becoming more muted at lower initial levels of ML. For example, it would take earnings retention equal to (i) 100% of total *firm* value (debt plus equity value) to reduce ML from 0.500 to 0.250 and (ii) 900% of firm value to reduce ML from 0.500 to 0.050. Thus, it would take an enormous amount of earnings retention (relative to firm value) to depress the ML ratio from its typical level at peak (around 0.500) to a near-zero level.

firm is in distress and a likely candidate for bankruptcy. Z-scores above 2.99 are commonly viewed as indicating the firm is in safe condition, while Z-scores between 1.81 and 2.99 are viewed as difficult-to-assess borderline cases in which there is some chance the firm will be facing serious trouble.

At peak ML, Altman Z-scores are 2.01, 2.20, and 1.81 respectively for the median firm in the baseline sample and for the five-year-plus and one-to-four-year subsamples (row 1, Table 4). These Z-scores indicate that most firms exhibit nontrivial signs of distress at peak ML. It thus makes sense that most managers would make decisions that reduce ML significantly, as section 4 indicates they do. The net result is that, after deleveraging, Z-scores indicate that most firms are in safe financial condition (row 2).

Consistent with the systematic advent of distress around ML peaks, Table 4 indicates that most of our sample firms have large negative stock returns in the year they attain peak ML, with equity values falling a modest amount the prior year, and not declining the year before that. Specifically, the median firm in the baseline sample has raw stock returns (unadjusted for market movements) of (i) -0.380 in the year of peak ML, (ii) -0.462 cumulated over the peak year and the prior year, and (iii) -0.415 over the peak year and the two prior years (row 3). Qualitatively similar stock returns are observed for both subsamples.

The adverse stock returns behavior is mirrored in earnings and return on assets (ROA). Most firms report negative earnings in the year they attain peak ML, with a somewhat stronger tendency toward peak-year losses among firms with one-to-four years of post-peak data (row 4 of Table 4). Most also have lower ROA in the peak ML year than they had at the prior trough, with ROA recovering to a large degree by the trough after peak (row 5). The loss measure here is based on earnings after extraordinary items (EBEI), while ROA is the Rajan and Zingales (1995) profitability measure (EBITDA/assets). Since EBEI nets out interest payments and depreciation charges, there is no puzzle in the fact that most firms have negative EBEI and positive ROA in the peak ML year. For both losses and ROA, the trough-peak-trough reversal pattern indicates transitory problems for most firms around peak ML (rows 4 and 5).

Table 4 further indicates that 42.4% of ML peaks occur during NBER recessions (row 6), which is consistent with the view that the financial difficulties at peak are often both transitory and not fully idiosyncratic to individual firms. The incidence of ML peaks during recession periods is slightly lower at

38.3% when we consider all 14,196 firms in the baseline sample, including those with no post-peak data on Compustat (not tabulated).

Figure 5 plots the calendar-time incidence of ML peaks for all firms in the baseline sample and for firms with at least 20 years of data, with grey background identifying recession periods. The 1974 recession stands out strongly in the figure, accounting for almost 8.0% of the ML peaks in the baseline sample and almost 15.0% of the peaks among firms with 20 or more years of data. The 15.0% incidence is remarkably high and noteworthy because this subsample of firms contains many of the most prominent nonfinancial companies. [The 2,738 firms in this subsample account for 87.5% of the total equity value of firms in our full sample in the median year over 1950 to 2012.]

The high incidence of ML peaks during the 1974 recession reflects the broad-based collapse in stock market values that accompanied that recession. In contrast, the recession years of the early 1980s account for a much smaller portion of the ML peaks in our sample, reflecting the more muted equity declines that occurred at that time.

While the recession findings point to material co-movement across firms in deleveraging, Table 4 indicates that such co-movement is typically modest at the industry level. For example, in the baseline sample, the trough-peak-trough sequence of median ML ratios is 0.048, 0.491, and 0.088 (row 6). The analogous trough-peak-trough sequence of ML ratios for industry peer firms is 0.156, 0.219, and 0.165 (row 7). Hence there is a tendency for peer firms' ML ratios to increase when sample firms are increasing ML toward the peak, and for peers' ML ratios to decrease when sample firms subsequently deleverage. However, the changes in industry ML ratios are small relative to the changes in sample firms' ML ratios.

5.2 Heterogeneity in the extent of financial trouble among deleveraging firms

Table 5 documents the cross-firm distribution of ML ratios at the peak (panel A) and at the post-peak trough (panel B), with row 4 reporting the median Altman Z-score for each ML category in the columns. The table reports data for the baseline sample partitioned into firms with five or more years of post-peak data on Compustat and those with between one and four years of data.

Panel A of Table 5 indicates that the one-to-four-years group tends to have a higher percent of firms with low peak ML ratios (rows 2 and 3). However, holding the level of peak ML fixed, this group tends to show stronger signs of financial trouble than the five-plus-years group. Specifically, in every column in panel A, median Altman Z-scores are lower for the one-to-four-years group than for the five-plus-years group (row 4). Moreover, among firms in the one-to-four-years group with peak ML above 0.500, median Z scores are below the 1.81 Altman critical point that indicates serious financial trouble (row 4). These firms constitute 35.5% of the 5,390 firms in the one-to-four-years group (row 3), indicating that quite a few firms are in financial distress at the time they are at peak ML.

Relatively few firms continue to have very high ML ratios at the post-peak trough, with those that remain highly levered mainly concentrated among firms with four or fewer years of post-peak data. For example, only 12 of the 4,476 firms in the five-plus-years group have ML ratios of 0.800 or higher at the post-peak trough, while 234 of the 5,390 firms in the one-to-four-years group have comparably high ML at that time (row 1, panel B, Table 5). In the five-plus-years group, only 4.8% of firms fail to deleverage to ML below 0.500, while 18.9% of the one-to-four-years group fail to do so (row 3). Median Altman Z-scores for the latter firms are uniformly indicative of serious financial trouble (row 4, panel B).

The overall picture from Table 5 is that, at the end of their deleveraging episodes, a nontrivial subset of firms has serious financial troubles and is still highly levered, with such cases concentrated among firms with four or fewer years of post-peak data.

5.3 Attenuated deleveraging and delisting due to financial distress and mergers

The idea that financially troubled firms face impediments to deleveraging is supported by Gilson (1997), who reports that leverage typically does not decline by much from high levels at distressed firms that go through out-of-court debt restructuring. He finds that the median firm's long-term debt ratio (long-term debt/(long-term debt + equity value)) declines by only 0.060 – from 0.700 to 0.640 – in distressed debt restructurings, with deleveraging thwarted to the point that 35% of these firms later undergo further debt restructuring. Gilson also finds signs of attenuation in bankruptcy, with the median long-term debt ratio declining from 0.740 before filing for Chapter 11 to 0.470 at exit from bankruptcy. In a similar vein, Heron, Lie, and Rodgers (2009, table 1) report that the median ML ratio declines from

0.630 at the fiscal year end before Chapter 11 filings to 0.406 at exit.

Table 6 documents distress-related attenuated deleveraging – to an ML ratio that is lower than in these prior studies, but still well above zero – for many firms in our baseline sample. The table also reports nontrivial attenuated deleveraging by many firms that are acquired in their peak ML year, or soon after. The table indicates that 10.4% of firms in the baseline sample were delisted (per CRSP) because of financial distress in the four years after attaining peak ML, while another 11.5% were delisted due to distress almost immediately after attaining peak ML (row 2). The analogous sample incidences for firms delisted due to acquisition are 14.0% and 7.6% (row 2). We focus on the first and third columns of the table, which examine the distressed and merger delists that occur in the four years after peak ML. We focus on these firms because Compustat has data to gauge the extent of their post-peak deleveraging.

Table 6 reports that, among firms that are delisted due to distress, median ML at the peak is 0.523 (row 5), which is close to the analogous 0.543 figure reported in Table 2 for firms with five or more years of post-peak data. Distress delists have a median ML of 0.181 at the post-peak trough (row 6), which is well above the analogous 0.026 figure in Table 2 for firms with five or more years of post-peak data. It is also well above the 0.042 ML ratio that the median firm in this distressed-firm subsample had at the trough before peak ML (row 4). Altman Z-scores indicate serious financial trouble at peak ML and at the post-peak trough for distress delists (rows 10 and 11). Consistent with serious trouble, most of these firms lost money in the peak ML year (row 12), and they typically took on little additional debt (row 13) and instead reached peak ML due to a large fall in equity value (rows 14 and 15). The median firm has negative retained earnings while deleveraging and a resultant large contraction in total assets (row 16).

Firms delisted due to merger also show attenuated deleveraging, with median ML declining from 0.382 at the peak to 0.182 (rows 5 and 6) rather than to a near-zero ML ratio. However, these firms are much less troubled than the distress delists according to Altman Z-scores and other financial distress indicators (rows 10, 11, 12, 14, and 15). After attainment of peak ML, distressed delists and merger delists both tend to have relatively small Cash/TA increases that mirror their modest ML decreases (rows 8 and 9). Firms in both subsamples typically repay a substantial portion of the debt they had outstanding at peak ML (row 16). However, for the median firm among the distress delists, retained earnings actually erode after peak ML and only a small number of new shares are issued, while retention and share issuance are positive, but economically inconsequential for the median merger delist (row 16).

We interpret these facts as indicating that, at most merger delists, attenuated deleveraging reflects the coincidental timing of acquisitions around attainment of peak ML rather than the exogenous arrival of conditions (e.g., debt overhang) that thwart managers' ability to reduce leverage. Conversely, for distress delists, the attenuated deleveraging from peak ML is plausibly something that managers would have liked to avoid, but could not because their firms' financial troubles impeded further deleveraging.

5.4 Asset contraction versus expansion: Financial distress, earnings retention, and deleveraging

The nature of deleveraging by firms that shrink substantially differs radically from that of firms that expand substantially. In Table 7, the first column analyzes the 9.7% of firms whose total assets contract by half or more as they go from peak ML to trough, while the second column analyzes the 19.1% of firms whose assets at least double. For the median firm in both samples, ML at the post-peak trough is close to zero (row 4), but the paths up to peak and then down to trough differ greatly.

We find a much higher median ML at peak among firms that contract by half than for firms that double in size (row 3, Table 7). This difference reflects more conservative debt increases in the peak year (row 7) and much larger negative stock returns leading up to peak (rows 8 and 9). Firms that shrink markedly after peak ML face much more serious trouble at peak (row 5), and their troubles worsen despite their deleveraging (rows 5 and 6). Remarkably, despite deleveraging to near-zero ML, most of these firms remain in serious trouble (row 6). The explanation is straightforward: Their sharp asset shrinkage reflects many large losses in the peak year and thereafter (rows 11 to 13), and so they typically generate no retained earnings to foster deleveraging (rows 14 and 15). They accordingly attempt to stay ahead of their continuing losses by aggressively paying down debt (row 16), while relying in part on share issuance to bolster their equity (rows 17 and 18) instead of on earnings retention (rows 14 and 15).

Earnings retention plays a dramatically different role in the deleveraging of firms whose assets double or more in size after peak ML. These firms typically have high earnings during their deleveraging (rows

11 to 13, Table 7), and these high earnings provide the basis for large-scale earnings retention (rows 14 and 15). Large earnings retention after peak ML, in turn, helps bring ML closer to zero even though the typical firm in this group repays only about half the debt it had outstanding at peak (row 16).

Over the period leading up to peak ML, these firms expand by much larger amounts than firms whose assets shrink dramatically in the post-peak period (row 2, Table 7). It thus makes sense that, in a large majority of these cases, managers of these aggressively expanding firms proactively lever up to peak ML (row 7). [Here and below, we apply Denis and McKeon's (2012) algorithm for identifying large proactive increases in ML.] These firms' trough-peak-trough pattern of asset growth and leverage has an intuitively plausible interpretation: Firms that are expanding a lot tend to see ML increase because they often use debt to fund their growth, and their subsequent deleveraging in part reflects the accumulation of material retained earnings that help fund continued expansion.

5.5 The path to peak ML: Proactive debt issuance and equity-value declines

A potentially important source of path dependency in deleveraging concerns peak ML which, of course, is the start of the deleveraging episodes we study. We find that debt issuance and negative shocks to equity are both empirically important components of the path to peak ML, and there is considerable heterogeneity in their relative importance among firms in our baseline sample. In the year of peak ML, the median firm has a stock market rate of return of -0.382 (row 3, Table 4) and a 14.6% increase in debt (not tabulated). Just over 85% of these firms have negative stock returns and about 65% issue more debt in the peak year (not tabulated).

In Table 8, the columns partition the baseline sample by deciles of stock rates of return in the year of peak ML. For these firms, stock rates of return are close to percent changes in total equity value (rows 1 and 2). This close correspondence reflects the fact that these firms typically make small or no equity payouts and issue few new shares in the peak ML year. Only for the highest stock-return decile group do we find an increase in equity value for the median firm (rows 1 and 2). For this group, the median increase in debt in the peak ML year is a remarkably large 181.0%, which is more than ten times the medians in decile groups one through eight (row 3). The fact that debt issuance tends to be muted for the latter groups of firms makes sense given their higher incidence of losses (row 5), markedly lower ROA (row 6), and Altman Z-scores indicative of serious financial trouble (row 9).

In gauging the importance of debt issuance versus equity-value declines in generating peak ML, we apply the conditions used by Denis and McKeon (2012) to identify firms that proactively increase ML by large amounts. The key premise is that few managers voluntarily pursue declines in equity value and so, in identifying proactive ML increases, one should isolate cases in which debt issuances are large relative to any declines in equity value.[5] We find that 98.5% of firms in the highest returns decile proactively lever up according to the conditions of Denis and McKeon (row 4, Table 8). There is a much smaller incidence of proactive levering up to peak in lower deciles, especially in deciles five and lower (row 4).

We also find considerable variation across the stock-return decile groups in median ML at the peak. In the highest decile, median ML at peak is only 0.280 while the corresponding figure for the bottom eight deciles is never below 0.483 and generally considerably higher than that (row 7, Table 8). The latter comparison suggests that managers of firms that proactively lever up tend to be cautious about the peak ML ratios they find tolerable, whereas firms that do not proactively lever up tend to reach higher peak ML ratios mainly because they experience large negative shocks to equity value.

We find much less variation across the stock-return decile groups in median ML at the post-peak trough (row 8, Table 8). This, in turn, suggests that deleveraging to a low leverage capital structure is the norm regardless of whether firms proactively lever up to peak ML. This conjecture is valid for firms with at least five years of post-peak data, but not for those with fewer years. This difference is clear in row 2 of Table 9, which partitions our baseline sample into firms whose ML peaks meet the Denis and McKeon (2012) conditions for proactive ML increases versus all other firms.

Table 9 also indicates that firms that proactively move to peak ML are generally healthier than the sample firms that do not meet the Denis and McKeon conditions. Specifically, firms that proactively

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[5] Denis and McKeon (2012, pp. 1902-1903) specify three requirements for an observed increase in ML to be included in their sample of proactive leverage increases: (1) the current annual change in ML must be at least 0.100, (2) the post-increase ML ratio must be at least 0.100 above the firm's target leverage ratio (estimated using industry leverage and other leverage determinants traditionally posited in the literature), and (3) the total dollar change in debt must be at least 90% of a scale-adjusted change in the firm's total outstanding debt.

increase ML tend to attain lower peak levels of ML (row 1), with fewer signs of trouble while at peak (rows 4, 7, 9, and 10) and stronger asset growth both before and after peak (rows 11 and 12). They also tend to increase debt sharply in the peak ML year, while the other firms are typically already starting to pay down debt (row 6) and seeing their equity values fall more sharply (rows 7 and 8).

6. Cross-firm variation in deleveraging

The empirical capital structure literature identifies industry leverage and a handful of firm-specific characteristics as factors that help explain leverage decisions. The latter variables include a firm's current profitability, size, asset tangibility, market-to-book ratio, and whether or not it pays dividends (Rajan and Zingales (1995) and Frank and Goyal (2009)). The regressions in this section provide evidence on the extent to which cross-firm variation in deleveraging outcomes – ML at the post-peak trough – can be explained by traditional leverage determinants from the literature and by a number of other factors that are specific to firms' deleveraging episodes.

The main message from the regressions is that the key to explaining whether a firm's ML at the outcome of deleveraging is high or low is knowledge of how high ML was at the peak and at the prior trough and whether the firm has had time to work its leverage back down. Although the traditional determinants are statistically significant as in the literature, their stand-alone ability to explain the variation in deleveraging outcomes falls well short of a simple model that includes a firm's historical ML (at peak and at the trough before the peak) and whether it has had only a short-time to deleverage since attaining peak. Explanatory power increases modestly when this simple model is expanded to include the traditional variables and several other factors related to a firm's deleveraging episode.

In Table 10's regressions, the dependent variable is ML at the post-peak trough and the right-hand-side variables are (i) traditional determinants from the literature evaluated when the firm is at its post-peak trough (rows 1 to 6), (ii) ML at the peak and ML at the trough before peak (rows 7 and 8), and (iii) indicator variables that identify firms with four or fewer years of post-peak data and firms delisted due to financial distress or merger within four years of attaining peak (rows 9 to 11).

When the traditional leverage determinants are treated as a stand-alone model of deleveraging, their coefficients are statistically significant and of the signs found in prior studies (column (1), rows 1 to 6, Table 10). They collectively explain 19% of the variation in ML at the post-peak trough and, when the regression model also includes industry and year fixed effects, the adjusted R^2 is 26% (rows 13 and 14).

We find similar explanatory power for a basic model in which the only right-hand-side variable is ML at the trough before peak. The adjusted R^2s are 15% and 27%, respectively, for this model without and with fixed effects (rows 13 and 14, column (2), Table 10)). The coefficient on the pre-peak trough is positive and highly significant (row 7, column (2)), and this finding is robust, as will soon become apparent. It is tempting to view this finding as indicative of leverage rebalancing over long horizons to a target that is stationary or nearly so. However, when all the evidence is taken collectively, it is difficult to view our deleveraging episodes as generally conforming to the type of targeting behavior in standard tradeoff theories of capital structure. Rather, as we discuss in section 8.1, the evidence is more compatible with deleveraging to replenish financial flexibility, which most firms had in abundance at the pre-peak trough and which most also have in abundance at the post-peak trough.

In Table 10, when ML at the peak is included as an explanatory variable along with ML at the pre-peak trough, the R^2s increase to 36% and 50% (rows 13 and 14, column (3)). In other words, a simple model that includes only information known at the beginning of the deleveraging episode explains about twice the cross-firm variation in deleveraging outcomes as do models based solely on traditional leverage determinants measured at the end of the episode.

The R^2s increase to 52% and 55% when the Table 10 regressions also take into account the number of years of post-peak data a firm has on Compustat (column (5)). This still-simple model indicates that having fewer than five years of data after peak implies that ML at the trough is typically 0.157 higher than the trough ML for firms with longer post-peak data periods (row 9, column (5)). The ML troughs are typically higher by another 0.041 and 0.045 respectively after taking into account whether a firm is delisted due to distress or merger soon after reaching peak (rows 10 and 11, column (5)). These estimates together imply a total difference in deleveraging outcomes of around 0.200 for distress and merger delists over and above other sample firms. This large difference actually understates the extent of attenuation in deleveraging for these two types of delists. The reason is that the regression sample excludes quite a few cases (per section 5) in which firms are delisted due to distress or merger in the peak year.

When the traditional leverage determinants are added to the model, the R^2s increase by a modest amount (3% or 4%) to 55% and 59% respectively (rows 13 and 14, column (6), Table 10). All traditional variables retain the signs usually reported in prior studies, but there are some indications of diminished significance levels (compare columns (1) and (6), rows 1 to 6).

Table 11 expands the analysis of deleveraging outcomes to include several other factors that are known as of peak ML (rows 8 to 12) as well as factors that become known between peak and trough (rows 16 to 18).[6] Inclusion of this broader set of factors does not change the main carry-away about the strong explanatory power of historical ML ratios and the amount of time a firm has had to deleverage. The reason, in short, is that the all-inclusive models in columns (4) and (5) of Table 11 have R^2s that are only slightly above the R^2 for the simple model in columns (5) of Table 10.

Table 11 has four other findings of interest. First, there are at best minor differences in deleveraging outcomes between firms that are distressed when they are at peak ML and those that are not. The right-hand-side variables now include ML at peak interacted with an indicator variable for firms that are distressed at peak (rows 8 and 9) as well as the indicator variable itself (row 10). These refinements have negligible effects on overall explanatory power, as can be seen by comparing R^2s across Tables 10 and 11. Moreover, the estimated distress indicator effect is small and slightly negative (row 10) rather than positive as one would expect if being distressed at peak implies systematically higher ML at the trough (row 10, Table 11). A plausible reason is that the strong explanatory role of ML at the peak likely reflects

[6] The variables in rows 8 and 9 are ML at the peak interacted with financial distress at peak: Row 8 has ML at peak conditional on the firm having an Altman Z-score at peak < 1.81, while row 9 has ML at peak conditional on the firm's Z-score at peak ≥ 1.81. Rows 10 to 12, 17, and 18 contain indicator variables that take the value one if a particular specified condition is met, and zero otherwise. The row 10 variable equals one if the firm's Z-score at peak ML < 1.81. The row 11 variable equals one if the firm's ML increase in the peak year satisfies the Denis and McKeon (2012) condition for a proactive increase in leverage. The row 12 variable equals one if the year of peak ML comes within six months of an NBER-specified recession. Net cash flow (NCF) in the numerator of the row 16 variable is defined as in Denis and McKeon (2012, p. 1916, eq. (13)). It is the sum of Denis and McKeon's annual cash surplus amounts (net of lagged dividends) over all years in the firm's deleveraging episode.

the fact that financial distress is capitalized into a lower equity value at peak which, of course, translates to a higher ML ratio at that point in time.

Second, firms that proactively lever up to peak tend to have ML ratios at the subsequent trough that are significantly higher in a statistical sense, but the typical difference is less than 0.020 and thus of minor economic significance (row 11).

Third, the estimated outcome differential is of roughly the same minor magnitude for deleveraging episodes that begin during recessions, and it is not statistically significant at conventional levels (row 12, columns (3) and (4), Table 11). Although ML peaks often occur during recessions (per Figure 5), Table 11 indicates that the outcomes of deleveraging episodes that begin during recessions are indistinguishable from those that do not begin during recessions.

Fourth, taking into account net cash flow realizations and asset structure changes during deleveraging episodes reveals a negligible impact of the former (row 16, Table 11) and that large asset growth or contraction is associated with significantly lower ML ratios at the post-peak trough (rows 17 and 18). While the point estimates of the typical asset structure effects are reasonably large, inclusion of these variables does not help much in explaining deleveraging outcomes, as they generate an increase of only 2% in adjusted R^2 (compare columns (3) and (4), row 20).

Overall, then, while the refinements in Table 11 improve the ability to explain differences across firms in deleveraging outcomes, their incremental explanatory power is modest at best. We conclude that the main carry-away from Table 10 remains relevant: The key to understanding the extent of cross-firm variation in deleveraging outcomes is information about the firm's historical ML ratios (at peak and prior trough) and about whether it has had only a few years to deleverage after reaching peak.

7. Firm-level longitudinal analysis of deleveraging versus the findings of prior studies

Prior studies report that deleveraging is typically much more muted than we find, and they report no indication of pervasive deleveraging to near-zero leverage. This section describes the key deleveraging findings of prior studies and explains why their focus on trends in cross-sectional average leverage ratios understates the extent of deleveraging by firms with high and/or recently increased leverage ratios.

7.1 Prior studies examine event-time trends in cross-sectional average leverage ratios

Denis and McKeon (2011, fig. 2 and table 4) analyze the evolution of ML ratios after large proactive increases in ML that, on average, move firms 0.270 above their estimated target ratios. They find that, over the seven years after these ML increases, cross-firm average ML declines from almost 0.550 to just over 0.400. The moderate ML decline of 0.133 occurs gradually (i.e., average ML drifts down by less than 0.020 per year). This decline offsets slightly more than 50% of the average ML spike of 0.240 from seven years earlier, and leaves average ML 0.122 above the average estimated target.

Harford, Klasa, and Walcott (2009, table 5) report an average decline of around 0.060 in excess leverage (actual leverage minus an estimated target ratio) over the five years following cash-financed acquisitions. Their sample does not require that leverage be "high" in any sense at the time of the cash-based acquisition. However, it is similar to the study by Denis and McKeon in that both examine the time path of average leverage ratios following managerial decisions to increase leverage, i.e., exogenous leverage increases are excluded by design from both samples.

There is no such sampling restriction in the studies by Lemmon, Roberts, and Zender (LRZ, 2008, figs. 1 and 2) and DeAngelo and Roll (2015, p. 392), who analyze average leverage ratios over 20-year periods for samples of firms with leverage initially in the top quartile of the full leverage cross section. Both studies find that, although average leverage for the top quartile declines over time, it remains high in absolute terms and well above the average leverage of the other three quartiles. For example, LRZ (fig. 1, panel C) find that, for firms in the top quartile, the sample average ML declines from a bit more than 0.600 in the sample-formation year to slightly below 0.500 two decades later.

7.2 Trends in event-time sample averages understate the typical scale of deleveraging

The approach of these four studies – averaging first across firms at a given point in event time, and then examining the sequence of resultant sample average leverage ratios – yields information about the leverage of the typical firm at each event-time node after sample formation. DeAngelo and Roll (2015, p. 392) point out that trends in cross-sectional average leverage ratios can be misleading because averaging masks the empirically large time-series volatility in the leverage of most individual firms. For our study, the problem with this approach is not the masking of volatility. Rather, the problem is that it yields a downward-biased estimate of the size of the typical firm's deleveraging.

The bias arises from two empirically important features of the time path of leverage. First, the length of deleveraging episodes differs across firms. Second, after deleveraging to the post-peak trough level of leverage, firms commonly increase leverage. Consequently, in a given event year after sample formation, the leverage cross-section will include some firms that are reducing their leverage and other firms that are now increasing their leverage after having reduced it. Continued inclusion of the latter firms pulls the cross-sectional *event-time* sample average up, thereby giving a misleading (understated) impression of the typical scale of deleveraging within the sample being analyzed.

As Figure 6 shows, firms that deleverage relatively quickly to trough leverage and then increase leverage will inflate the cross-firm average leverage ratio during the event years that other firms are still deleveraging. This effect does not disappear over time because, with heterogeneity across firms in deleveraging, there is no future date at which all firms have fully deleveraged and remain at a new and stable level of leverage. There is nothing wrong with examining sample means or medians at the beginning or end of deleveraging episodes. The bias arises from examining changes in cross-firm *event-time* averages when episode length differs across firms.

The bias is large in our data. For example, among the 4,476 firms with five or more years of post-peak data, it takes six years for the median firm to reach the post-peak trough and the median ML at that trough is 0.026. The event-time median ML ratio for these firms are 0.166 in the fifth year after peak and 0.157 in the sixth year. The latter figures give the incorrect impression that the typical firm deleverages to an ML ratio that is considerably above 0.000.

7.3 Longitudinal analysis of deleveraging from high, but not necessarily peak, market leverage

As with deleveraging from historical peak ML, the typical size of deleveraging is quite large for firms whose ML is high relative to other firms. This fact is evident in Table 12, which documents the size of deleveraging by firms whose ML is currently in the highest quartile of the ML cross section. The table considers two distinct samples. In the first two columns, the sample contains firms that survive for 20 years after the date of sample formation. [Prior capital structure studies that analyze samples with comparably long-surviving firms include Shyam-Sunder and Myers (1999), Lemmon, Roberts, and Zender (2008), and DeAngelo and Roll (2015).] In the last two columns, the sample has no such survival condition for a firm to be included. The only requirement is that a firm have data available for two years (the year of sample formation and the next year) so that it is possible to measure the firm's change in ML.

For both the 20-year minimum and two-year minimum samples, we start with calendar year 1950 (event year t = 0) and identify the 25% of firms with the highest ML ratio in that year. For each firm, we record ML in years t = 0 to 19 as well as the change in ML from t = 0 to the year in which ML takes its minimum value over event years t = 1 to 19. We conduct 44 sample runs, taking in turn 1950, 1951,…, 1993 as the year of quartile-sample formation (t = 0). Table 12 also reports results for the 24 runs that have 1970 to 1993 designated as event year t = 0. For each variable specified in the first column, Table 12 reports the median over the relevant set of 44 or 24 sample runs.

Table 12 shows that the typical firm currently in the highest ML quartile deleverages by a large amount in subsequent years. For example, among firms listed at least 20 years, the median deleveraging entails a decline in ML of 0.325 over sample years 1950-2012, and a decline of 0.438 over 1970-2012 (row 1). The latter figure is larger because, as prior studies have documented, average leverage increased markedly during the boom that followed World War II. Consistent with such a secular increase in leverage, median ML in year t = 0 is 0.566 for sample runs over the later period 1970 to 2012 versus 0.483 for sample runs over the full period 1950 to 2012 (row 2).

The actual size of the typical deleveraging is much larger than the implied size estimated as the change from (i) the cross-firm median ML in the current year (t = 0) to (ii) the smallest value over subsequent years (t = 1 to 19) of the cross-firm median ML. For example, among firms listed 20-plus years, the implied size of deleveraging based on changes in the sample median ML is -0.109 over 1950-2012 (row 8), whereas the actual median size based on examination of all deleveraging episodes is -0.325 (row 1). The implied size of deleveraging based on changes in the sample mean ML is -0.132, whereas the actual mean size of deleveraging is -0.350 (details not tabulated).

These comparisons show that, as illustrated in Figure 6, deleveraging estimates based on changes in event-time sample median (or mean) leverage suffer from a nontrivial downward bias in our sample.

In Table 12, the median deleveraging is somewhat smaller for samples that include firms with as few as two years of data (row 1, last two columns) than for samples that include only firms with data in all years from t = 0 to 19 (first two columns). Because deleveraging generally plays out over an extended period, the difference is explained by the fact that firms that exit the sample after a few years are unlikely to have completed their full deleveraging within our sample period. However, even with attenuated deleveraging measures for firms listed just a few years, the actual size of the typical deleveraging remains large (row 1, last two columns), and it is still markedly greater than the implied size of deleveraging estimated from changes in event-time cross-firm median ML ratios (compare rows 1 and 8).

8. Implications of the evidence for theories of corporate financial policy

This section discusses implications of our evidence for three features of theories of financial policy: (1) the nature of leverage targeting behavior, (2) time-series variation in financial flexibility, and (3) the interdependence of capital structure and payout policies, especially through earnings-retention decisions. The emphasis here is on general features that our evidence indicates deserve serious attention in the construction of empirically viable theories. Section 9 summarizes our main findings and conclusions.

8.1 Deleveraging and the nature of leverage targets

The widespread proactive deleveraging from peak to near-zero ML that we find is hard to reconcile with even moderately positive leverage targets of the type in traditional tradeoff theories of capital structure. If such targets govern leverage optimization, why do so many firms proactively overshoot them by large amounts as they reduce ML to zero or near-zero levels, while also driving net debt negative?

With trivial transaction costs of distributing cash, firms could avoid overshooting of targets by buying back shares or paying a special dividend instead of accumulating large cash balances, as they actually do while deleveraging. Such transitory equity payouts could have kept ML ratios higher at most sample firms, where debt is not fully repaid, and net debt could have been kept positive. Instead, cash balances were allowed to grow, pushing ML closer to zero and net debt negative. Thus, managers' revealed preference indicates that their behavior is not driven by the objective of keeping leverage ratios close to materially positive targets. This point is reinforced by the fact that most firms also had near-zero leverage at the trough that prevailed before the peak.

The observed alternating sequence of extreme capital structures could reflect changes over time in managerial views of acceptable levels of corporate risk. For example, most firms are financially troubled at peak leverage and that experience may have made managers more conservative and thus encouraged proactive movement toward low leverage and high cash balances.

Another (not mutually exclusive) explanation is that pervasive deleveraging to near-zero ML could reflect leverage targets that differ from those in traditional tradeoff theories by inclusion of a value to financial flexibility. In traditional theories, there is no option value for unused debt capacity. When flexibility is valuable, leverage targets are lower than in traditional theories to provide the option to borrow to meet funding needs.[7]

In dynamic capital structure theories in which flexibility is valuable, firms will tend to borrow to raise funds to cover external funding needs, and then retain a portion of future earnings realizations to increase equity and repay debt, thereby deleveraging back toward target. This proactive deleveraging is desirable because it restores the firm's "dry powder," i.e., the option to issue debt to meet new funding needs.

Intuitively, this is the type of targeting implied by a simple "credit-card" theory of debt. Leaving aside taxes and other motives to have debt as a permanent component of capital structure, the target (optimal) balance on the credit card is zero because that provides maximal future funding capacity. Firms of course sometimes use their credit cards to meet funding needs, and so they will sometimes have large

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[7] The key conditions that make financial flexibility valuable and that lead to an option-inclusive leverage target are (i) a multi-period setting with endogenous investment, (ii) debt capacity is a scarce resource, (iii) debt is a relatively low cost means of raising outside funds, and (iv) there is a (tax, liquidity, or agency) cost that deters unlimited stockpiling of cash balances (DeAngelo, DeAngelo, and Whited (2011, pp. 235-236)). These conditions are satisfied by many dynamic capital structure models, including those of the general Hennessy and Whited (2005) class. They are not satisfied by the broad set of dynamic models, discussed by Strebulaev and Whited (2012), in which investment is exogenous.

account balances and a currently limited ability to borrow more. However, as future earnings arrive, firms proactively deleverage (repay their debt) to replenish the capacity to borrow.

The point here is not that the data conclusively validate a "credit-card" theory of capital structure. Rather, the point is that the leverage dynamics we observe are closer to the type of *target*-related behavior in the credit-card story than in traditional tradeoff models. For example, we find that many sample firms proactively deleverage from all-time peak ML to negative net debt. Traditional tax versus distress cost models hold investment policy fixed and therefore cannot explain this regularity. With investment policy fixed, there is a cost (avoidable corporate taxes) and no benefit from ever having more cash than debt.

Our evidence can thus be read as indicating that traditional tradeoff models of capital structure need to incorporate a motive for the accumulation of large cash balances. The most obvious such motive is a precautionary demand for cash to meet possible future funding needs, but agency-cost or behavioral motives could also lead to the choice of financial policies with ample financial flexibility.

Finally, Danis, Rettl, and Whited (2014, fn 5) note that many traditional dynamic tradeoff models assume that firms cannot reduce debt and that others predict that firms will never reduce debt outside of default or strategic renegotiation. The pervasive pay down of debt by sample firms indicates that the leverage dynamics in these models are far wide of the mark empirically.

8.2 Time-series variation in financial flexibility and corporate deleveraging

The fact that many firms proactively deleverage to negative net debt from high ML capital structures with modest cash balances is consistent with theories that assign a central role to financial flexibility. So, too, is the fact that firms typically have negative net debt before levering up to peak ML while spending down cash balances. Flexibility is valuable only if there are situations in which firms use at least some of their debt capacity and precautionary cash balances. Conversely, if flexibility is valuable, then firms should proactively attempt to replenish their financial flexibility after using it. In particular, to ensure they are once again prepared to meet potential funding needs, firms should seek to deleverage to restore the capacity to borrow and should also work to rebuild their cash holdings.

The data show that, at both the trough after peak ML and the trough before peak, the typical firm has almost no debt and substantial cash holdings, while substantial debt and modest cash holdings are the norm at peak ML. This sequence of financial policies is fully consistent with broad-based utilization and restoration of financial flexibility.

The same is true of the fact, reported in Table 9, that more than one third of sample firms choose to move to their all-time peak ML ratios and then typically also choose to deleverage to near-zero ML. This sequential pattern of proactive ML increases followed by proactive ML decreases is consistent with the evidence (and financial-flexibility interpretation thereof) in Denis and McKeon (2012).

In principle, a proactive move to all-time peak ML could represent adjustment toward a high target ML ratio. However, this interpretation begs the question why so many firms had targets at ML ratios they had never previously reached, and then saw those ostensible targets decline sharply to near-zero levels. A more plausible interpretation is that many cases involving proactive moves to all-time peak ML entail temporary borrowing as in the credit-card theory, not moves to high target ML ratios.

In any case, the important general implication is that any credible theory of corporate financial policy must allow for the possibility highlighted by Myers and Majluf (1984) that a given firm will, at different times in its history, operate with radically different degrees of flexibility. Empirically, most firms have times when they operate on a tight financial leash (with high ML and low Cash/TA) and then proactively deleverage to a capital structure with ample financial flexibility (low ML and high Cash/TA).[8]

8.3 Retention and the interdependence of capital structure and payout policy

The empirical corporate finance literature generally treats capital structure as the most important aspect of financial policy, with payout policy a largely separable issue of secondary importance. This empirical view clashes at the most basic level with the theoretical analyses of Stiglitz (1973), Myers and Majluf (1984), and others who emphasize the benefits of internally generated equity. In the latter studies,

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[8] Firms' tendency to have alternating periods of ample flexibility and of operating on a tight financial leash could plausibly explain the paucity of refinancing decisions recently found by Korteweg, Schwert, and Strebulaev (2014, KSS). In KSS, 17.0% of sample firms *never* refinance, i.e., never issue significant amounts of debt or equity during the analysis period. But these firms also have an average Cash/TA ratio of 0.370 during that period (KSS, Table III). These cash holdings are quite high, which is a clear sign that this KSS subsample contains many firms that currently have substantial financial flexibility. It thus makes sense that they would avoid issuing securities to meet funding needs, since they currently have abundant cash to address those needs.

internal financing yields benefits because corporate retention of resources implies lower personal taxes (in an overall PV sense) and mitigates asymmetric information problems associated with external financing. The two views clash because managers generate internal equity for a firm's capital structure through the choice of payout policy and, in particular, through decisions to retain rather than pay out earnings.

We interpret our findings on deleveraging and the role therein played by retention as supporting capital structure theories in which there are advantages to internally generated equity. Although decisions to retain rather than distribute earnings are clearly central to payout policy, our findings show that such decisions are also nontrivial contributors to deleveraging. Retention dictates a higher market value of equity and therefore a lower ML ratio (at levered firms) than would prevail if managers had instead paid out the earnings to shareholders. Decisions to retain large amounts of earnings, which are commonplace after firms reach ML peaks, are an empirically important means of effecting large-scale reductions in ML, especially from high to moderate ML ratios.

At the same time, however, our evidence does not support the strict pecking-order or other such models in which the benefits of internally generated equity capital imply that earnings retention always dominates equity payouts. Most sample firms increase dividends during the period that ML declines from peak to trough. Managers of these firms could have reduced ML more rapidly and, in some cases, to a lower level without upsetting shareholders with a dividend cut. All managers had to do was hold dividends constant and use the incremental retention to pay down debt or build up cash balances. Their decisions reveal that they willingly accepted muted deleveraging in order to deliver larger payouts to shareholders. In other words, the data indicate that these managers treat equity-payout considerations as important in their own right, and not as dominated by the benefits of deleveraging to a lower ML ratio.

9. Summary of main findings and key implications

The firm-level deleveraging episodes we study are much larger and more focused on reaching low leverage than one would expect to observe from the prior empirical and theoretical literature. Most firms face financial trouble when they are at their all-time peak market leverage (ML). Almost 22% of sample firms are delisted due to financial distress within four years of peak, with ML typically well above the post-peak troughs of firms that are not delisted. Most of the latter firms proactively deleverage to safe financial condition, with near-zero ML, high cash balances, and negative net debt. These deleveraging episodes reflect, to a remarkable degree, decisions to repay debt, retain earnings, and issue new shares. Debt repayment typically plays the main role, but earnings retention is also important, especially at firms that initially have high to moderate ML ratios and/or that increase debt while deleveraging.

Our findings thus indicate that credible theories of financial policy must be able to explain pervasive (large-scale) proactive deleveraging from peak to near-zero ML accompanied by decisions to bolster cash holdings materially. Such theories must also be able to explain why, among the many firms that pay off all debt, most effectively reduce leverage far below the zero lower bound on ML by accumulating large cash balances, driving their net-debt ratios deeply negative. These facts are difficult to reconcile with firms having materially positive target leverage ratios, given that there are trivial costs of avoiding the over-shooting of the ostensible positive targets by distributing the accumulated additional cash through share repurchases or special dividends.

Since the data clearly show that most firms proactively deleverage from all-time peak ML to financial policies with ample financial flexibility, Occam's razor suggests that a sensible foundation for a credible theory is to assign an important role to rebuilding financial flexibility. However, our data also indicate that the deleveraging episodes we study cannot be explained simply by incentives to rebuild flexibility. For example, the rate and size of deleveraging are often dampened by decisions to increase a firm's equity payouts instead of paying down debt or growing cash balances. Thus, instead of an exclusive focus on restoring unused debt capacity and ample cash holdings, the data point to capital structure theories with important dependencies among leverage, cash-balance, and earnings-retention/payout decisions.

Moreover, the fact that most firms proactively move from peak ML to a negative-net-debt capital structure could be explained by a behavioral theory that posits material variation over time in managerial conservatism. Most firms are financially troubled when at peak ML, and that may have scared managers and induced systematic decisions to move toward low ML and high cash balances. As with the flexibility argument, an increase in managerial fear is a plausible contributing factor rather than a viable stand-alone explanation for our findings. The reason, again, is that many firms increase dividends while deleveraging and a non-trivial minority take on more debt. Such actions would not be taken if the objective is to reach a safe financial condition as quickly as possible.

Viewed most broadly, our findings cast doubt on theories with materially positive leverage targets, and highlight the need for theories that (i) can explain why most firms proactively deleverage from peak to near-zero ML (and negative net debt) after having had similarly conservative financial policies before peak ML, (ii) treat financial flexibility as a valuable and transitory element of financial policy, (iii) recognize the benefits of internally generated equity capital obtained through earnings retention, and (iv) have empirically important dependencies among leverage, cash-balance, and earnings-retention decisions.

We close with two thoughts about how our findings relate to Fama and French's (2005, pp. 580-581) conclusion that traditional tradeoff and pecking-order theories both fail as a stand-alone model of capital structure, and that researchers should focus on elements of each that help explain financing decisions. Our findings suggest that the distress-cost side of the leverage tradeoff in traditional theories is an essential element of any credible theory of financial policy. Without distress costs, theories will struggle to explain the large proactive deleveraging from financially troubled to safe condition that pervades our sample. Our findings also suggest a significant role for financial flexibility, as the pecking-order theory was first to highlight in the literature. Theories in which financial flexibility is valuable can plausibly explain why many firms do not simply reduce leverage to low, but positive, levels to avoid financial distress, and instead proactively deleverage deep into the negative-net-debt zone.

Figure 1

Scale of Deleveraging from Peak Market Leverage (ML) to Subsequent Trough: Sample Sorted by Deciles of Peak ML

Market leverage (ML) is book debt divided by the sum of book debt and the market value of equity. Peak leverage is the maximum ML over a firm's time in the sample. The subsequent trough is the lowest value of ML after the peak. The sample contains 4,476 nonfinancial firms that have five or more years of post-peak data on Compustat. Each of the ten decile groups accordingly contains 447 or 448 firms. For deciles 1 and 2, the median firm has zero debt at the post-peak trough, and so the figure shows a positive value for the median ML at the trough after peak only for deciles 3 to 10.

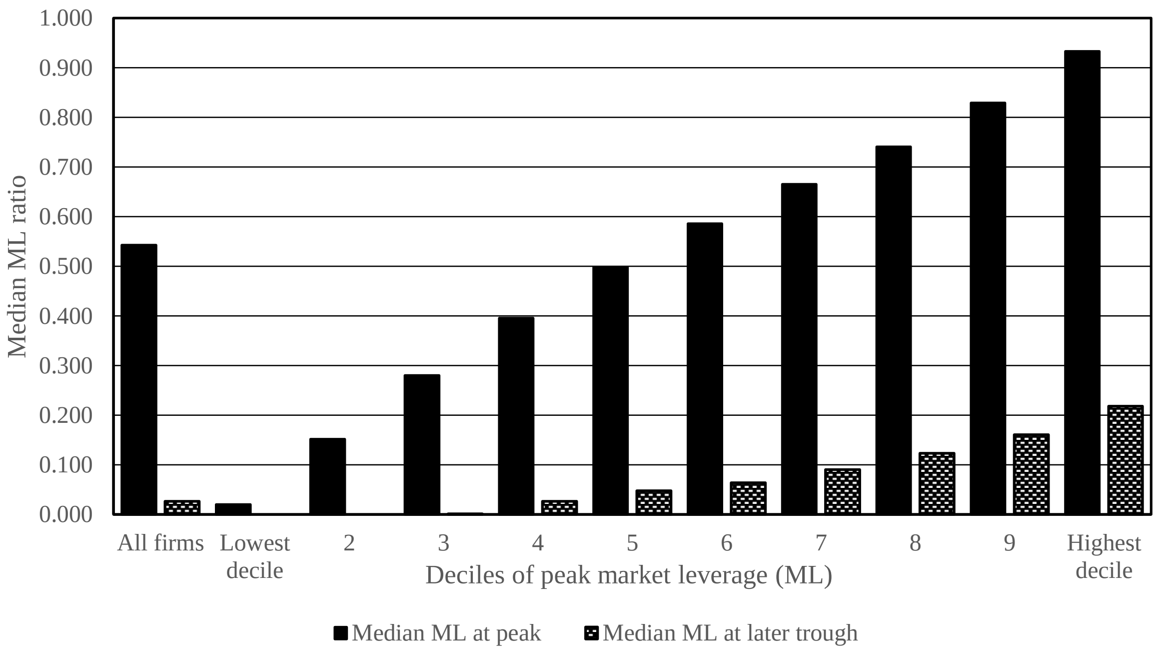


Figure 2

Percent of Firms that Deleverage to Zero Debt and Negative Net Debt Capital Structures: Sample Sorted by Deciles of Peak ML

Market leverage (ML) is book debt divided by the sum of book debt and the market value of equity. Peak leverage is the maximum ML over a firm's time in the sample. The subsequent trough is the lowest value of ML after the peak. A negative-net-debt capital structure has a level of debt that is lower than the firm's cash holdings. The sample contains 4,476 nonfinancial firms that have five or more years of post-peak data on Compustat. Each of the ten decile groups accordingly contains 447 or 448 firms.

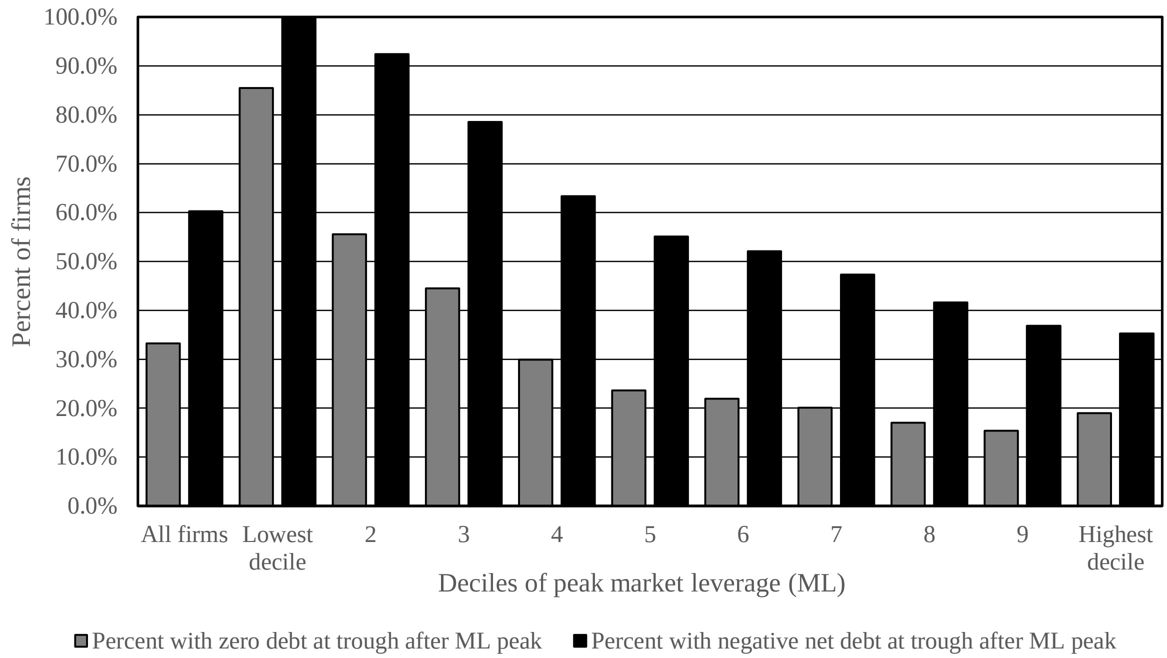
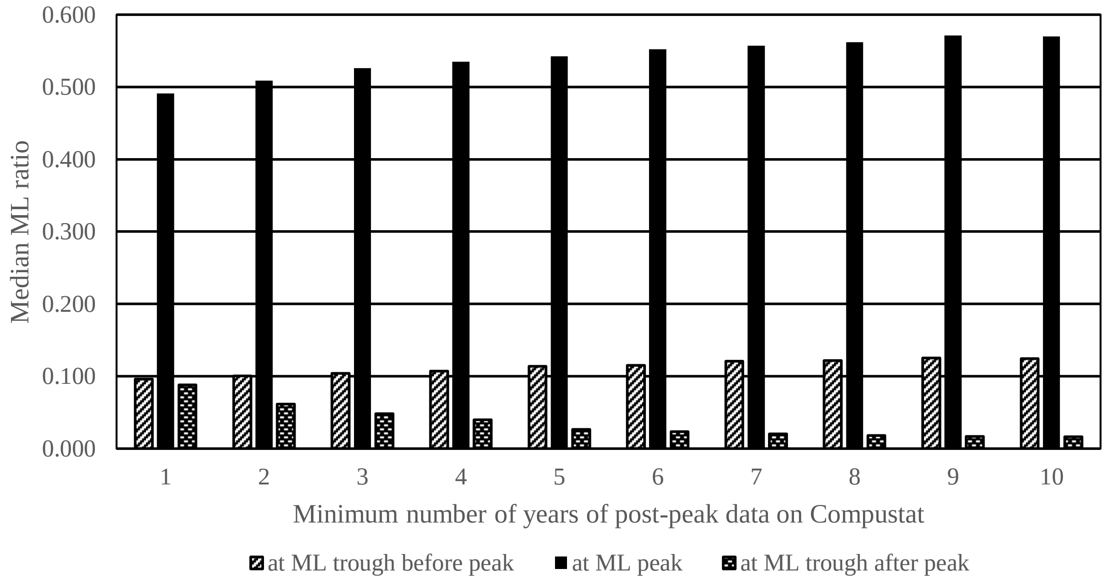


Figure 3
Median Market Leverage (ML) at the Peak and at the Troughs Before and After the Peak: Sample Sorted by the Number of Years of Post-Peak Data on Compustat

Market leverage (ML) is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. Peak leverage is the maximum value of ML over a firm's entire time in the sample. The ML trough after (before) peak is the lowest ML value that comes after (before) the ML peak. Results for the full baseline sample are reported at the far left in panel A. The baseline sample has 9,866 firms with at least one year of post-peak data on Compustat. Sample sizes for the other subsample entries in panel A are in row 12 of Table 2. Sample sizes for panel B can be calculated by taking differences in the row 12 entries for adjacent columns in Table 2.

A. Sample partitioned by *minimum* number of years of post-peak data on Compustat



B. Sample partitioned by *exact* number of years of post-peak data on Compustat

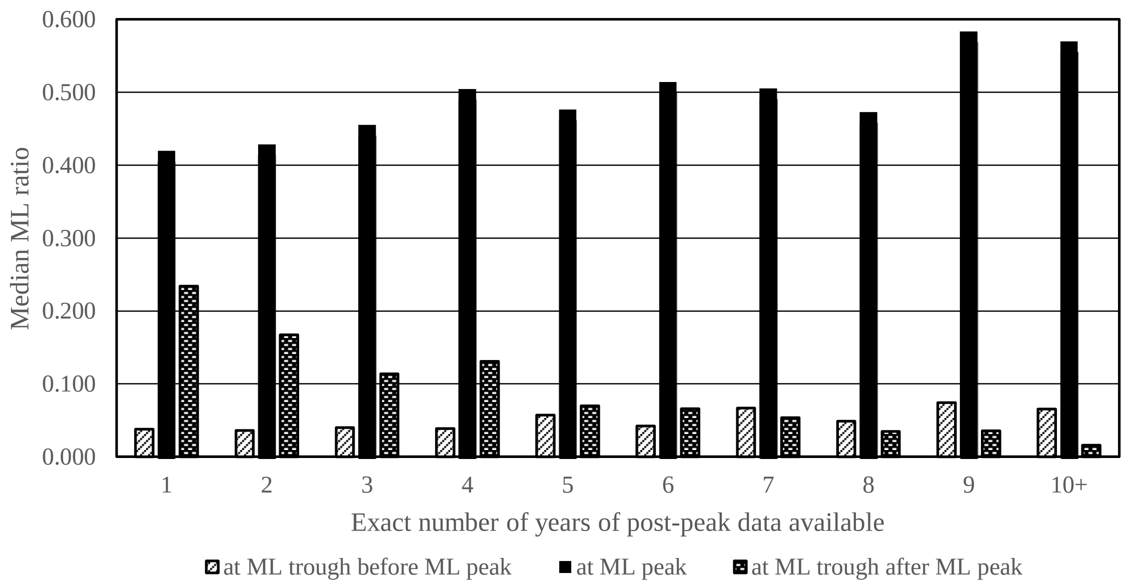
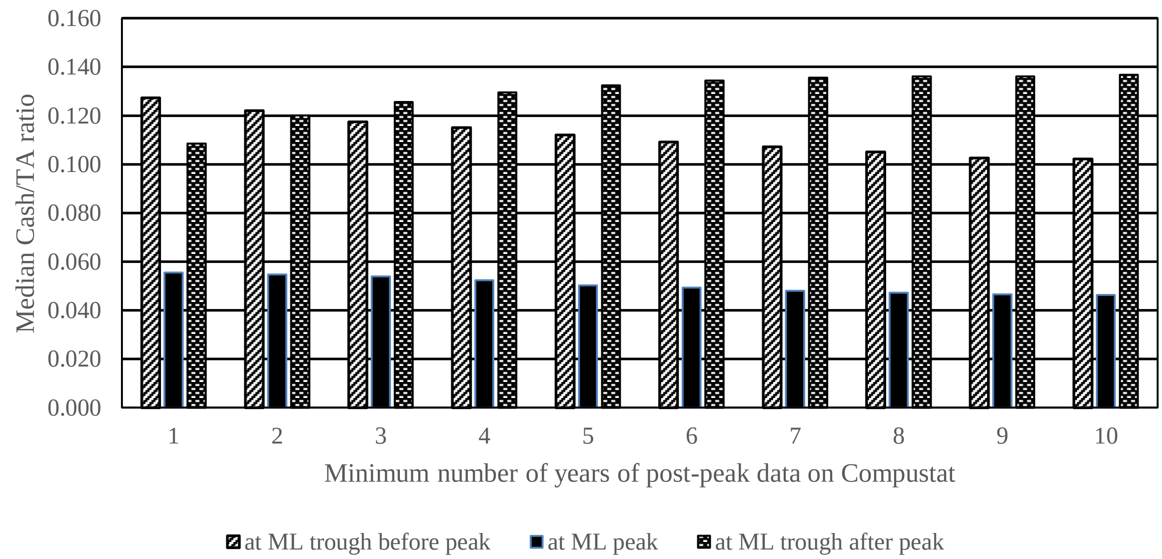


Figure 4

Median Cash-Balance Ratios and Incidence of Negative Net Debt Capital Structures at the Troughs Before and After Peak Market Leverage (ML)

Market leverage (ML) is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. Peak leverage is the maximum value of ML over a firm's entire time in the sample. The ML trough after (before) peak is the lowest ML value that comes after (before) the ML peak. Cash/TA is the ratio of cash plus marketable securities to total assets. A negative net debt capital structure has less debt than cash plus marketable securities. The baseline sample has 9,866 firms with at least one year of post-peak data on Compustat. Results for the baseline sample are presented in the first set of columns in both panels. Sample sizes for the other subsample entries in both panels are in row 12 of Table 2.

A. Median Cash/TA ratio at trough before peak ML, peak ML, and trough after peak ML



B. Percent of firms with negative net debt at troughs before and after peak ML

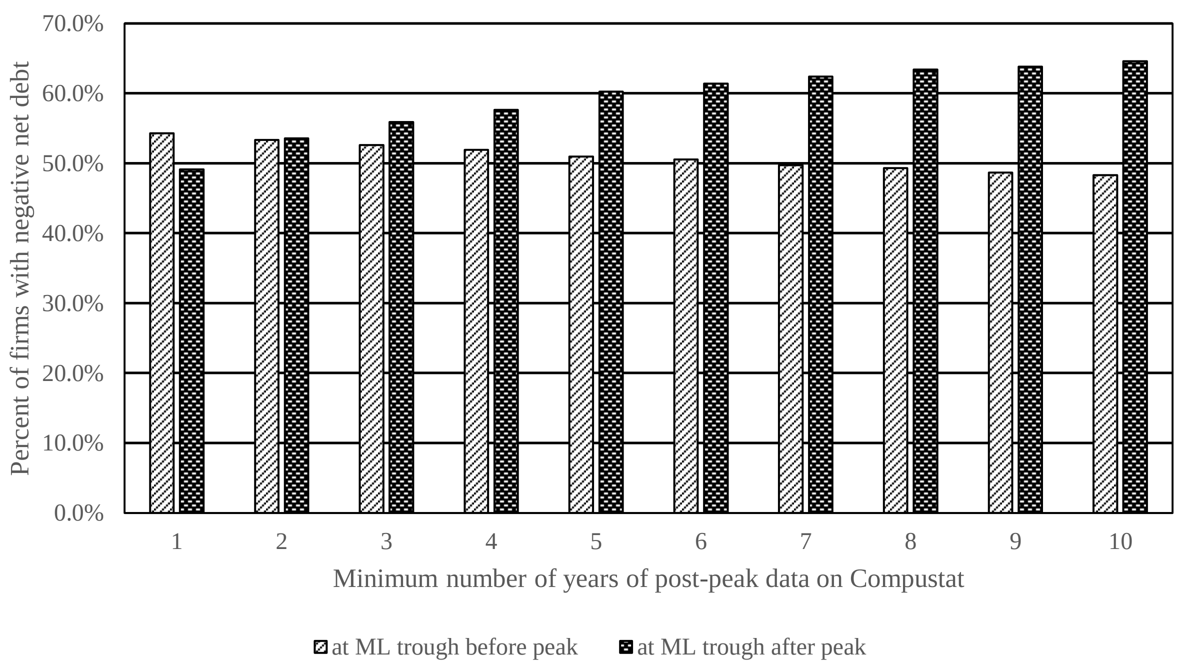


Figure 5

Calendar Timing of Market-Leverage Peaks

Market leverage (ML) equals the book value of debt divided by the sum of the book value of debt and the market value of equity. The figure reports the percent of firms for which the peak ML came in the specified calendar year. Recession timing is marked with grey vertical shading of the background in the figure and is based on the NBER's classification of recessions. Since our data are grouped by year on Compustat while the NBER classifies recessions based on months, the figure portrays a given year as a recession period if at least one month in that year is classified as such by the NBER. [As a result, the figure shows no separation between the 1980 and 1981 recessions, despite the brief respite noted in the NBER's monthly data.] See the header for Table 4 for details on how we classify each deleveraging episode as related (or not) to recessions. The baseline sample has 14,196 firms with at least two years of data on Compustat. The 20-year plus sample contains the subset of 2,738 firms with at least 20 years of data on Compustat. These samples exclude cases in which ML takes the same value in all years on Compustat (since such firms do not have an economically meaningful peak ML). For example, the 20-year plus sample excludes eight firms that have ML = 0.000 in all years.

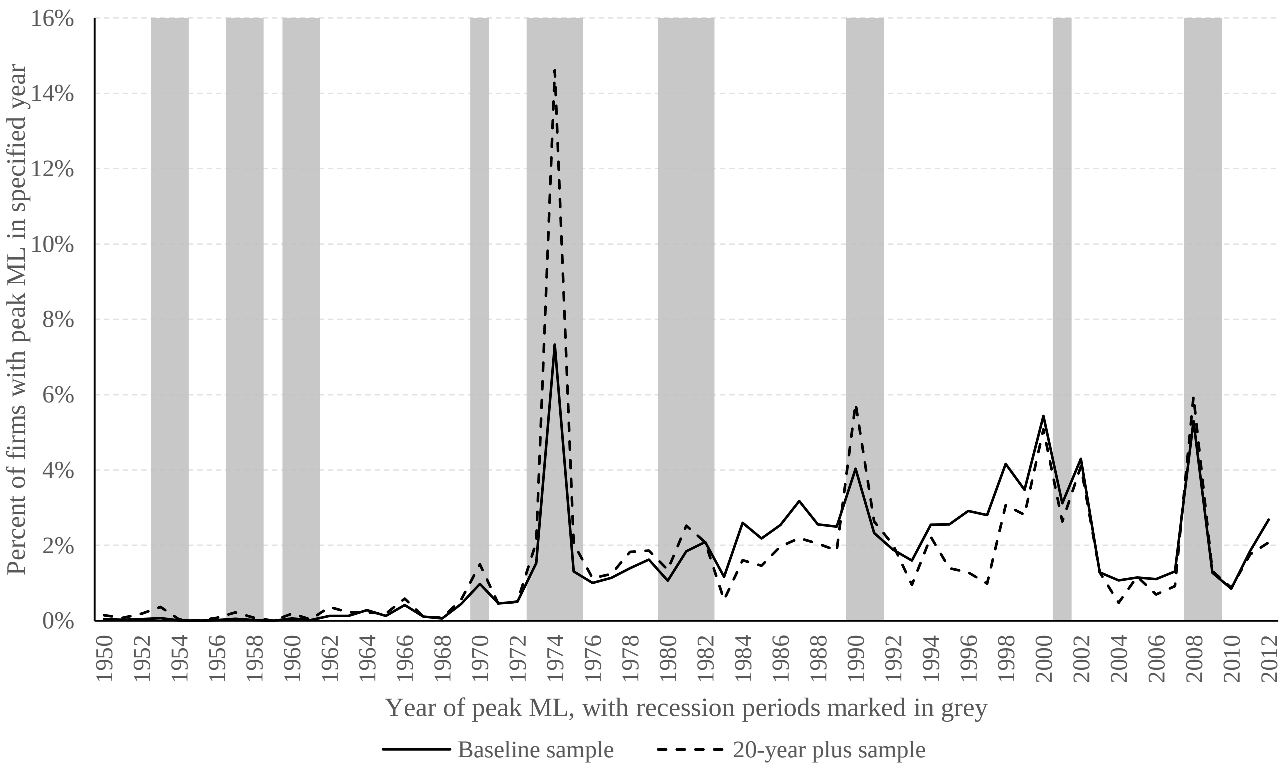


Figure 6

Why Changes in Event-time Sample Average Leverage Ratios Give Downward-Biased Estimates of the Magnitude of Deleveraging

Prior studies measure the magnitude of deleveraging by the change in cross-sectional average (mean or median) leverage ratios calculated in event time. The figure below illustrates why this approach yields downward-biased measures of deleveraging. In this simple example, Firms 1 and 2 start at the same peak leverage, L_{peak}, and both deleverage to a zero-debt capital structure, but at different rates. Both firms take on new debt after reaching the trough at zero leverage. Since both firms reduce leverage from L_{peak} to zero, the true mean (and median) magnitude of the deleveraging in these two episodes is L_{peak}. However, if one plots the average leverage ratio in event time relative to peak, leverage bottoms out at L_{min}. The measured deleveraging is $L_{peak} – L_{min}$, which is well below the true amount, L_{peak}. This attenuation reflects (i) cyclicality in leverage (with both firms taking on debt after their deleveraging episodes end) and (ii) heterogeneity in the rate at which firms deleverage. In this example, the height to the minimum point on the Event-time Sample Average plot represents the bias inherent in using the *event-time* mean or median leverage to gauge the magnitude of deleveraging by the typical firm. In other examples, the Sample Average plot will not be flat after Firm 1's deleveraging episode ends. In general, the slope of the Sample Average plot depends on the rate of deleveraging at Firm 2 versus the rate that leverage increases at Firm 1 after the end of its deleveraging episode. In all cases, as long as some firms are increasing leverage while others are reducing deleverage – which is virtually always true in the real data – the event-time sample mean and median leverage ratios will yield downward-biased measures of the magnitude of deleveraging by the typical firm.

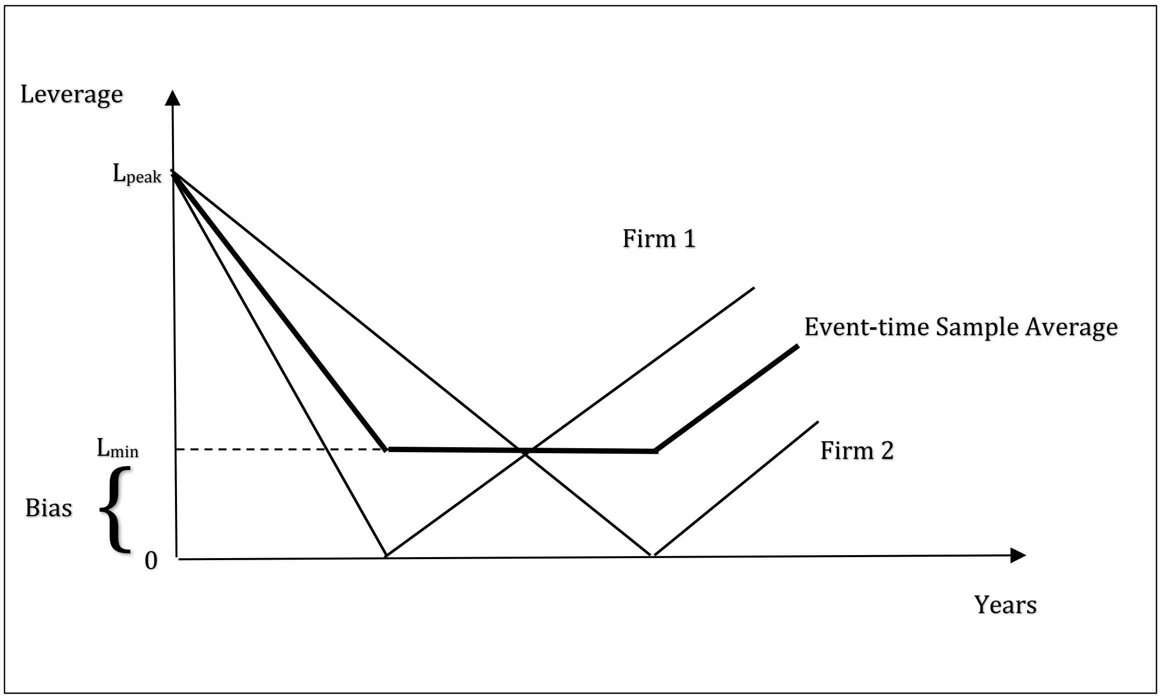


Table 1

Deleveraging Propensities:
Annual Changes in Leverage as a Function of the Beginning-of-Year Level of Leverage

Market leverage (ML) is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. Book leverage (BL or Debt/TA) is the ratio of the book value of total (short-term plus long-term) debt to the book value of total assets. The net-debt ratio (NDR or Net Debt/TA) equals debt minus cash, divided by total assets. The full sample contains 14,741 nonfinancial firms with a total of 171,010 firm-year observations in the CRSP/Compustat file over 1950-2012. The number of firms here exceeds the number in the baseline sample because here we do not exclude firms that have the same ML ratio in all years (as we do in the baseline sample). The data on changes in book leverage and net-debt exclude firm-year observations with Debt/TA above 1.000.

	Market Leverage		Book Leverage		Net Debt/TA	
Beginning-of-year ratio (ML or BL or Net Debt/TA)	Probability of annual decrease	Median annual change	Probability of annual decrease	Median annual change	Probability of annual decrease	Median annual change
1. 0.500 < Leverage	57.8%	-0.022	60.4%	-0.019	61.0%	-0.022
2. 0.400 < Leverage ≤ 0.500	53.6%	-0.012	58.6%	-0.014	59.1%	-0.016
3. 0.300 < Leverage ≤ 0.400	51.4%	-0.004	56.6%	-0.010	56.2%	-0.011
4. 0.200 < Leverage ≤ 0.300	48.3%	0.004	53.9%	-0.005	52.7%	-0.005
5. 0.100 < Leverage ≤ 0.200	45.9%	0.008	51.7%	-0.002	49.2%	0.001
6. 0.000 < Leverage ≤ 0.100	45.9%	0.002	53.5%	-0.001	45.3%	0.009
7. All Leverage > 0.000	49.9%	0.000	55.0%	-0.003	---	---
8. All including BL = ML = 0.000	43.6%	0.000	47.8%	0.000	---	---
9. All Net Debt/TA ≥ 0.000	---	---	---	---	52.5%	-0.005
10. All Net Debt/TA < 0.000	---	---	---	---	38.3%	0.029

Table 2

Deleveraging Episodes:
Market Leverage (ML) and Related Financial Ratios at the ML Peak and Subsequent ML Trough:
Baseline Sample Partitioned by the Minimum Number of Years of Post-Peak Data Available

Market leverage (ML) is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. Peak leverage is the maximum value of ML over a firm's entire time in the sample. The trough after peak is the lowest value of a firm's ML that comes subsequent to its peak. When a firm has multiple post-peak years with the same minimum value of ML, we take the earliest such year to be the date of the post-peak trough. Book leverage (BL) is the ratio of the book value of debt to the book value of total assets. Net Debt/TA is the book value of debt minus the sum of cash and marketable securities, divided by total assets. Results for the full baseline sample are in the first column. Successive columns report results for subsets of the baseline sample that exclude firms with a small number of years of post-peak data available on Compustat. For example, the column labeled "≥ 2" excludes the 2,065 firms (9,866 minus 7,801, per row 13) that have exactly one year of post-peak data available.

	Minimum number of years of data available after the market leverage (ML) peak:									
	≥ 1	≥ 2	≥ 3	≥ 4	≥ 5	≥ 6	≥ 7	≥ 8	≥ 9	≥ 10
1. Median ML at peak	0.491	0.509	0.526	0.535	0.543	0.552	0.557	0.562	0.571	0.570
2. Median ML at trough after peak	0.088	0.062	0.048	0.040	0.026	0.023	0.020	0.018	0.017	0.016
3. Percent of firms that have										
zero debt at ML trough after peak	22.8%	26.7%	28.9%	30.5%	33.2%	34.0%	34.7%	35.3%	35.8%	36.0%
negative net debt at ML trough after peak	49.1%	53.6%	55.9%	57.6%	60.3%	61.4%	62.4%	63.4%	63.8%	64.6%
4. Median Cash/TA at ML peak	0.056	0.055	0.054	0.052	0.050	0.049	0.048	0.047	0.047	0.046
5. Median Cash/TA at post-peak ML trough	0.109	0.120	0.126	0.130	0.132	0.134	0.136	0.136	0.136	0.137
7. Median Net Debt/TA at ML peak	0.283	0.286	0.288	0.291	0.296	0.299	0.302	0.304	0.310	0.310
8. Median Net Debt/TA at post-peak ML trough	0.007	-0.023	-0.040	-0.052	-0.067	-0.072	-0.076	-0.079	-0.081	-0.084
9. Median book leverage (BL) at ML peak	0.354	0.354	0.356	0.358	0.359	0.360	0.361	0.362	0.365	0.363
10. Median BL at post-peak ML trough	0.121	0.090	0.076	0.063	0.044	0.036	0.032	0.028	0.026	0.024
11. Median peak-to-trough decline in ML	-0.244	-0.305	-0.339	-0.365	-0.395	-0.414	-0.427	-0.438	-0.451	-0.462
12. Median years from ML peak to trough	2	3	4	5	6	6	7	8	9	9
13. Number of firms	9,866	7,801	6,529	5,547	4,476	3,954	3,467	3,075	2,756	2,462

Table 3
Managerial Actions that Reduce Leverage:
Debt Repayment, Earnings Retention, and Share Issuance

Market leverage (ML) is book debt divided by the sum of book debt and the market value of equity. Peak leverage is the maximum ML over a firm's time in the sample. The subsequent trough is the lowest value of ML after the peak. Panel A contains 4,476 firms with five or more years of post-peak data on Compustat. Panel B contains the 9,866 firms with at least one year of post-peak data. In row 7 of both panels, note that some firms increased dividends and cut dividends at different times during their deleveraging episodes. In row 9 of both panels, we report for the median firm the percentage of the decline in ML (from peak to trough) that would hypothetically obtain if the only things that changed were the managerial actions specified in the first column; see the Appendix for calculation details. In the far-right column, virtually all firms increased debt over the period from peak to trough, while a few firms (0.4% in panel A and 2.2% in panel B) did not decrease debt while deleveraging.

A. Sample of firms with at least five years of data after the ML peak

	All firms	Repay all debt	Repay some debt	Increase debt
1. Median market leverage (ML) at peak	0.543	0.287	0.612	0.652
2. Median ML at subsequent trough	0.026	0.000	0.078	0.169
3. Median Cash/TA at ML peak	0.050	0.110	0.043	0.040
4. Median Cash/TA at post-peak ML trough	0.132	0.303	0.097	0.052
5. Median Net Debt/TA at ML peak	0.296	0.136	0.342	0.344
6. Median Net Debt/TA at post-peak ML trough	-0.067	-0.303	0.008	0.173
7. Managerial actions during deleveraging:				
Median percent change in debt	-80.2%	-100.0%	-64.0%	61.0%
Median [earnings retention ÷ debt plus equity value at peak]	0.243	0.084	0.243	0.790
Median percent change in shares outstanding	15.2%	11.6%	12.1%	30.5%
Percent of firms with [asset sales ÷ debt] > 0.500	27.2%	28.8%	12.3%	12.9%
Median percent change in cash balances	169.5%	169.3%	143.1%	255.2%
Percent of firms that increased dividends	41.6%	22.3%	44.9%	68.5%
Percent of firms that cut dividends	33.2%	17.7%	38.5%	47.4%
Percent of firms with no interim debt increases	32.1%	56.3%	27.3%	0.4%
8. Median peak-to-trough decline in ML	-0.395	-0.287	-0.436	-0.395
9. Median percent of decline in ML due to				
Debt repayment (DR)	71.3%	100.0%	48.5%	0.0%
DR and earnings retention (ER)	93.7%	100.0%	82.4%	36.6%
DR, ER, and net share issuance (SI)	94.5%	100.0%	86.2%	46.0%
10. Percent of firms for which				
100.0% of ML decline is due to DR, ER, and SI	38.0%	100.0%	11.2%	1.3%
≥ 50.0% of ML decline is due to DR, ER, and SI	83.7%	100.0%	87.3%	45.4%
< 10.0% of ML decline is due to DR, ER, and SI	3.4%	0.0%	1.0%	15.7%
11. Adjusted R^2: Percent of cross-firm variation in deleveraging explained by DR, ER, and SI	75%	100%	73%	58%
12. Median ML if Cash/TA increase were used to repay debt	0.000	0.000	0.039	0.147
13. Number of firms	4,476	1,488	2,186	802
14. Percent of firms in sample	100.0%	33.2%	48.8%	17.9%

(table continued)

Table 3 continued

B. Sample of firms with at least one year of data after the ML peak

	All firms	Repay all debt	Repay some debt	Increase debt
1. Median market leverage (ML) at peak	0.491	0.218	0.544	0.579
2. Median ML at subsequent trough	0.088	0.000	0.142	0.242
3. Median Cash/TA at ML peak	0.056	0.150	0.048	0.042
4. Median Cash/TA at post-peak ML trough	0.109	0.309	0.086	0.052
5. Median Net Debt/TA at ML peak	0.283	0.059	0.317	0.333
6. Median Net Debt/TA at post-peak ML trough	0.007	-0.309	0.064	0.243
7. Managerial actions during deleveraging:				
Median percent change in debt	-52.7%	-100.0%	-48.4%	29.1%
Median [earnings retention ÷ debt plus equity value at peak]	0.052	0.014	0.049	0.109
Median percent change in shares outstanding	5.1%	7.5%	3.6%	9.8%
Percent of firms with [asset sales ÷ debt] > 0.500	17.6%	26.4%	13.4%	20.1%
Median percent change in cash balances	52.4%	84.6%	36.5%	77.6%
Percent of firms that increased dividends	26.9%	16.7%	26.4%	40.9%
Percent of firms that cut dividends	26.1%	14.8%	28.3%	33.0%
Percent of firms with no interim debt increases	52.2%	68.5%	61.7%	2.2%
8. Median peak-to-trough decline in ML	-0.244	-0.218	-0.164	-0.220
9. Median percent of decline in ML due to				
Debt repayment (DR)	57.9%	100.0%	52.8%	0.0%
DR and earnings retention (ER)	83.9%	100.0%	78.1%	4.1%
DR, ER, and net share issuance (SI)	87.3%	100.0%	82.7%	25.8%
10. Percent of firms for which				
100.0% of ML decline is due to DR, ER, and SI	35.6%	100.0%	21.4%	4.2%
≥ 50.0% of ML decline is due to DR, ER, and SI	74.3%	100.0%	79.0%	29.4%
< 10.0% of ML decline is due to DR, ER, and SI	8.3%	0.0%	2.4%	36.6%
11. Adjusted R^2: Percent of cross-firm variation in deleveraging explained by DR, ER, and SI	76%	100%	75%	58%
12. Median ML if Cash/TA increase were used to repay debt	0.054	0.000	0.105	0.222
13. Number of firms	9,866	2,252	5,782	1,832
14. Percent of firms in sample	100.0%	22.8%	58.6%	18.6%

Table 4
Deleveraging Episodes:
Financial Distress, Recession Timing, and Industry-Leverage Trends

Market leverage (ML) is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. Peak leverage is the maximum value of ML over a firm's entire time in the sample. The trough before (after) peak is the lowest value of a firm's ML that comes prior to (subsequent to) its peak. Results for the full baseline sample are in the first column. The next two columns partition the baseline sample into firms with (i) at least five years of post-peak data on Compustat and (ii) between one and four years of post-peak data. In row 4, a loss is a negative value of the firm's earnings before extraordinary items (EBEI). The return on assets (ROA) figure in row 5 is the Rajan and Zingales measure of profitability and equals EBITDA divided by total assets. Since EBEI is generally lower than EBITDA due, at a minimum to netting out interest, there is no paradox in the peak year findings that most firms in the baseline sample report losses (negative EBEI) yet ROA is positive for the median firm. Altman Z-scores below 1.81 are generally interpreted as indicating a firm is in distress and a likely candidate for bankruptcy. Z-scores above 2.99 are generally viewed as indicating the firm is safe, while Z-scores between 1.81 and 2.99 are viewed as indicating that it is difficult to tell if the firm will experience distress. A deleveraging episode is classified as recession related if the calendar date of the balance sheet that has peak ML is within six months of the closest month classified as a recession by the NBER. To obtain the industry median ML ratios reported in row 8, we use the approach of Denis and McKeon (2012, p. 1902), with the exception that we require a minimum of five other peer firms in the same 4-digit SIC industry (rather than their minimum of 10) in order to use the 4-digit peer group. If that condition is violated, we use a 3-digit industry peer group, provided there are at least five peer firms in the relevant 3-digit industry. If the latter condition is not satisfied, we use a 2-digit peer group.

	Number of years of post-peak data:		
	1 or more years	5 or more years	1 to 4 years
1. Median Altman Z-score at peak ML	2.01	2.20	1.81
2. Median Altman Z-score at post-peak trough	3.50	4.50	2.63
3. Median rate of return on common stock in			
peak ML year	-0.380	-0.348	-0.413
peak ML year and prior year	-0.462	-0.456	-0.467
peak ML year and two prior years	-0.415	-0.397	-0.429
4. Percent of firms with a loss in year of			
trough before peak ML	43.3%	36.6%	48.9%
peak ML	52.2%	45.5%	57.8%
trough after peak ML	42.5%	33.0%	50.8%
5. Median return on assets (ROA) in year of			
trough before peak ML	0.125	0.141	0.111
peak ML	0.074	0.085	0.060
trough after peak ML	0.117	0.141	0.092
6. Percent of firms with peak ML during recession	42.4%	45.8%	39.5%
7. Median market leverage (ML) at			
trough before peak ML	0.048	0.061	0.038
at peak ML	0.491	0.543	0.446
at trough after peak ML	0.088	0.026	0.173
8. Median Industry ML at			
trough before peak ML	0.156	0.162	0.150
at peak ML	0.219	0.241	0.197
at trough after peak ML	0.165	0.159	0.175
9. Number of firms	9,866	4,476	5,390

Table 5
Distributions of Market Leverage (ML) Ratios at the Peak and at the Post-Peak Trough:
Baseline Sample Partitioned by Number of Years of Post-Peak Data Provided in the Compustat File

Market leverage (ML) is book debt divided by the sum of book debt and the market value of equity. Peak leverage is the maximum ML over a firm's time in the sample. ML at the post-peak trough is the lowest value of ML that comes after the peak. The table partitions the baseline sample of 9,866 firms into the 4,476 firms with five or more years of post-peak data on Compustat and the 5,390 firms with between one and four years of post-peak data. Altman Z-scores below 1.81 are generally interpreted as indicating a firm is in distress and a likely candidate for bankruptcy. Z-scores above 2.99 are generally viewed as indicating the firm is safe, while Z-scores between 1.81 and 2.99 are viewed as indicating that it is difficult to tell if the firm will experience distress.

		Peak ML in specified range:									
A. ML at the peak	All firms	0.000 to 0.100	0.100 to 0.200	0.200 to 0.300	0.300 to 0.400	0.400 to 0.500	0.500 to 0.600	0.600 to 0.700	0.700 to 0.800	0.800 to 0.900	0.900 to 0.999
1. Number of firms											
5+ years of post-peak data	4,476	901	562	472	520	542	479	524	487	473	430
1-to-4 years of post-peak data	5,390	512	320	338	419	433	505	586	545	477	341
2. Percent of firms											
5+ years of post-peak data	100.0%	11.4%	7.1%	7.6%	9.3%	9.7%	11.3%	13.1%	12.2%	10.7%	7.6%
1-to-4 years of post-peak data	100.0%	16.7%	10.4%	8.8%	9.6%	10.1%	8.9%	9.7%	9.0%	8.8%	8.0%
3. Cumulative percent of firms											
5+ years of post-peak data	---	11.4%	18.5%	26.1%	35.4%	45.1%	56.4%	69.5%	81.7%	92.4%	100.0%
1-to-4 years of post-peak data	---	16.7%	27.1%	35.9%	45.5%	55.6%	64.5%	74.2%	83.2%	92.0%	100.0%
4. Median Altman Z-score at peak											
5+ years of post-peak data	2.20	5.85	3.48	2.63	2.61	2.19	2.24	2.04	2.02	1.46	0.63
1-to-4 years of post-peak data	1.81	4.59	2.77	2.27	2.16	1.98	1.60	1.51	1.41	1.12	0.16

		Post-peak ML in specified range:									
B. ML at the trough after peak	0.000	0.000 to 0.100	0.100 to 0.200	0.200 to 0.300	0.300 to 0.400	0.400 to 0.500	0.500 to 0.600	0.600 to 0.700	0.700 to 0.800	0.800 to 0.900	0.900 to 0.999
1. Number of firms											
5+ years of post-peak data	1,488	1,447	635	380	225	133	93	41	22	9	3
1-to-4 years of post-peak data	764	1,422	729	592	503	360	323	259	204	137	97
2. Percent of firms											
5+ years of post-peak data	33.2%	32.3%	14.2%	8.5%	5.0%	3.0%	2.1%	0.9%	0.5%	0.2%	0.1%
1-to-4 years of post-peak data	14.2%	26.4%	13.5%	11.0%	9.3%	6.7%	6.0%	4.8%	3.8%	2.5%	1.8%
3. Cumulative percent of firms											
5+ years of post-peak data	33.2%	65.5%	79.7%	88.2%	93.2%	96.2%	98.3%	99.2%	99.7%	99.9%	100.0%
1-to-4 years of post-peak data	14.2%	40.6%	54.1%	65.1%	74.4%	81.1%	87.1%	91.9%	95.7%	98.2%	100.0%
4. Median Altman Z-score at post-peak trough											
5+ years of post-peak data	5.75	5.81	3.89	3.36	3.04	2.48	2.26	1.39	2.06	1.77	-5.07
1-to-4 years of post-peak data	3.88	4.67	3.17	2.67	2.37	1.87	1.80	1.49	1.27	0.65	-0.68

Table 6
Attenuated Deleveraging: Firms Delisted Due to Financial Distress or Merger

Market leverage (ML) is book debt divided by the sum of book debt and the market value of equity. Peak leverage is the maximum ML over a firm's time in the sample. The first column contains the firms with one to four post-peak years of data that were delisted due to financial distress during that period (CRSP delist code in the 400s or 500s). The second column contains the firms with peak ML in their last year on Compustat that were delisted (per CRSP) due to financial distress in the year of or year after peak ML. The third column contains the firms with one to four post-peak years of data that were delisted due to mergers or acquisitions (CRSP delist code in the 200s or 300s). The fourth column contains the firms with peak ML in their last year on Compustat that were delisted due to mergers or acquisitions in the year of or year after peak ML. Altman Z-scores below 1.81 are generally interpreted as indicating a firm is in distress and a likely candidate for bankruptcy. Z-scores above 2.99 are generally viewed as indicating the firm is safe, while Z-scores between 1.81 and 2.99 are viewed as indicating that it is difficult to tell if the firm will experience distress. The abbreviation n.a. indicates that data are not available.

	Financial distress delists		Merger delists	
	1 to 4 years in sample after peak ML	Peak ML occurs in last year in sample	1 to 4 years in sample after peak ML	Peak ML occurs in last year in sample
1. Number of firms	1,482	1,636	1,976	1,077
2. Percent relative to 14,196 firms in baseline sample	10.4%	11.5%	14.0%	7.6%
3. Median years from peak market leverage (ML) to trough	1	n.a.	1	n.a.
4. Median ML at trough before peak	0.042	0.034	0.046	0.017
5. Median ML at peak	0.523	0.627	0.382	0.347
6. Median ML at trough after peak	0.181	n.a.	0.182	n.a.
7. Median Cash/TA at trough before ML peak	0.161	0.152	0.129	0.158
8. Median Cash/TA at peak ML	0.055	0.039	0.059	0.062
9. Median Cash/TA at trough after peak	0.068	n.a.	0.085	n.a.
10. Median Altman Z-score at ML peak	0.49	-0.95	2.58	2.07
11. Median Altman Z-score at post-peak trough	0.49	n.a.	3.35	n.a.
12. Percent of firms with a loss in peak ML year	82.1%	92.6%	39.7%	52.2%
13. Median percent change in debt in peak ML year	12.5%	12.5%	23.8%	41.3%
14. Median total stock market return in peak ML year	-54.2%	-63.1%	-30.3%	-30.4%
15. Median total stock market return in peak ML and prior year	-67.1%	-78.6%	-31.0%	-38.3%
16. Median changes over period from peak ML to later trough:				
Percent change in debt	-52.8%	n.a.	-24.2%	n.a.
Earnings retained ÷ debt plus equity value at peak	-0.165	n.a.	0.040	n.a.
Percent change in shares outstanding	2.9%	n.a.	1.2%	n.a.
Total assets	-21.5%	n.a.	5.2%	n.a.

Table 7
Asset Contraction versus Expansion During Deleveraging Episodes

This table compares firms whose total assets halved (contracted by 50% or more) while moving from peak ML to trough with firms whose total assets doubled (increased by 100% or more). Total assets (TA) is denominated in book value terms. Market leverage (ML) is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. Peak leverage is the maximum value of ML over a firm's entire time in the sample. These data are for all 9,866 firms with at one year of post-peak data on Compustat. The trough before (after) peak is the lowest value of a firm's ML that comes prior to (subsequent to) its peak. Altman Z-scores below 1.81 are generally interpreted as indicating a firm is in distress and a likely candidate for bankruptcy. Z-scores above 2.99 are generally viewed as indicating the firm is safe, while Z-scores between 1.81 and 2.99 are viewed as indicating that it is difficult to tell if the firm will experience distress. Row 10 reports the percent of sample firms whose increase in ML in the peak year satisfies the sampling conditions in Denis and McKeon (2012) for a proactive increase in leverage. In row 16, the loss incidence is based on earnings before extraordinary items.

	Total assets halved	Total assets doubled	All firms
1. Median percent change in total assets (TA) from ML peak to trough	-69.1%	247.1%	7.8%
2. Median percent change in TA from prior trough to peak	7.7%	37.6%	33.8%
3. Median ML at peak	0.627	0.451	0.491
4. Median ML at post-peak trough	0.012	0.016	0.088
5. Median Altman Z-score at peak ML	0.21	2.39	2.01
6. Median Altman Z-score at post-peak trough	-1.65	5.63	3.50
7. Median percent change in debt in peak ML year	7.0%	22.3%	14.6%
8. Median rate of return on common stock in peak ML year	-0.591	-0.309	-0.380
9. Median rate of return on common stock in peak ML year and prior year	-0.706	-0.363	-0.462
10. Percent of firms that proactively increase ML in peak year	23.7%	70.3%	35.9%
11. Median return on assets (ROA) in peak ML year	-0.047	0.094	0.074
12. Median return on assets (ROA) in year of post-peak trough	-0.196	0.151	0.117
13. Median percent of years with losses during deleveraging episode	100.0%	0.0%	14.3%
14. Median retained earnings ÷ market value at peak ML	-0.313	0.844	0.052
15. Median retained earnings ÷ total assets at peak ML	-0.290	0.747	0.047
16. Median percent change in debt from peak to trough	-98.7%	-54.6%	-52.7%
17. Percent of firms that are net issuers of stock during deleveraging episode	69.7%	88.4%	74.9%
18. Median percent of shares issued during deleveraging episode	18.1%	51.0%	15.9%
19. Number of firms	957	1,883	9,866
20. Percent of full sample of 9,866 firms	9.7%	19.1%	100.0%

Table 8

Market Leverage (ML) as a Function of Common Stock Rate of Return for the Year Leading Up to Peak ML

Market leverage (ML) is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. Peak leverage is the maximum value of ML over a firm's entire time in the sample. The post-peak trough is the lowest value of a firm's ML that comes subsequent to its peak. The table analyzes the baseline sample of 9,866 firms with at least one year of post-peak data on Compustat. The classification in row 4 is based on the conditions that Denis and McKeon (2012) use to identify large proactive ML increases. In row 5, a loss is a negative value of the firm's earnings before extraordinary items (EBEI). The return on assets (ROA) figure in row 6 is the Rajan and Zingales measure of profitability and equals EBITDA divided by total assets. Since EBEI is generally lower than EBITDA due, at a minimum to netting out interest, there is no paradox in the decile 5 finding s that most firms report losses (negative EBEI) yet ROA is positive for the median firm. Altman Z-scores below 1.81 are generally interpreted as indicating a firm is in distress and a likely candidate for bankruptcy. Z-scores above 2.99 are generally viewed as indicating the firm is safe, while Z-scores between 1.81 and 2.99 are viewed as indicating that it is difficult to tell if the firm will experience distress.

	Deciles of common stock rates of return for the year leading to peak ML									
	Lowest	2	3	4	5	6	7	8	9	Highest
1. Median rate of return on common stock in peak ML year	-0.859	-0.717	-0.614	-0.515	-0.422	-0.335	-0.241	-0.143	-0.006	0.313
2. Median percent change in equity value in peak ML year	-85.5%	-71.7%	-61.4%	-51.5%	-42.9%	-35.0%	-25.6%	-15.9%	-2.9%	29.9%
3. Median percent change in debt in peak ML year	4.0%	4.1%	7.3%	6.3%	7.0%	5.9%	12.0%	17.4%	38.5%	181.0%
4. Percent of firms with proactive increase in ML in peak year	12.4%	12.5%	15.1%	16.4%	19.6%	24.4%	36.9%	50.9%	80.2%	98.5%
5. Percent of firms with a loss in year of										
trough before peak ML	74.7%	54.5%	51.1%	40.6%	39.3%	35.2%	30.4%	25.1%	24.1%	25.7%
peak ML	92.3%	79.0%	69.6%	58.2%	51.7%	43.2%	41.1%	32.8%	25.2%	25.5%
trough after peak ML	77.5%	61.5%	55.1%	42.7%	39.3%	33.1%	29.8%	24.6%	19.9%	19.9%
6. Median return on assets (ROA) in year of										
trough before peak ML	0.029	0.100	0.120	0.132	0.145	0.151	0.146	0.161	0.151	0.150
peak ML	-0.078	0.019	0.039	0.065	0.076	0.093	0.093	0.104	0.113	0.122
trough after peak ML	0.029	0.072	0.103	0.113	0.121	0.131	0.142	0.139	0.146	0.155
7. Median ML at peak	0.642	0.606	0.566	0.578	0.543	0.523	0.534	0.483	0.428	0.280
8. Median ML at subsequent trough	0.079	0.088	0.109	0.123	0.106	0.106	0.130	0.126	0.112	0.047
9. Median Altman Z-score at peak ML	-0.34	1.06	1.48	1.90	2.14	2.28	2.39	2.50	2.72	2.98
10. Median Altman Z-score at post-peak trough	1.20	2.64	2.98	3.33	3.58	3.72	3.84	3.81	4.07	4.45

Table 9
Deleveraging Episodes for the Sample Partitioned by Whether Firms Proactively Move to Peak Market Leverage

Market leverage (ML) is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity. Peak leverage is the maximum value of ML over a firm's entire time in the sample. The trough after peak is the lowest value of a firm's ML that comes subsequent to its peak. The first, third, and fifth columns of the table examine firms that proactively increased ML in the year they attained peak ML, with the conditions that Denis and McKeon (2012) use to identify large proactive ML increases. The second, fourth, and sixth columns examine all other firms, i.e., all that do not satisfy the Denis and McKeon conditions. The table analyzes 8,356 of the 9,866 firms in the baseline sample. This subsample excludes 1,396 firms with peak ML in their first year on Compustat because the Denis and McKeon conditions require knowledge of the magnitude of leverage changes in the year in question and, for these firms, we do not have values for beginning-of-period ML. The subsample also excludes 114 firms with fiscal year end changes in the year of peak ML because of the difficulties of comparing ML changes calculated over heterogeneous intervals. Altman Z-scores below 1.81 are generally interpreted as indicating a firm is in distress and a likely candidate for bankruptcy.

	All firms		5+ years of post-peak data		1-to-4 years of post-peak data	
	Proactive	Other	Proactive	Other	Proactive	Other
1. Median market leverage (ML) at peak	0.441	0.578	0.489	0.606	0.397	0.544
2. Median ML at post-peak trough	0.081	0.118	0.028	0.037	0.153	0.226
3. Percent of firms with Altman Z-score < 1.81 at peak ML	40.0%	53.2%	36.3%	46.8%	45.0%	58.6%
4. Median Altman Z-score at peak ML	2.21	1.67	2.35	1.94	2.05	1.43
5. Median Altman Z-score at post-peak trough	3.79	3.18	4.55	4.27	2.96	2.24
6. Median percent change in debt in peak ML year	132.2%	-0.2%	93.4%	-0.5%	175.9%	0.0%
7. Median rate of return on common stock in peak ML year	-0.104	-0.500	-0.090	-0.455	-0.116	-0.538
8. Median rate of return on common stock in peak and prior years	-0.218	-0.625	-0.216	-0.611	-0.220	-0.643
9. Percent of firms with a loss in year of						
trough before peak ML	35.8%	48.1%	29.8%	41.0%	41.1%	54.3%
peak ML	43.9%	61.1%	38.0%	53.9%	49.1%	67.2%
trough after peak ML	36.3%	46.0%	26.9%	36.4%	44.7%	54.1%
10. Median return on assets (ROA) in year of						
trough before peak ML	0.126	0.132	0.141	0.145	0.113	0.117
peak ML	0.084	0.064	0.092	0.075	0.069	0.050
trough after peak ML	0.126	0.112	0.145	0.139	0.104	0.086
11. Median percent change in total assets from ML peak to trough	12.8%	2.2%	51.7%	31.1%	2.4%	-5.1%
12. Median percent change in total assets from prior trough to peak	70.6%	45.2%	89.0%	64.2%	56.2%	30.9%
13. Number of firms	3,000	5,356	1,407	2,466	1,593	2,890
14. Percent of firms	35.9%	64.1%	36.3%	63.7%	35.5%	64.5%

Table 10

Cross-Firm Variation in Market Leverage (ML) at the ML Trough after Peak

Market leverage (ML) is the ratio of book debt to the sum of book debt and the market value of equity. The left-hand-side variable is ML at the post-peak trough. Rows 1 to 6 have traditional leverage determinants as in Rajan and Zingales (1995) and Frank and Goyal (2009), with all variables evaluated at the trough after peak ML. Row 1 employs the industry median ML ratio. Rows 6 to 11 have zero-one indicator variables that equal one if a firm has the specified characteristic. Standard errors are clustered by peak year and industry, and t-statistics are in parentheses. In all cases, the reported coefficients are for models without fixed effects. Row 14 reports adjusted R^2s for the indicated specification with fixed effects (FEs) for industry and years in the deleveraging episode. The reduction in sample size from 9,866 firms reflects missing data items on Compustat for some variables. The sample size is 8,328 firms in all cases because that is the largest number of observations (with non-missing data items) for which we can keep the sample composition constant across models.

	(1)	(2)	(3)	(4)	(5)	(6)
Traditional factors:						
1. Industry ML at trough after peak	0.495					0.159
	(8.91)					(4.57)
2. Profitability (ROA) at trough	-0.066					-0.015
	(-2.40)					(-0.93)
3 Size at trough	0.009					0.010
	(2.55)					(6.64)
4. Market to book at trough	-0.017					-0.005
	(-5.34)					(-3.90)
5. Asset tangibility at trough	0.213					0.090
	(3.43)					(3.19)
6. Paid dividends in trough year	-0.080					-0.005
	(-6.56)					(-0.56)
Known as of peak:						
7. ML at trough before peak		0.525	0.181		0.186	0.145
		(12.54)	(6.62)		(9.15)	(9.59)
8. ML at peak			0.434		0.460	0.417
			(20.00)		(20.64)	(20.26)
Known by post-peak trough:						
9. < 5 years of post-peak data				0.138	0.157	0.158
				(10.68)	(9.81)	(9.38)
10. Distress delist < 5 years after peak				0.067	0.041	0.053
				(4.04)	(2.50)	(3.46)
11. Merger delist < 5 years after peak				0.011	0.045	0.027
				(0.79)	(3.17)	(1.77)
12. Number of firms	8,328	8,328	8,328	8,328	8,328	8,328
13. Adjusted R^2 without FEs	19%	15%	36%	12%	52%	55%
14. Adjusted R^2 with FEs	26%	27%	50%	22%	55%	59%

Table 11
Deleveraging Outcomes: Impact of Financial Distress, Proactive Leverage Increases, and Recession Timing

Market leverage (ML) is the ratio of book debt to the sum of book debt and the market value of equity. In all regressions, the left-hand-side variable is ML at the post-peak trough. Rows 1 to 7 and 13 to 15 are as defined in Table 10. Rows 1 to 6 have traditional leverage determinants. Row 8 has ML at the peak for firms with Altman Z-scores at peak < 1.81. Row 9 has ML at the peak for firms with Z-scores ≥ 1.81. Rows 6, 10 to 15, 17, and 18 have zero-one indicator variables that equal one if the firm has a particular specified characteristic. For row 10, distressed firms are those with Z-scores < 1.81 at peak ML. The row 11 variable equals one if ML at peak satisfies the Denis and McKeon (2012) conditions for a proactive increase. The row 12 variable equals one if the ML peak is within six months of an NBER-defined recession. In row 16, net cash flow is the sum of Denis and McKeon's (2012, p. 1916) annual cash flow surplus (net of lagged dividends) over all years in the deleveraging episode. Except for (5), the reported coefficients are for models without fixed effects. Row 21 reports adjusted R^2s for the same column model with fixed effects (FEs) for industry and years in the deleveraging episode. Standard errors are clustered by peak year and industry, and t-statistics are in parentheses. The sample size is 7,125 because that is the largest number of firms (with non-missing data items) for which we can keep the sample composition fixed across models.

	(1)	(2)	(3)	(4)	(5)
Traditional factors:					
1. Industry ML at trough after peak	0.495		0.155	0.146	0.226
	(9.18)		(4.58)	(4.77)	(6.38)
2. Profitability (ROA) at trough	-0.058		-0.014	-0.031	-0.031
	(-2.18)		(-0.79)	(-1.77)	(-1.58)
3 Size at trough	0.009		0.010	0.010	0.013
	(2.11)		(6.01)	(5.40)	(6.40)
4. Market to book at trough	-0.016		-0.005	-0.004	-0.004
	(-4.99)		(-3.19)	(-3.05)	(-2.42)
5. Asset tangibility at trough	0.209		0.076	0.070	0.115
	(3.80)		(3.27)	(3.28)	(8.56)
6. Paid dividends in trough year	-0.070		-0.002	-0.003	0.005
	(-5.30)		(-0.28)	(-0.39)	(0.55)
Known as of peak:					
7. ML at trough before peak		0.210	0.163	0.167	0.162
		(9.44)	(10.36)	(11.44)	(9.14)
8. ML at peak x distressed at peak		0.449	0.444	0.450	0.470
		(19.94)	(20.15)	(20.80)	(19.27)
9. ML at peak x not distressed at peak		0.470	0.415	0.416	0.450
		(20.66)	(15.64)	(16.04)	(16.59)
10. Financially distressed at peak			-0.022	-0.022	-0.015
			(-3.04)	(-3.18)	(-1.70)
11. Proactive increase to peak ML			0.017	0.017	0.016
			(4.01)	(4.51)	(3.22)
12. Peak ML during recession			-0.016	-0.016	
			(-1.60)	(-1.70)	
Known by post-peak trough:					
13. < 5 years of post-peak data		0.152	0.153	0.135	0.109
		(9.09)	(10.03)	(9.90)	(9.87)
14. Distress delist < 5 years after peak		0.042	0.052	0.056	0.050
		(2.44)	(3.65)	(4.06)	(4.60)
15. Merger delist < 5 years after peak		0.040	0.020	0.019	0.008
		(2.55)	(1.40)	(1.34)	(0.94)
16. Net cash flow ÷ debt at peak			-0.002	-0.003	-0.003
			(-1.32)	(-2.09)	(-1.71)
17. Assets halved from peak to trough				-0.078	-0.067
				(-7.22)	(-5.07)
18. Assets doubled from peak to trough				-0.064	-0.023
				(-6.86)	(-3.39)
19. Number of firms	7,125	7,125	7,125	7,125	7,125
20. Adjusted R^2 without FEs	18%	52%	55%	57%	---
21. Adjusted R^2 with FEs	26%	56%	---	---	60%

Table 12
Size of Deleveraging for Firms in the Highest Market Leverage (ML) Quartile

We start with calendar year 1950 (event year t = 0) and sort firms into quartiles based on market leverage (ML). We take the highest ML quartile and track forward in time for that group of firms, recording a variety of statistics (described below) for t = 1 to 19. We repeat the process for 1951, …, 1993, with each of these years treated in turn as the year of sample formation (t = 0) for a new sample run. The columns labeled 1950 to 2012 report results for all 44 runs, while those labeled 1970 to 2012 report results for the most recent 24 runs. The first and second columns report results for sample runs in which firms have non-missing ML for all years t = 0 to 19. The third and fourth columns report results for sample runs in which firms have non-missing ML for t = 0 and 1, and can exit the sample at any point up to t = 19. For a given firm in a given sample run, the size of deleveraging is the difference between ML in year 0 and its lowest value of ML over years t = 1 to 19. For each sample run, we calculate the size of the median firm's deleveraging, with row 1 reporting the median across all runs of this variable. For each run, we calculate the median firm's ML in the initial year, with row 2 reporting the median across all runs of this variable. Analogously, for each run, we calculate the median firm's ML at the trough level of ML over years t = 1 to 19 (only for firms with at least one year with ML below the level in year t = 0). Row 3 reports the median across all runs of the latter variable. For each run, we also calculate the percent of firms that have at least one year with ML below its t = 0 value. Row 4 reports the median across all runs of the latter variable. Row 5 reports medians across all runs of the percent of deleveraging firms that have no debt or negative net debt at their ML trough over years t = 1 to 19. For each run, we also calculate cross-firm sample median ML ratios for each event year. Row 6 reports the median across all runs of the latter set of cross-firm sample median ML for selected event years over t = 0 to 19. [Note that the row 6 entry for t = 0 can, in principle, differ from the figure reported in row 2. The reason is that row 2 gives the median ML in t = 0 for the subset of firms that subsequently reduce leverage, whereas row 6 gives the median ML in t = 0 for all firms.] Row 8 reports the implied size of deleveraging obtained by taking the difference between median ML in year t = 0 (row 6) and the lowest median ML in any year after t = 0 (row 7). As Figure 6 shows and a comparison of rows 1 and 8 confirms, the row 8 deleveraging amount is a downward-biased estimate of the typical size of deleveraging.

	Firms listed all 20 years		Firms listed at least 2 years	
	1950 to 2012	1970 to 2012	1950 to 2012	1970 to 2012
1. Median size of deleveraging	-0.325	-0.438	-0.278	-0.328
2. Median ML in initial year (t = 0)	0.483	0.566	0.537	0.623
3. Median ML at later trough	0.157	0.122	0.195	0.258
4. Percent of firms that deleverage	99.2%	99.6%	92.4%	91.3%
5. Percent of deleveraging firms with				
ML = 0.000 at trough	8.1%	13.5%	6.6%	8.7%
Net Debt/TA < 0.000 at trough	32.5%	37.5%	24.4%	26.5%
6. Cross-firm median ML in event year				
t = 0	0.483	0.566	0.536	0.623
t = 1	0.472	0.545	0.542	0.623
t = 3	0.439	0.483	0.489	0.573
t = 5	0.413	0.428	0.457	0.517
t = 10	0.387	0.384	0.437	0.448
t = 15	0.381	0.368	0.403	0.399
t = 19	0.378	0.329	0.391	0.363
7. Lowest median ML after t = 0	0.374	0.329	0.391	0.363
8. Scale of deleveraging implied by change in event-time median ML	-0.109	-0.237	-0.145	-0.260

Appendix
Contribution of Managerial Actions to Observed Deleveraging

This appendix describes how we gauge the contribution of three decisions – repay debt, retain earnings, and/or issue shares – to the actual deleveraging by each sample firm. These calculations underlie the three categories of results reported in rows 9 and 10 of Table 3.

For a given firm, ML(peak) and ML(trough) denote the actual market-leverage ratios at the beginning and end of the deleveraging episode. MVE(peak) and MVE(trough) denote the actual total market values of equity at the ML peak and trough, while Debt(peak) and Debt(trough) denote the actual values of debt that, respectively, are embedded in ML(peak) and ML(trough).

We use the symbol HML(trough) to denote what the firm's *hypothetical* market-leverage ratio would be at the trough if the only things that changed during the time between peak and trough are the specific managerial decisions in question.

Hypothetical deleveraging due solely to debt repayment

For the debt repayment entry in row 9 of Table 3, we calculate HML(trough) under the assumption that the only thing that changes from peak ML is that the firm pays down its debt from Debt(peak) to Debt(trough). In this case, we first define HD = Min[Debt(trough), Debt(peak)]. We then substitute HD into HML(trough) = HD/[HD + MVE(peak)].

Note that, if a given firm actually increases the dollar value of debt during its deleveraging, then HD = Debt(peak). In this case, HML(trough) = Debt(peak)/[Debt(peak) + MVE(peak)] = ML(peak) so that the hypothetical deleveraging magnitude due to debt repayment per se is nil.

Hypothetical deleveraging due to debt repayment and earnings retention

We first calculate HMVE(trough), the hypothetical market value of equity at the post-peak trough under the assumption that the only thing that has changed is the accumulation of additional earnings within the firm. Specifically, we set HMVE(trough) = MVE(peak) plus the increase in retained earnings over the period from peak to trough. We then use the value of HMVE(trough) as an input to calculate HML(trough) = Min[Debt(trough)/{Debt(trough) + HMVE(trough)}, ML(peak)].

This calculation assumes a zero impact on the total market value of equity from (i) new share issuance, (ii) equity payouts that are not netted out from retained earnings, (iii) any element of normal stock price appreciation beyond that captured by retained earnings, (iv) unanticipated changes in other managerial decisions, and (v) exogenous shocks to a firm's opportunity set or to general capital market conditions.

There are three other things to note about this calculation. First, it likely understates the true impact of retained earnings per se on the market value of equity because it makes no adjustment for compounded returns on any earnings retained in the years prior to attainment of the post-peak trough. On the other hand, it assumes that (uncompounded) retention adds dollar-for-dollar to the market value of equity, with no discount for any tax that will apply to future payouts that result from the hypothetical retention.

Second, if the change in retained earnings is negative, we make no adjustment and instead treat the hypothetical equity value at the trough as equal to the value that prevailed at the peak, i.e., HMVE(trough) = MVE(peak). In this case, any leverage reduction from ML(peak) is due solely to the repayment of debt (as in the calculation for the debt repayment entry in row 9 of Table 3).

Third, this calculation allows increases in the dollar value of debt over the deleveraging episode, i.e., Debt(trough) > Debt (peak) is admissible. In such cases, HML(trough) falls below ML(peak) only if the impact of retained earnings on the denominator of the leverage ratio outweighs the impact on the numerator of the debt increase. If the reverse holds, then the formula sets HML(trough) = ML(peak) so that the hypothetical deleveraging magnitude is nil.

Hypothetical deleveraging due to debt repayment, earnings retention, and net share issuance

In this case, we first take the retained earnings inclusive value of HMVE(trough) described immediately above and add the change (from peak to trough) in the net number of shares outstanding valued at the share price that prevailed at peak ML (with the share quantity change and share price treated on a consistent split-adjusted basis). [This calculation will shrink the equity base when the firm repurchases stock and reduces the outstanding number of shares.]

We take the resultant value of HMVE(trough) and use it to generate HML(trough) following the formula given in the calculation for debt repayment and earnings retention.

Percent of actual deleveraging attributable to managerial decisions

Table 3 (rows 9 and 10) and various subsequent tables report the percent of a firm's actual deleveraging that is explained by managerial decisions to repay debt, issue shares, and/or retain earnings.

To generate the relevant percentage figures for each firm, we use the inputs defined above in the following calculations.

The actual deleveraging amount is [ML(peak) – ML(trough)]. The hypothetical deleveraging amount is [ML(peak) – HML(trough)].

If HML(trough) ≤ ML(trough), then the decisions account for 100.0% of the actual deleveraging.

If HML(trough) = ML(peak), then the decisions account for 0.0% of the actual deleveraging.

For intermediate cases, the portion of deleveraging explained by the decisions being analyzed is the percent equivalent of the ratio [ML(peak) – HML(trough)] ÷ [ML(peak) – ML(trough)], which in these cases, will fall strictly between 0.0% and 100.0%.

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