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The leverage-profitability puzzle resurrected*

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Abstract

With zero capital structure rebalancing costs, dynamic tradeoff theory predicts that firms stay at their leverage targets with more profitable firms staying at higher leverage. This prediction is rejected by the robustly negative correlation between leverage and profitability. When rebalancing costs are added to this theory, it predicts a positive leverage-profitability correlation only in periods where companies pay these costs and actively rebalance their capital structures. However, we show that the correlation is negative when firms issue debt and distribute the proceeds to shareholders—precisely the case where the theory predicts it should be positive. Our results thus resurrect the leverage-profitability puzzle.

JEL classification: G32

Keywords: Capital structure, tradeoff theory, issue costs and benefits, dynamic rebalancing, leverage-profitability correlation

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1 Introduction

The classical tradeoff theory of capital structure predicts that firms choose levels of debt to balance the corporate tax-shield with expected costs of financial distress.[1] Three decades of testing has provided only mixed empirical support for this theory (Graham and Leary, 2011). On the positive side, low-volatility firms and firms with more tangible assets have more leverage. Also, firms increase leverage in response to tax increases (Heider and Ljungqvist, 2015), and high profitability helps predict debt issuances and equity repurchases (Frank and Goyal, 2015). On the negative side, a large number of industrial firms have zero or near-zero leverage (Strebulaev and Yang, 2013), and leverage is so volatile as to question the basic notion that persistent firm characteristics give rise to long-run leverage targets (DeAngelo and Roll, 2015). Also, Eckbo and Kisser (2020) study high-frequency net-debt issuers—the subset of firms most likely to follow the tradeoff theory—and find evidence that they do not, which DeMarzo (2019) refers to as "most problematic for the standard tradeoff model".

A central prediction of tradeoff theory is a positive cross-sectional relation between profitability and leverage. However, the empirical relation has long been reported as negative for public industrial firms (Titman and Wessels, 1988; Rajan and Zingales, 1995; Frank and Goyal, 2009). The reported relation is unconditional in the sense that the estimation does not condition on periods in which firms actively issue debt to rebalance leverage. Conditioning is important because fixed rebalancing costs, which characterize debt issuances (Eckbo, Masulis, and Norli, 2007), in theory deter firms from continuously maintaining the target leverage ratio (Fischer, Heinkel, and Zechner, 1989; Goldstein, Ju, and Leland, 2001). When firms remain passive (do not rebalance), positive profitability shocks lower market leverage and cause a negative (mechanical) leverage-profitability relation. Thus, with rebalancing costs, tradeoff theory predicts a positive leverage-profitability correlation *conditional* on rebalancing events, while the correlation may be negative in other periods. Importantly, testing this central cross-sectional prediction does not require estimating the theoretical target leverage ratio itself.

In this paper, we isolate quarters in which US industrial firms undertake large leverage-increasing capital structure rebalancings by issuing debt and distributing the proceeds to shareholders. Debt-issuance costs help justify the long spells between these rebalancings, and the new debt gives rise to

[1]See Robicheck and Myers (1966), Kraus and Litzenberger (1973), Miller (1977), and Brennan and Schwartz (1984) for early static versions of the theory. Fischer, Heinkel, and Zechner (1989), Goldstein, Ju, and Leland (2001), and Strebulaev (2007) place the tradeoff theory in a dynamic setting with capital structure rebalancing costs.

tax-related benefits. Thus, more profitable firms are predicted to move to higher leverage. However, we reject this central prediction as the estimated leverage-profitability correlation is typically negative *both* in periods with and without such large rebalancings. In sum, the data does not find that more profitable industrial firms choose higher leverage when they rebalance by issuing debt. While conditioning on large debt-financed rebalancing events could theoretically have resolved the long-standing leverage-profitability puzzle, empirically it does not.

Our main empirical conclusion is robust. Most importantly, it is not driven by confounding cash flow effects such as a simultaneous spike in leverage and investment, which may occur in the context of the financing pecking order (Myers and Majluf, 1984) or in financing and investment models where investment is endogenous (Hennessy and Whited, 2005; DeAngelo, DeAngelo, and Whited, 2011). We show that net investment is stable both shortly before, during and shortly after our rebalancing events. To reinforce this point, we show that the conditional correlation estimate is negative also if we restrict the events to firm-quarters in which investment is below the industry median or even close to zero. Moreover, the conditional leverage-profitability correlation remains negative if we add operating leverage, which Chen, Harford, and Kamara (2017) find to be positively correlated with profitability. Finally, the conditional correlation remains negative if we replace the leverage ratio by net leverage (by subtracting cash balances) while maintaining debt-financed rebalancing events.

We also contribute by clarifying Danis, Rettl, and Whited (2014)'s finding of a positive conditional leverage-profitability correlation, which they suggest is "good news for the class of dynamic trade-off theories in which cash flows are exogenous and leverage adjustments are infrequent" (p. 440). We show that their positive correlation estimate is caused by their inclusion of *internally financed* rebalancing events—events financed by cash draw-downs rather than by new debt issues. This inclusion is problematic for their empirical test because events financed by cash draw-downs are neither costly nor do they increase the debt-related corporate tax shield determining the leverage target. With zero financing cost, there is no rebalancing inertia, and hence those events are not informative about the dynamic trade-off theory being tested (which itself relies on costly adjustment). Furthermore, we show that cash-financed events are associated with a positive leverage-profitability correlation *only* when the firm's pre-event cash-balance exceeds an estimated cash target. Since it is well known that firms tend to disgorge excess cash following high profitability, this further suggests that Danis, Rettl, and Whited (2014)'s finding of positive leverage-profitability correlation has more to do with managing cash balances than leverage targets. Of course, irrespective of the role of internally-financed rebalancing events, our evidence of a negative conditional correlation across debt-financed rebalancings cannot be reconciled with the type of dynamic inaction models being tested both here and in Danis, Rettl, and Whited (2014).

The rest of the paper is organized as follows. Section 2 motivates the two alternative net- and gross-leverage rebalancing event definitions that form the core of this paper, and Section 3 presents the sample description. Sections 4 and 5 detail the estimation and robustness tests using first the gross-leverage and, second, the net leverage event definitions, respectively. Section 6 concludes the paper.

2 Tradeoff theory and empirical test strategy

In this section, we summarize, at an intuitive level, leverage dynamics when rebalancing is costly and derive a theoretically consistent empirical rebalancing definition. We then lay out our main empirical test strategy.[2]

2.1 Leverage dynamics

Figure 1 illustrates the familiar concave levered firm (enterprise) value $V(L)$ under tradeoff theory—also referred to as dynamic inactivity theory—where L is the market leverage ratio. The interest on the debt D is tax deductible, and defaulting on the debt payment results in liquidation and a deadweight loss. Hence, $V(L)$ is the discounted value of the after-tax expected cash flow to the firm's security holders plus the present value of the tax shield minus the present value of expected bankruptcy costs. The firm maximizes equity value as there are no agency conflicts nor informational asymmetries. When the period's after-tax profit is positive, it is immediately and costlessly distributed to shareholders as a dividend. Thus, firms do not save cash—cash balances do not exist—and so active leverage-increasing capital structure rebalancings require issuing new debt.

The firm arrives at the target leverage ratio L^* by trading off, at the margin, the debt-interest tax shield and the expected bankruptcy cost. In Figure 1, FC is a fixed debt-issue cost, which along with the above tradeoff is an integral part of the dynamic inactivity theory (Goldstein, Ju, and Leland, 2001, p.500). Intuitively, as the firm's cash flow drifts upward, V increases and causes the market leverage

[2]For theoretical details, see Fischer, Heinkel, and Zechner (1989) and Goldstein, Ju, and Leland (2001). More recent work includes, for example, Hackbarth and Morellec (2006), Strebulaev (2007), and Morellec, Nikolov, and Schürhoff (2012). See also Strebulaev and Whited (2012) and Sundaresan (2013) for comprehensive reviews.

ratio L to decline below L^*. If $FC = 0$, the firm continuously issues new debt (paying the proceeds to shareholders) so as to stay at L^*. This is the implicit assumption behind unconditional estimates of the leverage-profitability correlation, which treat the observed leverage in all quarters as optimal. However, when $FC > 0$, continuous rebalancing is suboptimal, creating a temporary wedge between L and L^*. The optimal rebalancing policy now involves waiting with the debt issue until the value-creation from the rebalancing also covers FC. This occurs at the lower boundary $\underline{L}$ in Figure 1. Finally, if firm value drifts down so that L drifts above L^*, the firm remains passive to avoid over-compensating debtholders.[3]

2.2 The theoretically consistent debt-financed rebalancing

When the firm hits the rebalancing boundary $\underline{L}$ in Figure 1, it increases leverage by issuing long-term debt and paying proceeds to equity holders (a dividend or stock repurchase). Since, at that point, the firm also distributes any positive after-tax earnings (the difference between operating profits and interest payments), the model-implied cash flow identity (budget constraint) is as follows:

$$\text{Budget constraint at } \underline{L}\text{:} \quad \text{After-Tax Earnings} \quad = \quad \underbrace{ER^e - \Delta D^e > 0.}_{\text{Debt-financed rebalancing amount}} \tag{1}$$

where ER^e is the sum of cash dividends and equity repurchases in excess of equity issues (net equity retirements), and ΔD^e is the period's net increase in long-term debt that—combined with the after-tax earnings—moves the firm's leverage ratio from $\underline{L}$ to the target L^*. Investment funding (capital expenditures) is not part of the budget constraint since, under the dynamic tradeoff model, asset growth from investment arises exogenously through the underlying stochastic state variable driving operating cash flow.[4]

The budget constraint in Eq. (1) is instructive as it suggests two qualifications for a theoretically consistent empirical rebalancing definition. First and most important, the financing of the equity payout ($ER^e_t > 0$) should come from a debt issue ($\Delta D^e_t > 0$) that supplements the period's after-tax profits. Since firms do not save (positive after-tax earnings are continuously paid out to shareholders), internally-

[3]See pp. 499-506 in Goldstein, Ju, and Leland (2001) for the functional forms of $\underline{L}$, and their Table 2 (page 506) for the definition of the optimal leverage ratio. Admati, DeMarzo, Hellwig, and Pfleiderer (2018) also discuss the sub-optimality of retiring debt when $L > L^*$.

[4]For example, in the continuous-time model of Goldstein, Ju, and Leland (2001), the exogenous operating cash flow δ_t follows a standard Brownian motion under the risk-neutral measure z_t: $\delta_t = \mu\delta_t dt + \sigma\delta_t dz_t$ where μ and σ are the instantaneous growth rate and volatility, respectively. Hence, $V_t = \delta_t/(r - \mu)$, where r is the constant risk-free rate and $(r - \mu)$ is the constant total payout ratio.

financed shareholder distributions do not constitute rebalancing events under the theory and so fall outside of the theoretical prediction. Second, to serve as an empirically interesting rebalancing event, the magnitudes of ER_t^e and ΔD_t^e should both be large in absolute value and relative to the left-hand-side of Eq. (1).

The following indicator variable ($a \in [0,1]$) of a debt-financed rebalancing event satisfies the two qualifications above:

$$\text{Debt-financed rebalancing event:} \;\; a = 1 \;\; \text{if} \;\; \frac{\Delta D^e}{A} > s \text{ and } \frac{ER^e}{A} > s, \tag{2}$$

and $a = 0$ otherwise. Here, s is an issue size threshold measured in percent of book assets A, typically 5% in the empirical analysis below. Moreover, since the dynamic inactivity period in Figure 1 is driven by the fixed cost FC, we measure ΔD^e as the proceeds from long-term debt issues in excess of long-term debt retirements. That is, ΔD^e excludes short-term debt issues including drawing down credit lines with remaining maturity of one year or less, for which FC is close to zero.[5]

2.3 Adding cash-balance draw-downs

While firms in dynamic inactivity models cannot save—and so the only way to increase leverage is to issue debt—it is well known that firms tend to hold significant amounts of *both* debt and cash (Bates, Kahle, and Stulz, 2009; DeAngelo, Goncalves, and Stulz, 2018). Theoretical justifications for why firms accumulate cash balances are many, ranging from hedging of cash flow in the presence of external financing frictions to financing R&D investments when the borrower lacks tangible assets that can be used as debt collateral.[6] Thus, in practice, firms may also increase leverage by financing some or all of the shareholder distribution in the rebalancing event by reducing cash holdings.

[5] While Compustat classifies draw-downs of credit lines with remaining maturities longer than one year as increases in long-terms debt (Korteweg, Schwert, and Strebulaev, 2020), credit line adjustments typically occur to finance working capital, which tend to be small and are therefore excluded by our issue size threshold s.

[6] See, e.g., Froot, Sharfstein, and Stein (1993), Acharya, Almeida, and Campello (2007), Hall and Lerner (2010), Brown, Martinsson, and Petersen (2012), and Bena and Li (2014). Structural models also formalize the option value of holding cash within all-equity financed firms, e.g., Boyle and Guthrie (2003), Bolton, Chen, and Wang (2011), Decamps, Mariotti, Rochet, and Villeneuve (2011), Kisser (2013), and Hugonnier, Malamud, and Morellec (2015). Anderson and Carverhill (2012) add exogenous debt, while Gamba and Triantis (2008) present a dynamic financing and investment model without a stationary leverage target.

Let $a^N \in [0,1]$ indicate a rebalancing event with mixed internal and external financing, as follows:

$$\text{Cash-and-debt-financed rebalancing event: } a^N = 1 \text{ if } \frac{\Delta D^e - \Delta C}{A} > s \text{ and } \frac{ER^e}{A} > s. \tag{3}$$

ΔC_t is the change in the firm's cash balance, which includes cash holdings and short-term investments in marketable securities. Importantly, while the event indicator a follows from tradeoff theory, the *ad hoc* inclusion of cash balances in a^N does not. The two main reasons for the theoretical inconsistency are as follows. First, since the fixed cost of a cash-balance is close to zero ($FC \approx 0$), the existence cash balances in principle cannot create the theoretical rebalancing inertia depicted Figure 1. Second, a cash-balance draw-down does not increase the firm's debt-related tax shield, which is the main theoretical motivation for undertaking a rebalancing at $\underline{L}$ in Figure 1.[7]

Notwithstanding its *ad hoc* nature, we include a^N in our empirical analysis below. The main reason for this inclusion is that it allows us to clarify the central empirical conclusion of Danis, Rettl, and Whited (2014). They report a significantly positive conditional leverage-profitability correlation based on an event indicator such as a^N, which they conclude is "good news for the class of dynamic trade-off theories in which cash flows are exogenous and leverage adjustment is infrequent" (p.440). Taken at face value, this conclusion appears to resolve the leverage-profitability puzzle. However, for this conclusion to be correct, it must be supported by a positive correlation estimation based on a, which is the main empirical proposition of this paper.

2.4 Proposition 1: The leverage-profitability correlation

Let Π_t, denote the firm's operating profitability in period t. The theoretical tradeoff proposition to be tested is as follows:

Proposition 1: *After positive profitability (Π_{t-1}) has lowered leverage (L_t) sufficiently, the firm increases leverage by paying the fixed rebalancing cost (FC) and distributing the debt-issue proceeds (ΔD_t^e) to shareholders (ER_t^e). Let $a_t \in [0,1]$ indicate such a rebalancing event. Since more profitable firms have higher leverage targets (L^*), they move to higher leverage when they rebalance, producing a positive cross-*

[7] A reduction in cash holdings can reduce the corporate tax penalty from holding cash. However, relative to debt issues, tax savings are negligible given zero interest on cash itself and relatively low interest on cash equivalents. Note also that there may even be a tax penalty on dividend payments following repatriation of foreign earnings (Foley, Hartzell, Titman, and Twite, 2007).

sectional correlation: $Cov(L_t, \Pi_{t-1}|\ a_t = 1) > 0$*. In other periods, the upward drift in profitability lowers market leverage, producing a negative cross-sectional correlation:* $Cov(L_t, \Pi_{t-1}|\ a_t = 0) < 0$.

Absent closed-form solutions to the dynamic optimization problem, Strebulaev (2007) and Danis, Rettl, and Whited (2014) prove a proposition such as Proposition 1 using simulations. These simulations generate dynamic paths of the market leverage ratio L_t, which are regressed on the simulated lagged values Π_{t-1}. The simulations confirm that the cross-sectional relation between leverage and operating profitability is positive at rebalancing points and negative in other periods. It is also worth stressing (as do Danis, Rettl, and Whited (2014)) that testing Proposition 1 does not require estimating the optimal leverage ratio L^*. This follows because the leverage adjustment observed in rebalancing events itself brings the firm close to its long-run target leverage L^*. Hence, the cross-sectional correlation $Cov(L_t, \Pi_{t-1}|\ a_t = 1)$ is sufficient to capture the theory that more profitable firms have higher leverage targets.

3 Test strategy, data, and sample characteristics

In this section, we first parameterize Proposition 1 using a regression specification, which generates our main, empirically testable tradeoff hypothesis (H1). We then describe the sample selection, rebalancing event frequencies, and characteristics of rebalancing firms.

3.1 The empirical tradeoff hypothesis (H1)

To parameterize Proposition 1, we use the following linear regression specification, which has the same form as Eq. (3) on p.427 in Danis, Rettl, and Whited (2014). The difference is that, while they use net leverage as dependent variable and a^N as the rebalancing-event indicator, we primarily employ gross leverage (L) and the debt-financed event indicator a:

$$L_{it} = \alpha + \gamma_0 \Pi_{i,t-1} + \gamma_1 \Pi_{i,t-1} a_{it} + \gamma_2 a_{it} + \beta X_{i,t-1} + \epsilon_{it}. \tag{4}$$

$L_{it} \equiv (D/MV)_{it}$, where D is firm i's book value of short- and long-term debt and MV is the sum of D and the market value of total equity. The operating profit $\Pi_{i,t-1}$ is measured as earnings before interest taxes depreciation and amortization allowances, EBITDA, and standardized by the book value A of total assets. $X_{i,t-1}$ is a set of lagged control variables defined in Section 4 below.

Combining Proposition 1 and the regression specification in Eq. (4) produces the following cross-sectional leverage-profitability correlations:

$$Cov(L_t, \Pi_{t-1}|\ a_t = 0) < 0 : \quad \frac{\partial L}{\partial \Pi}_{|a=0} = \gamma_0 < 0, \tag{5}$$

and

$$Cov(L_t, \Pi_{t-1}|\ a_t = 1) > 0 : \quad \frac{\partial L}{\partial \Pi}_{|a=1} = \gamma_0 + \gamma_1 > 0. \tag{6}$$

This leads to the following empirical dynamic tradeoff hypothesis, which is the centerpiece of this paper's empirical analysis:

$$\text{H1 (dynamic tradeoff hypothesis)} : \gamma_0 < 0 \text{ and } \gamma_0 + \gamma_1 > 0. \tag{7}$$

The intuition is simple. In periods with rebalancing inactivity ($a_t = 0$), higher profits mechanically drive down leverage, so $\gamma_0 < 0$. When firms actively rebalance ($a_t = 1$), two conditions must be fulfilled: First, leverage and profitability must be positively correlated at the margin, so $\gamma_1 > 0$. Second, in the cross-section, more profitable firms must move to higher leverage: $\gamma_0 + \gamma_1 > 0$. If $\gamma_1 < 0$, the theory is rejected outright. If $\gamma_1 > 0$ but $\gamma_0 + \gamma_1 < 0$, then the tradeoff hypothesis is also rejected because the positive γ_1 just means a less negative relation between leverage and profitability. In sum, for there to be evidence that more profitable firms move to higher leverage when they rebalance, *both* conditions must be satisfied in the data.

Recall that H1 is derived directly from dynamic tradeoff theory, and that gross leverage (L) is commonly used by the extant literature on the *unconditional* leverage-profitability puzzle. As our approach is agnostic, we also systematically explore this puzzle in the empirical analysis below by replacing a_t with a_t^N and L_{it} with net leverage: $L_{it}^N \equiv [(D-C)/(MV-C)]_{it}$, where C is firm i's cash balance and MV the market value of the firm. This replacement helps clarify the main empirical conclusion of Danis, Rettl, and Whited (2014), which is based on a^N and L^N.

3.2 Data sources and event frequencies

Our sample is drawn from the merged quarterly CRSP/Compustat (CCM) database. The sample period begins in fiscal Q1/1984, the first year in which the quarterly CCM cash flow statements are consistently available, and ends in fiscal Q4/2016. Table 1 details the change in the number of firms and firm-quarters as we impose various (commonly used) sample restrictions. We exclude financial companies and regulated utilities, as well as firms with missing entries of key Compustat balance sheet, income statement and cash flow characteristics. Moreover, we require twenty consecutive quarters with non-missing observations on operating profitability. These restrictions produce an overall sample of 350,210 firm-quarters and 7,537 firms (Panel A). All variables are listed in Table 2 with their Compustat mnemonics.

In Panel B of Table 1, we show the additional impact on the sample size of requiring a specific minimum period to estimate the central firm characteristic *Risk* (the standard deviation of firm profitability). Requiring at least four contiguous quarterly observations on profitability ($T = 4$) reduces the sample size to 333,249 firm-quarters because the sampling algorithm sets the first three observations (the estimation period - 1) for *Risk* as missing. Requiring twenty contiguous firm-quarters further drops the total sample to 209,259. These different data requirements also create variation in average firm listing age, which is fifteen years when *Risk* is computed using $T = 4$ and eighteen when using $T = 20$. Across the CCM database, firm listing age averages twelve years when we do not impose the restriction of twenty consecutive quarters with non-missing observations. Thus, our sample firms are somewhat older than the broader population of listed firms.

Figure 2 shows average annual gross and net market leverage ratios (L and L^N), and frequencies of debt-financed and cash-and-debt-financed rebalancing events (type a and type a^N events, using an issue-size threshold of $s = 5\%$). In Panel A, L^N is substantially lower than L (as expected), and L^N turns negative for several years after 2004. Panel A also suggests that L and L^N are highly correlated, but that L^N is somewhat more volatile than L and exhibits a higher rate of increase after 2010. The latter observation is consistent with the increase in share repurchase activity following the more recent period with low interest rates. Notice also that, while Graham, Leary, and Roberts (2015) document a substantial increase in aggregate leverage over the past five decades, Panel A of Figure 2 shows a slight leverage *reduction* for the average firm over the sample period.

Panel B of Figure 2 shows that the annual event frequencies based on a and a^N are both low, with peaks in 2007, 2012 and 2015. Debt-financed rebalancings (a) occur in only 0.40% and cash-and-debt-financed rebalancings (a^N) in 1.2% of the 350,210 firm-quarters, respectively. Thus, by including internally-financed shareholder distributions, Danis, Rettl, and Whited (2014) triple the number of rebalancing events. This increase occurs over the entire sample period, with the greatest increase after year 2000, reflecting possibly the recent surge in cash balances held by US manufacturing companies (Bates, Kahle, and Stulz, 2009).

Eckbo and Kisser (2020) show that net debt issues are also rare for most firms. For example, five years following the year of public listing, the average (and median) industrial firm has issued net debt in excess of 5% of total assets in only two of the twenty-four quarters. Moreover, across the net-debt issue frequency distribution in year five, firms in the lowest quartile have on average made one-half such issue, while firms in the top quartile has issued in five of the twenty quarters. Most of those net-debt issues are mainly for investment funding purposes as they are not associated with simultaneous equity distributions of the type studied here.

3.3 Characteristics of rebalancing firms

Figure 3 and Table 3 show characteristics of firms undertaking debt-financed and cash-and-debt-financed leverage rebalancings. In Figure 3, firms undertaking debt-financed rebalancing (type a) have substantially higher average (market and book) leverage ratios than firms that finance the shareholder distribution with a combination of cash and debt (type a^N). Both categories exhibit stable leverage ratios over the sixteen quarters prior to the rebalancing event. However, the event increases leverage much more for type a firms than for type a^N firms. For the average cash ratio, the effect is the opposite. While both categories of firms have stable cash holdings prior to the event, the average cash ratio of type a^N firms drops substantially while remaining largely unchanged for type a firms. We return to the substantial cash-balance draw-down associated with type a^N events in the empirical analysis.

Table 3 shows firm characteristics in the quarter just prior to and the quarter of the rebalancing event (periods $t-1$ and t, respectively). In both panels, the first row computes averages using all available observations (*All*). The remaining two rows show that the conclusions based on the full sample hold also for the smaller sample sizes implied by increasing the minimum number of observations T required for computing the variable *Risk*. Thus, we focus here on the information in the first row. Notice first that gross rebalancing firms do not differ much from net rebalancing firms in terms of profitability, $\frac{M}{B}$

or capital expenditures. The main differences are in terms of average book- and market leverage ratios, cash balances, net leverage ratios and asset tangibility.

Beginning with the leverage ratios, type a firms on average increase market leverage from 15% to 24% and book leverage from 26% to 40%. The average increase in leverage is much smaller for the type a^N firms in Panel B. Here, the market (book) leverage ratio rises from 8% to 12% (15% to 19%), respectively. In sum, gross-leverage rebalancing firms are both more highly leveraged and increase leverage much more than net-leverage rebalancing firms. The higher leverage ratios of type a firms is supported by greater asset tangibility, which averages 32% (Column 9) in Panel A versus 25% for the type a^N firms in Panel B. Finally, the difference in average leverage ratios across a and a^N firms mirrors significant differences in cash holdings (CR, columns 4 and 8).

The average cash balance for gross-leverage rebalancing firms remains unchanged at 12% through the event, while it drops from 30% to 24% in the net-leverage rebalancing sample. The significant differences in cash holdings and cash draw-downs are also reflected in the net leverage ratio (L^N) which increases from -30% to -6% for net-leverage rebalancings. It is noteworthy that, for a^N-type firms, the net leverage ratio remains negative after the rebalancing event. This suggests that the sample of net-leverage rebalancing events reflects firms' cash policies much more than leverage (trade-off) policies. In contrast, for the sample of debt-financed rebalancings, leverage (both gross and net) is positive both before and after the rebalancing events.

Recall from Section 2.2 that, to have reasonable test power, the rebalancing event must not only be financed with a debt issue as the event indicator but must also isolate periods without potentially confounding cash flow events. Moreover, these financing components should be large both in absolute magnitude and relative to all other empirical sources and uses of funds. To verify these empirical requirements, we check the firm's cash flow statement in the rebalancing quarter, as follows:

$$OCF - INV + OTH + \underbrace{(-CH + IVSTCH)}_{\text{Cash and cash equivalents}} = \underbrace{ER^e - DI^e}_{\text{Debt-financed equity payout}} \tag{8}$$

where OCF is operating cash flow, INV is total net investment outlays, and OTH denotes (generally small) other financing cash flows. The contribution of cash and cash equivalents consists of two components: cash-balance draw-down ($-CH$) and net sale of short-term marketable securities ($IVSTCH$). On the right-hand side, ER^e is (again) the net equity retirement (dividends and share repurchases net of equity issues) and DI^e are debt issues in excess of debt retirements. All variables are scaled by the book value of total assets (the exact variable definitions using Compustat mnemonics are given in Panel B of Table 2).

Panel A of Table 4 confirms that the magnitudes of the debt-financed rebalancing components dwarf the other items in the firm's cash flow identity, which is reassuring. The net equity payout in Column (6) is large, averaging 17% of book assets, while the average debt issue (DI^e) is a near identical 16% (Column 7). Moreover, the items on the left-hand side of Eq. (8) are all small, indicating that the debt issue in Column (7) is by and large financing the equity payout. Of the remaining cash flow components, operating cash flow (OCF) and cash used for investments (INV) each averages 3% of book assets, while sale of short-term marketable securities ($IVSTCH$) and cash and cash equivalents are all near-zero in magnitude.

Panel B of Table 4 documents the magnitudes of the average cash flow components behind cash-and-debt-financed rebalancing events (a^N). Note first that the average net equity payout is almost identical to those in Panel A (16%). This is important because it shows that the main difference between the events captured by type a and type a^N rebalancing events lies in their respective sources of financing and *not* in the size of the equity payout itself. The equity payout in Panel B is financed with a combination of a large cash balance draw-down ($-CH = 8\%$ on average), a smaller debt issue ($DI = 5\%$) and some sale of marketable securities ($IVSTCH = 2\%$). Operating cash flow (OCF) and investment (INV) are of similar magnitude as in Panel A (about 2%).

While cash-balance draw-downs (CH) are costless, selling short-term investments in marketable securities ($IVSTCH$) may entail a small transaction cost (Duchin, Gilbert, Harford, and Hrdlicka, 2017). However, Panel B of Table 4 also shows that CH on average constitutes 80% of the internal financing of the Danis, Rettl, and Whited (2014) rebalancing events in our sample. Thus, more than half of the net-leverage recapitalization events consist of near-costless rebalancings.

Panel C Table 4 shows components of the cash flow identity when the cash draw-down *alone* is sufficient to finance the shareholder distribution. The event indicator is now $a^c = 1$ if $\frac{-\Delta C_t}{A_t} > 5\%$ and $\frac{ER^e_t}{A_t} > 5\%$. As can be seen, almost no debt is issued in those quarters, while other variables are much like those for the net rebalancing events in Panel B. For robustness, we explore all three event definitions (a, a^N and a^c) in the empirical analysis below.

Finally, Figure 4 shows the dynamics of a firm's cash flow identity in event time relative to the quarter of the capital structure rebalancing. Following each firm over a 33 quarter horizon (16 quarters before and after the rebalancing), it visualizes that the large equity payout is truly a one-time event. Similarly, debt issues meeting the 5% issue size threshold spike in the year of the debt-financed rebalancing (Panel A) whereas the debt-issue spike is replaced by a significant cash draw-down spike in the case of cash-and-debt-financed rebalancings (Panel B). Operating cash flow and net investment outlays, on the other hand, are stable throughout the entire event horizon.

4 Analysis of debt-financed rebalancing events

In this section, we present estimates of the conditional leverage-profitability correlations using regression Eq. (4). We first report our main finding based on our rebalancing event dummy a_{it} and then proceed with a number of robustness checks.

4.1 Main empirical result

Table 5 reports the conditional leverage-profitability correlation estimates γ_0 and γ_1. Columns (1) and (2) use an issue-size threshold of 5%, which is commonplace in the extant literature on security issuances (Leary and Roberts, 2005, 2010; Eckbo, Masulis, and Norli, 2007). For robustness, the table also re-estimates the coefficients after changing the size threshold to a low of 1.25% and a high of 7.5%, which substantially changes the sample of rebalancing events. For example, when using $T = 4$ contiguous quarters to estimate $Risk$, lowering the size threshold to s=1.25% in Column (4) increases the number of rebalancing events from $N = 1,251$ in Column (2) to $N = 6,944$ in Column (4). Conversely, implementing the largest size threshold of 7.5% reduces the sample of rebalancings to 722 in Column (6).

The vector X_{it} of lagged control variables include the standard deviation of Π (labelled $Risk$), the market-to-book ratio (M/B), asset tangibility (Tan), and firm size ($Size$). Size is adjusted for inflation, the continuous variables ($Size$, M/B, Π, $Risk$) are winsorized at the 1(99) percent level, and naturally bounded variables (L, Tan) are set to be within the unit interval. The regressions include quarter-fixed effects. The conclusions are unchanged when we include industry fixed effects as well (shown in Table 11 below).

In all of the columns, all of the lagged regressors in X_{it} in Table 5 receive coefficient estimates that are statistically significant at the 1% level of better. Moreover, the sign, magnitude and statistical significance of the leverage-profitability correlation estimates γ_0 and γ_1 are all robust to the cross-column sample size change, as is the sign and significance of the coefficient sum $\gamma_0 + \gamma_1$ shown in the last two rows of the table. We add the last two rows at the bottom of the table for expositional simplicity, as they highlight the results of testing the tradeoff hypothesis H1 using the Wald test statistic.

In periods *without* rebalancing activity, all of the leverage-profitability correlation estimates of γ_0 (in the first row of the table) are negative and significant at the 1% level, ranging from -0.72 in Column (1) to -0.57 in Column (6). As for γ_1 in the third row, the point estimates are negative but statistically insignificant, except in columns (3) and (4) where the small issue size threshold of $s = 1.25\%$ produces a significantly negative γ_1. As shown in the last two rows, the estimated sum $\gamma_0+\gamma_1$ is negative everywhere, ranging from -0.74 in the Column (1) to -0.62 in Column (2). Hypothesis H1, $\gamma_0 + \gamma_1 = 0$, is strongly rejected by the Wald test statistic across all columns.

In sum, using the type-a rebalancing-event definition which is dictated by dynamic tradeoff theory with exogenous investment, Table 5 shows that, conditional on the rebalancing event, the cross-sectional leverage-profitability correlation is significantly negative—not positive as predicted by the tradeoff hypothesis H1. The result that $\gamma_0 < 0$ and $\gamma_0 + \gamma_1 < 0$ in all six columns of Table 5 effectively resurrects the long-standing leverage-profitability puzzle after Danis, Rettl, and Whited (2014) fail to reject H1.[8] Next, we first show that the main conclusion from Table 5 is highly robust. We then show that Danis, Rettl, and Whited (2014)'s finding of a positive leverage-profitability correlation is unlikely to address H1.

4.2 Robustness test

4.2.1 Restricting the rebalancing-event sample

In Table 6, we report the leverage-profitability correlation estimates using a size threshold of $s = 5\%$ and three restrictions on the rebalancing event indicator a_t. First, in Columns (1) and (2), we restrict the sample of capital structure rebalancing events to exclude *any* same-period cash-balance draw-downs: $a_t = 0$ if $\Delta C_t < 0$. Since firms do not hold cash balances in the type of dynamic tradeoff models underlying H1, this restriction further narrows the distance between the theory and the experimental setting. The resulting coefficients γ_0 and γ_1 are again individually negative and, if anything, *larger* (in

[8] While dynamic tradeoff theory and the above tests are couched in terms of market leverage, we have also replicated Table 5 using book leverage. While not tabulated, this replication also fails to support H1.

absolute magnitude) than in Table 5. The sum $\gamma_0 + \gamma_1$ is negative and significant as per the Wald test statistic, which strongly rejects H1.

Second, in Columns (3) and (4), we zero out rebalancing events in quarters where the lagged profit is negative: $a_t = 0$ if $\Pi_{t-1} < 0$. The idea here is that, since Π_{t-1} serves as a proxy for future expected profitability, rebalancings of the type predicted by tradeoff theory are more likely to occur in periods when $\Pi_{t-1} \geq 0$. In fact, while Π_{t-1} is negative in 18% of the total sample of firm-quarters, $\Pi_{t-1} < 0$ in only 5% of the subsample of quarters where firms undertake a rebalancing event. Columns (3) and (4) of Table 6 zero out such rebalancing-quarters. As shown, the sum $\gamma_0 + \gamma_1$ remains negative (yet statistically insignificant) after this change in the rebalancing-event definition. If we instead replace Π_{t-1} with a twelve-quarter average profitability measure (to capture long-run managerial expectations about profits), the sum of $\gamma_0 + \gamma_1$ is negative (and statistically significant).

Third, in columns (5)–(8) of Table 6, we examine whether investment financing decisions that are contemporaneous with the rebalancing event tend to mask true tradeoff behavior in the data. Before turning to the coefficient estimates, recall from the descriptive evidence in Section 3 that the debt issues observed in quarters with rebalancing events are on average much greater than the periods' investment outlays: 16% versus 2% of total assets, respectively (tables 3 and 4). Moreover, as shown by the 16-quarter time series on both sides of the leverage-rebalancing events in Panel A of Figure 4, total net investment outlays remain stable through the events. The only abnormality inside the event quarter appears to be the net debt issue and the associated shareholder distribution. Thus, this descriptive evidence shows that significant investment decisions do not on average occur in the same quarters as the rebalancing events.

Columns (5)–(8) of Table 6 condition the regression sample on low levels of contemporaneous investments. In columns (5) and (6), we zero out rebalancing events in quarters where the ratio of capital expenditure to total assets ($Capex$) exceeds the quarter's industry median value of $Capex$ defined using the 3-digit SIC code ($Ecapex = 1$). As shown, the leverage-profitability correlation remains negative also for this restricted sample. Finally, in in columns (7) and (8), we impose an even stricter investment-financing requirement by zeroing out rebalancing events during periods when the firm's total investment outlays (INV) are greater than one percent of book assets. Again, the coefficient sum of $\gamma_0 + \gamma_1$ remains negative and statistically significant, rejecting the tradeoff hypothesis H1.

While not tabulated, we also replace financial leverage L with the consolidated leverage ratio $L^C_{it} = (D + SG\&A)/(D + MV)$ as dependent variable in regression Eq. (4), where $SG\&A$ is selling, general &

administrative expenses. This consolidates financial with operating leverage. While the cross-sectional variation in expected default cost driven by variation in operating leverage is to some extent captured by the volatility control variable $Risk$, it allows us to more specifically test whether firms manage financial leverage towards a target that includes operating leverage. If they do, a given increase in profitability may cause a firm with high operating leverage to issue less debt than a firm with low operating leverage. As Chen, Harford, and Kamara (2017), who report that operating leverage is (unconditionally) positively correlated with profitability, we use $SG\&A$ as a measure fixed costs. Using L_{it}^{C} as dependent variable results in $\gamma_0 + \gamma_1 < 0$. Thus, expanding the measure of leverage to include operating leverage does not change the main conclusion of a negative conditional correlation between profitability and leverage.

4.2.2 Regressions with rebalancing firms only

The fact that only a small fraction of the data panel in Table 5 contains quarters with rebalancing events raises the question of whether non-rebalancing firms drive the coefficient estimate of γ_0 to be too low to be overcome by the estimate of γ_1 driven by the rebalancing firms. To examine whether this issue affects our main conclusion, Table 7 reports leverage-correlation estimates after restricting the data panel to rebalancing firms only. As shown, even with this extreme restriction, the Wald test continues to reject H1. While the coefficient estimate of γ_1 is now positive, the coefficient sum $\gamma_0 + \gamma_1$ remains negative. In other words, in the cross-section of rebalancing events, the debt issues are not sufficiently large to offset the increase in equity value caused by the higher profitability (which by itself decreases market leverage). This strongly rejects hypothesis H1, which holds that, in the cross-section of rebalancing firms, more profitable companies move to higher levels of leverage.

The positive coefficient estimate of γ_1 in Table 7 is consistent with extant research indicating a positive relation between profitability and the size and likelihood of debt issuances (Hovakimian, 2004; Frank and Goyal, 2015; Eckbo and Kisser, 2020). However, what Table 7 shows is that the size of the debt issue involved in the rebalancing events is insufficient to overcome the simultaneous increase in equity value, so that $\gamma_0 + \gamma_1 < 0$. In other words, the debt issues involved in the rebalancing events attenuate but *do not prevent* the conditional leverage-profitability relation from becoming negative.[9]

Also interesting, the evidence in Table 7 complements the evidence in Eckbo and Kisser (2020), who

[9] While not tabulated, sorting the sample of rebalancing firms in Table 7 into size quintiles (and estimating the regression separately for each quintile) does not produce evidence that supports H1.

find that H1 is rejected for high-frequency net-debt issuers (net of debt repurchases) or HFIs. HFIs, which raised the bulk of all private and public debts over the past three decades, likely exhibit a combination of low debt issuance costs and high financing benefits. HFIs are relatively investment intensive with high asset tangibility and low Tobin's Q. Firms emerge as HFIs shortly after public listing for then to persist in this category throughout their public lifecycle. Thus, much as the regression sample in Table 5, testing H1 using HFIs likely favors finding evidence that $\gamma_0 + \gamma_1 > 0$. Nevertheless, the data rejects H1 both here and in Eckbo and Kisser (2020).

4.2.3 Introducing net leverage as dependent variable

Recall that, as firms in Fischer, Heinkel, and Zechner (1989) and Goldstein, Ju, and Leland (2001) do not save, our main regression analysis (Eq. 4) uses the gross leverage ratio L as dependent variable. Gross leverage is also commonly used in the extant empirical literature on the unconditional leverage-profitability correlation (Titman and Wessels, 1988; Rajan and Zingales, 1995; Frank and Goyal, 2009). However, given the prevalence of cash-balances (discussed below), it is also interesting to examine whether switching the dependent variable from L to leverage net of cash balances (L^N) affects the H1 test results. For example, it is possible that L^N captures the rebalancing firm's credit risk better than L and, hence, the cross-sectional variation in the unobservable leverage target (DeAngelo, Goncalves, and Stulz, 2018).

Table 8 shows that estimating Eq. (4) with L^N as dependent variable results in a net-leverage-profitability relation for debt-financed rebalancings that is strongly negative and, as evidenced by the Wald test, highly statistically significant. Thus, irrespective of whether firms manage towards a gross or net leverage target, debt-financed rebalancings do *not* exhibit a positive leverage-profitability correlation. Table 9 further shows that the net-leverage results are robust to narrowing the rebalancing event—as we do in Table 6 above—to regressions with L^N as dependent variable.

In sum, the above analysis shows that H1 is robustly rejected whether the regressions use gross or net leverage as dependent variable in regression Eq. (4). Since the theory dictates a focus on debt-financed rebalancing events, this evidence shows that the empirical leverage-profitability relation is *unconditionally* negative, i.e., in quarters with rebalancings as well as in other periods. This evidence therefore unambiguously resurrects the long-standing leverage-profitability puzzle. We next address the apparent contradictory evidence of Danis, Rettl, and Whited (2014), who conclude that H1 is supported when using the cash-and-debt-financing indicator (a^N) to identify rebalancing events.

5 Analysis of cash-financed rebalancing events

In this section, we first reproduce the main conclusion in Danis, Rettl, and Whited (2014) of a positive leverage-profitability correlation for rebalancing events of type a^N. We then explore in greater detail the role of cash-balance draw-downs to finance rebalancings events in driving this positive correlation. Our new evidence suggests that cash-financed rebalancing events are primarily driven by managing cash balances—rather than leverage—towards a target and thus fall outside of H1.

5.1 Confirming the prior evidence

The two first columns of Table 10 reproduce the main conclusion of Danis, Rettl, and Whited (2014) by re-estimating Eq. (4) using event indicator a_t^N, net leverage L^N as dependent variable, and an issue size-threshold of 5%. Notice first that adding cash-financing of the shareholder distribution triples the sample of rebalancing events. For example, in Column (2) of Table 10, the sample increases to 3,800 a_t^N-type events from the 1,251 a_t-type events in Column (2) of Table 8. More important, this addition of mixed cash-and-debt-financed events produces a coefficient-sum $\gamma_0 + \gamma_1$ that is now positive and significant. Whiloe not tabulated, this conclusion is robust to varying the size-threshold from a low of $s = 1.25\%$ to high of $s = 7.5\%$. The primary effect of adding cash-financing of the rebalancing events is to increase the coefficient estimate of γ_1 enough to drive the sum $\gamma_0 + \gamma_1$ to become positive.

As shown by the first four columns of Table 11, the conclusion from columns (1) and (2) of Table 10 also follows when we replicate Table 2 of Danis, Rettl, and Whited (2014) using their sample of 1,583 a^N-type of rebalancing events (1983–2011) and their firm characteristics (available on the web site of *Journal of Financial Economics*).[10] Specifically, Columns (1)–(3) of Table 11 confirm that $\gamma_0 + \gamma_1 > 0$ when the event indicator is of type a^N, which prompts Danis, Rettl, and Whited (2014) to strongly conclude in favor of H1.[11]

However, in columns (5)–(8) of Table 11, we apply the sample of Danis, Rettl, and Whited (2014) to our regression specification with gross leverage L_{it} as dependent variable and the debt-financed re-

[10] As shown in Column (2) of Table 11, Danis, Rettl, and Whited (2014) also experiment with four firm characteristics beyond our vector X without altering the conclusions. These additional characteristics are *Rating* (a dummy indicating that the firm has an S&P rating in quarter t), HHI (the Herfindahl industry concentration measure), and *Ilev* (mean industry leverage). Table 11 also uses their definition of *Size* as the logarithm of quarterly sales, which in our analysis above is defined as logarithm of book assets. We appreciate the opportunity to discuss with Daniel Rettl when we performed this replication.

[11] In Column (4), which adds firm fixed effects, the Wald test fails to reject that $\gamma_0 + \gamma_1 = 0$—a result that is also present in the earlier study.

balancings a_t as the event indicator. This application, which the prior study does not investigate, again lowers the event sample by almost one-third (from 1,583 in Column 1 to 648 in Column 5). Importantly, columns (5)–(8) confirm our main conclusion from Table 5 above: $\gamma_0 + \gamma_1 < 0$ for debt-financed rebalancings, which rejects H1 also when using the subsample of debt-financed rebalancings contained in Danis, Rettl, and Whited (2014)'s total event sample.

5.2 Cash-only-financed rebalancing events

To further illuminate the role of the cash-financed rebalancing events that dominates the evidence of Danis, Rettl, and Whited (2014), we decompose the a_t^N-type events into two subgroups. These groups place successively greater weight on the cash-portion in the total financing of the shareholder distribution, as follows:

$$\text{Cash-financed rebalancings:} \quad a_t^c = 1 \text{ if } \tfrac{-\Delta C_t}{A_t} > 5\% \text{ and } \tfrac{ER_t^e}{A_t} > 5\% \tag{9}$$

$$\text{Cash-only rebalancings:} \quad a_t^{c'} = 1 \text{ if } a_t^c = 1 \quad \text{and} \quad \Delta D_t^e \leq 0 \tag{10}$$

The empirical results are shown in columns (3)–(6) of Table 10. The table continues to show that $\gamma_1 > 0$ and $\gamma_0 + \gamma_1 > 0$ and statistically significant for these subgroups of cash-financed events. For the sample of 1,965 cases in Column (3), which uses $T = 20$ contiguous quarters to estimate *Risk*, $\gamma_1 = 1.6$ and $\gamma_0 + \gamma_1 = 1.37$, with both estimates being highly significant. Columns (5) and (6), where we further restrict the sample by eliminating events where the firm issues any long-term debt (requiring $\Delta D_t^e \leq 0$), further reinforce this result. For the sample of 1,615 $a_t^{c'}$-type events in Column (5), where $T = 20$, $\gamma_1 = 1.72$ and $\gamma_0 + \gamma_1 = 1.48$, both highly statistically significant.

Table 10 makes it abundantly clear that internally-financed rebalancing events produce $\gamma_1 > 0$ and $\gamma_0 + \gamma_1 > 0$. That is, in the cross-section of cash-financed rebalancing events, more profitable firms return more cash to shareholders (through share repurchases and dividends). Again, this evidence contrasts with our evidence for debt-financed rebalancing events, where the coefficient-sum $\gamma_0 + \gamma_1$ is robustly negative. As discussed in Section 2.3 above, while the latter strongly rejects the tradeoff hypothesis H1, the *ad hoc* nature of cash-financed events does not necessarily support H1. Specifically, a policy of maintaining cash-balances may from time to time produce cash-financed shareholder distributions to restore a target *cash holding* rather than a target leverage ratio. We turn to this possibility next.

5.3 Introducing target cash holdings

In this section, we examine whether inferences concerning the validity of the tradeoff hypothesis H1 is affected by the presence of a firm-specific target cash ratio. First, recall from Table 3 that firms undertaking a_t^N-type events on average adjust their net leverage ratios from $L_{t-1}^N = -0.3$ to the *still negative* net-debt ratio of $L_t^N = -0.06$. This, of course, is at odds with the move from $\underline{L}$ to L^* in the tradeoff Figure 1 and suggests instead that the firms are moving towards a target cash-balance C^*.

To explore this issue further, we estimate C^* using either the industry median cash ratio or the empirical cash model of Bates, Kahle, and Stulz (2009).[12] We then split the total sample of a^N-type of rebalancing events according to whether the excess cash $(C - C^*)$ is positive or negative (in the quarter preceding the rebalancing). The idea is that, when $C - C^* > 0$, the rebalancing decision may be to lower the cash holding towards C^* with no particular role for L^*. On the other hand, when $C - C^* < 0$, a debt issue would be required to finance a rebalancing towards L^* while at the same time avoiding a further erosion of the cash-balance below C^*. Thus, since the latter subsample will involve some debt issuance, it is more relevant for testing H1 than is the former subsample.

Panel A of Figure 5 displays the dynamics of $C - C^*$ in event time using two alternative measures of C^*. For the solid blue line, C^* is the industry median cash ratio, while the red dashed line measures C^* using a standard cash-balance regression model such as that of Bates, Kahle, and Stulz (2009). For both lines, excess cash steadily increases over the fifteen quarters leading up to the rebalancing event and decreases significantly in event quarter zero. Panel B shows that the increase in excess cash is not, on average, associated with firm characteristics such as *Risk* or R&D expenditures, which are stable over the event window. Also, recall from Figure 4 above that total investment outlays and profitability exhibit little variation surrounding these rebalancing event.

Table 12 presents the leverage-profitability correlation estimates with L^N as dependent variable and by splitting the cash-and-debt-financed rebalancings (a^N) into the two cash-balance subgroups:

$$\text{Rebalancing when excess cash is positive: } a_t^{N'} = 1 \text{ if } a_t^N = 1 \text{ and } \left(C_{t-1} - C_{t-1}^*\right) > 0 \quad (11)$$

$$\text{Rebalancing when excess cash is negative: } a_t^{N''} = 1 \text{ if } a_t^N = 1 \text{ and } \left(C_{t-1} - C_{t-1}^*\right) \leq 0 \quad (12)$$

[12] The regression is based on regressing the cash ratio on profitability, size, M/B, capital expenditures, net working capital, book leverage, the ratio of R&D expenditures to sales, an indicator variable for dividend payments, acquisition outlays, industry risk, time and industry fixed effects. Nominal values are scaled by the book value of assets.

In columns (1)–(4), $\gamma_0 + \gamma_1$ is positive and highly significant irrespective of whether the cash target is estimated using the industry median the regression-based target. In other words, when firms have "too much" cash ($C - C^* > 0$), the amount distributed to shareholders is positively correlated with profitability in the cross-section. This is consistent with extant evidence that large cash dividends and stock repurchase are positively correlated with profitability and free cash flow.[13] On the other hand, for the rebalancing events in columns (5)–(8), firms have "too little" cash ($C - C^* \leq 0$) and so may need to issue debt to finance the shareholder distribution. The data also shows that these firms adjust leverage to a positive net-leverage ratio. Importantly, for these rebalancing events, which are candidates for testing the dynamic tradeoff hypothesis, Table 12 shows that $\gamma_0 + \gamma_1 < 0$, which rejects H1.

In sum, the leverage-profitability correlation associated with debt-financed rebalancing events is negative, which reject H1. The leverage-profitability correlation is positive only in the subsample where firms exhibit excess cash holdings and distribute some of this cash to shareholders. Since such events fall outside of H1, the associated positive leverage-profitability correlation does not speak to the validity of the dynamic tradeoff theory *per se*.

6 Conclusion

The leverage-profitability puzzle is the tension between the positive leverage-profitability correlation predicted by classical tradeoff theory and the negative correlation in the data. In this paper, we attempt to resolve this tension by exploiting quarters in which firms undertake large leverage rebalancings by issuing debt and distributing the proceeds to shareholders. Dynamic tradeoff theory holds that fixed debt-issuance costs cause firms to optimally refrain from this type of rebalancing until the benefit covers the transaction cost. While waiting, positive profitability shocks drive down leverage, which may be the driving force behind the negative unconditional leverage-profitability correlation in the data. On the other hand, when actively rebalancing, firms move close to their optimal leverage ratios, which is when the theory implies a positive leverage-profitability correlation. Ours is the first paper to test this conditional tradeoff prediction using a theoretically consistent definition of a rebalancing event.

Our main finding is that the leverage-profitability correlation is significantly negative also in periods when firms undertake large capital structure rebalancings financed by debt issues. This finding, which

[13] Jensen (1986), Brav, Graham, Harvey, and Michaely (2005), Peyer and Vermaelen (2008), and DeAngelo, DeAngelo, and Skinner (2009). Note that firms continue to have negative net debt following rebalancings where $C - C^* > 0$.

fails to support dynamic tradeoff theory, is robust to variations in the debt-issue size-threshold used to define the rebalancing event, and to the specific definition of leverage and profitability. Moreover, while the class of dynamic inaction models treat investment financing as exogenous, we show that the conditional leverage-profitability correlation is negative also after controlling for the level of same-period investments. In sum, our evidence rejects the notion that the negative *unconditional* leverage-profitability correlation empirically overrides a positive correlation in periods with significant rebalancing events.

Moreover, we show that, while debt-financed rebalancing events are associated with a negative cross-sectional leverage-profitability correlation, the correlation is positive in the data if and only if the rebalancing is financed internally by a cash-balance draw-down. Moreover, we demonstrate that this is also why Danis, Rettl, and Whited (2014) report a positive correlation estimate in their sample of mixed cash-and-debt-financed rebalancing events. However, internally-financed rebalancing events are theoretically inappropriate for several reasons: firms in tradeoff theory do not save, cash-financing does not increase the debt-related tax shield, and cash draw-downs do not incur the level of transaction costs required to generate capital structure rebalancing inertia. The prevalence of cash balances in practice suggests that, following periods with high profitability, firms may from time to time make large cash distributions to restore a target cash holding rather than a leverage target.

Data Availability Statement

The data underlying this article were provided by Compustat and CRSP through the Wharton Research Data Services database under licence. Data will be shared on request to the corresponding author if the user requesting the data can document a valid subscription to the Compustat and CRSP databases.

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Figure 1: **Debt issue costs and optimal rebalancing policy**

As in the class of dynamic tradeoff models with exogenous investment (Fischer, Heinkel, and Zechner, 1989; Goldstein, Ju, and Leland, 2001), firm value $V(L)$ is a concave function of the leverage ratio $L \equiv D/V$, where D is the market value of outstanding debt. L^* is the value-maximizing (target) leverage ratio, and FC is a fixed debt issuance cost. The firm rebalances capital structure (issues debt and distributes the proceeds to shareholders) when L reaches the lower leverage boundary $\underline{L}$, drawn here at $V(L^*) - FC$ for illustrative simplicity. To avoid over-compensating debtholders, the firm does not retires debt when $L > L^*$ (Admati, DeMarzo, Hellwig, and Pfleiderer, 2018).

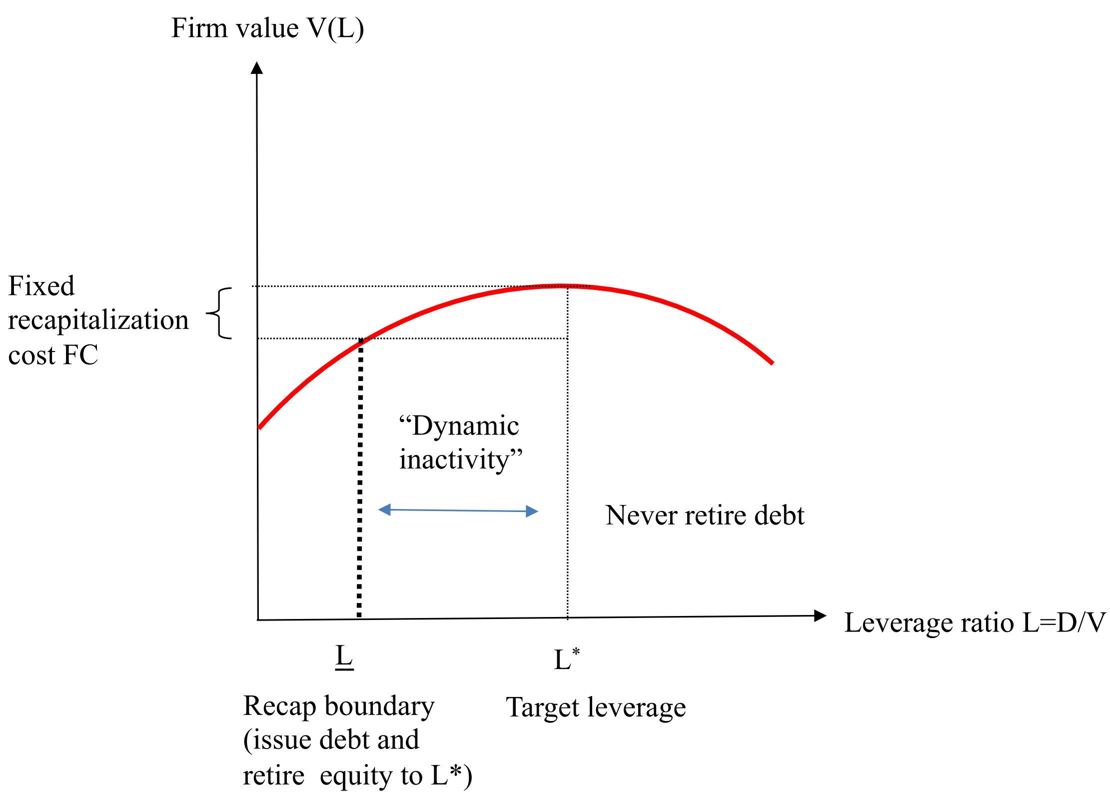


Figure 2: Evolution of leverage ratios and rebalancing-event frequencies, 1984–2016

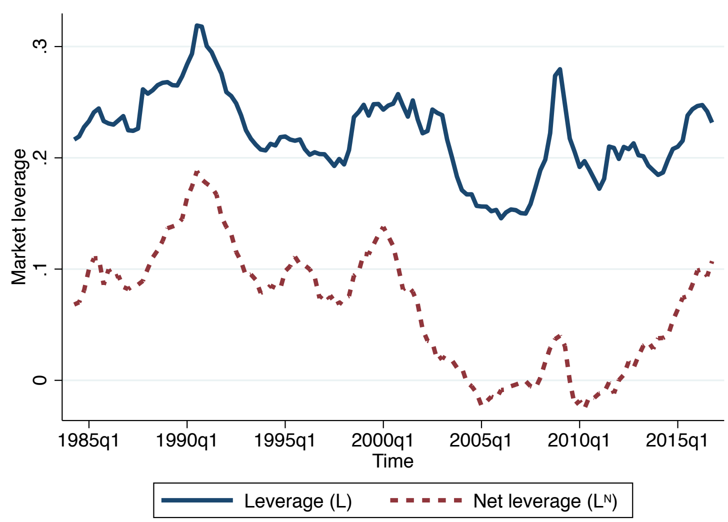
Panel A shows annual average gross and net market leverage ratios, while Panel B displays average frequencies of debt-financed (type a_t) and cash-and-debt-financed (type a_t^N) rebalancing events, respectively, where

$$\text{Debt-financed rebalancings: } a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

$$\text{Cash-and-debt-financed rebalancings: } a_t^N = 1 \text{ if } \frac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

ΔD^e is the firm's increase in long-term debt in excess of debt retirement, ΔC the cash-balance change, ER^e the equity retirement in excess of equity issues, and A the book value of total assets. See Table 2 for the variable construction and Compustat mnemonics. Total sample of 7,537 U.S. public firms (350,210 firm-quarters), 1984–2016.

A: Gross and net market leverage ratios ($L \equiv D/MV$ and $L^N \equiv (D-C)/(MV-C)$)



B: Debt-financed and cash-and-debt-financed rebalancing events (types a_t and a_t^N)

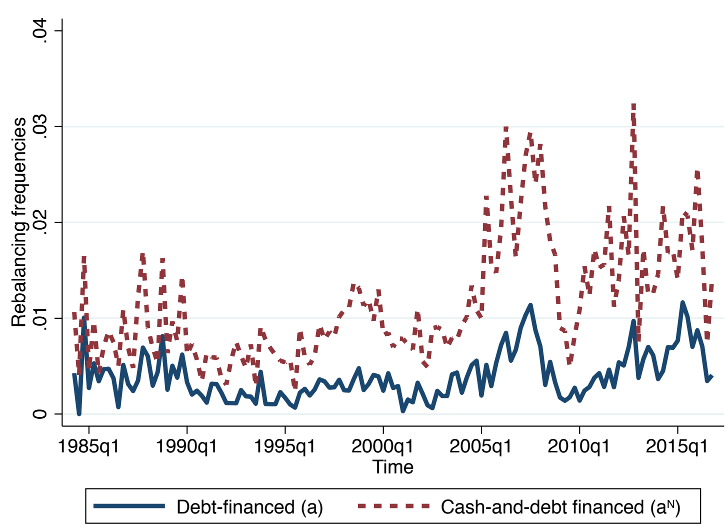


Figure 3: **Leverage- and cash-dynamics surrounding rebalancing events**

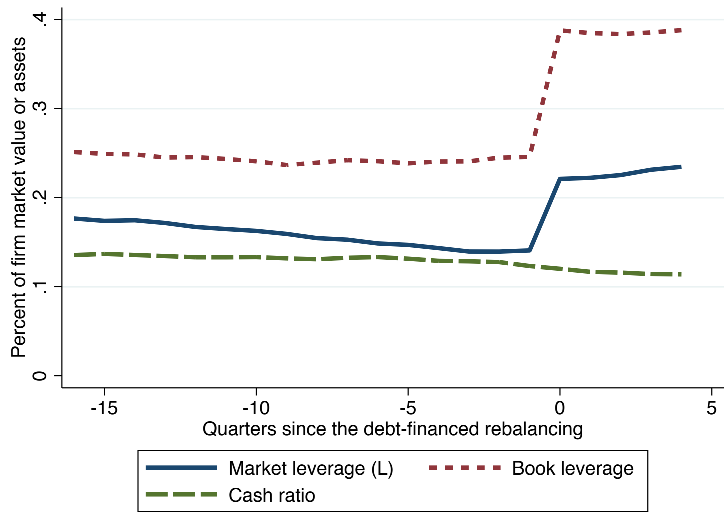
The figure displays dynamics of leverage (market and book) and the cash ratio in quarters surrounding leverage rebalancing events in quarter 0. In Panel A, firms undertake debt-financed rebalancings (of type a_t), while in Panel B firms undertake cash-and-debt financed rebalancings (of type a_t^N), where

$$\text{Debt-financed rebalancings: } a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

$$\text{Cash-and-debt-financed rebalancings: } a_t^N = 1 \text{ if } \frac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

ΔD^e is the change in long-term debt, ΔC is change in cash balances, ER^e is equity retirement in excess of equity issues, and A is book value of total assets. See Table 2 for the variable construction and Compustat mnemonics. Total sample of 870 gross and 2,673 net rebalancings with at least 20 quarters of data to compute the variable risk. 1984-=2016.

A: Debt-financed rebalancing events (type a_t)



B: Cash-and-debt-financed rebalancing events (type a^N)

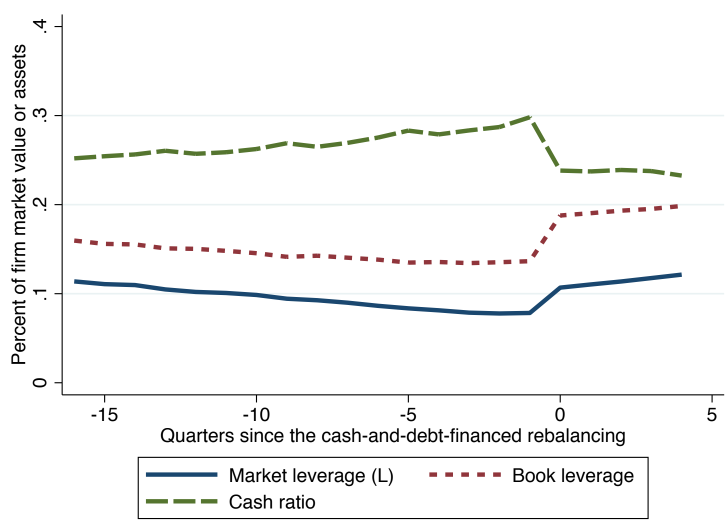


Figure 4: Cash-flow dynamics surrounding leverage rebalancing events

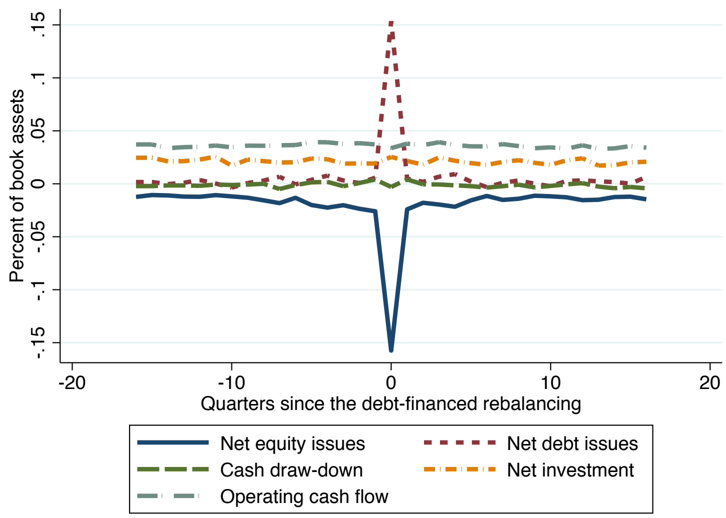
The figure displays dynamics of major cash flow statement components in quarters surrounding leverage rebalancing events (quarter 0). In Panel A, firms undertake debt-financed rebalancings (of type a_t), while in Panel B firms undertake cash-and-debt financed rebalancings (of type a_t^N), where

$$\text{Debt-financed rebalancings: } a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%,$$

$$\text{Cash-and-debt-financed rebalancings: } a_t^N = 1 \text{ if } \frac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%,$$

and where ΔD^e is increase in long-term debt in excess of debt retirement, ΔC is change in cash balances, ER^e is equity retirement in excess of equity issues, and A is book value of total assets. The figure shows the contribution of net equity issues ($-ER^e$), net debt issues (DI^e), total cash drawdowns ($-CH + IVSTCH$), operating cash flow (OCF) and total net investment outlays (INV). All variables are scaled by the book value of assets. See Table 2 for the variable construction and Compustat mnemonics and Table 4 for more information on the cash flow identity. Total sample of 870 gross and 2,673 net rebalancings with at least 20 quarters of data to compute the variable risk. 1984-2016.

A: Debt-financed rebalancing events (type a_t)



B: Cash-and-debt-financed rebalancing events (type a^N)

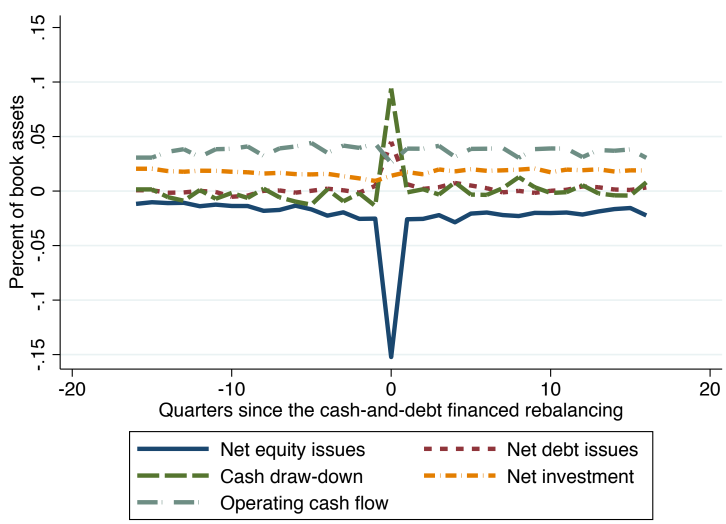


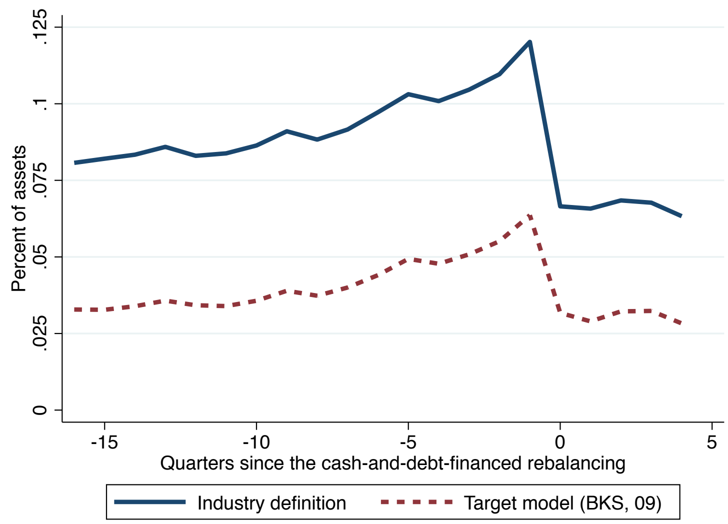
Figure 5: Excess cash holdings, *Risk* and R&D expenses around type-a^N rebalancings

The figure displays dynamics of abnormal cash holdings, *Risk* and R&D expenditures surrounding cash-and-debt financed rebalancing events in quarter 0, where

$$\text{Cash-and-debt-financed rebalancings: } a_t^N = 1 \text{ if } \frac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%,$$

and where ΔD^e is the change in long-term debt, ΔC is change in cash balances, ER^e is equity retirement in excess of equity issues, and A is book value of total assets. In Panel A, abnormal cash holdings are defined using two empirical measures: the solid blue line defines abnormal cash relative to the industry median cash ratio, the red dashed line relative to the regression model of Bates, Kahle, and Stulz (2009). In Panel B, $R\&D$ is the ratio of research and development expenditures to total assets and *Risk* is the standard deviation of operating cash flow. See Table 2 for the variable construction and Compustat mnemonics. Total sample of 2,673 net rebalancings with at least 20 quarters of data to compute the variable risk. 1984-2016.

A: Excess cash holdings



R&D expenses and *Risk*

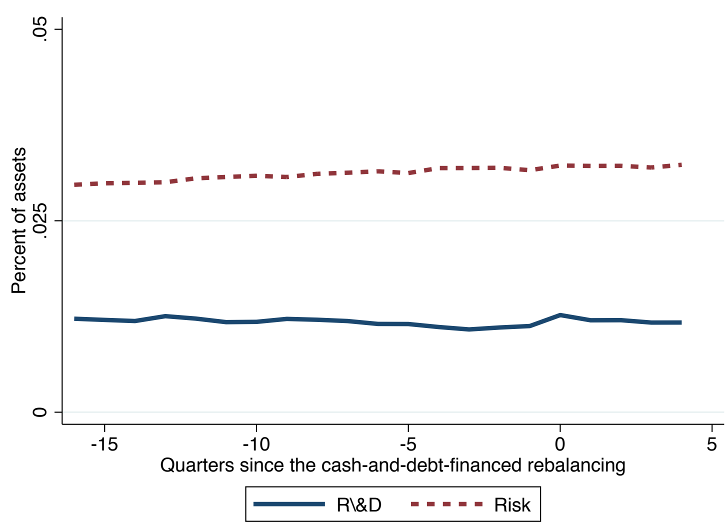


Table 1: **Quarterly CRSP/Compustat sample selection, 1984-2016**

Sample restriction	Change in number of firm-quarters	Change in number of firms
A: Total sample w/o a minimum estimation period for *Risk*		
Raw sample	876,178	22,399
Industrial firms only[a]	-256,364	-5,715
No multiple quarterly observations[b]	-8,301	0
No missing information on profitability[c]	-83,798	-688
Contiguous data for at least 20 quarters[d,e]	-134,733	-8,358
Non-missing balance sheet data[f]	-27,883	-24
Non-missing income statement data[g]	-7,151	-63
Non-missing cash flow statement data[h]	-7,738	-14
= Final Sample	350,210	7,537
B: Sample for different minimum estimation periods for *Risk*[i]		
Estimation period for *Risk* is $T = 4$ quarters	333,249	7,533
Estimation period for *Risk* is $T = 20$ quarters	209,259	7,404

[a] Eliminates utilities (SIC codes 4900-4999) and financial firms (SIC codes 6000-6999).

[b] The requirement excludes duplicate information and cases in which firms change the date of the fiscal year. For example, the first fiscal quarter may be changed from March, 31 to April, 30. As a consequence, the *CCM* database would contain two observations for the first fiscal quarter. Our sampling algorithm drops the first (March, 31) and keeps the second (April, 30) observation.

[c] We require non-missing information on profitability (=oibdpq/atq).

[d] We require twenty contiguous observations on profitability for each firm. Our sampling algorithm reflects the possibility that firms may have several periods with at least twenty contiguous observations. Suppose a firm has 60 quarterly observations, but profitability is not available in quarter 30. In this case, we would observe two periods with at least twenty contiguous observations on profitability for this firm (i.e. before and after quarter 30).

[e] The variable *Risk* is computed as the standard deviation of profitability. The estimation is based on a rolling basis and keeps the first observation constant. Panel B displays the additional impact on sample size in case we require an estimation period of at least 4 or 20 observations to compute risk.

[f] For balance sheet data consistency, we require non-missing data for the book value of assets (atq), the market value of the firm's equity (prccq $\times$ cshoq), total debt (dlttq + dlcq), cash holdings (cheq), property plant and equipment (ppentq) as well as changes in long-term debt and cash.

[g] For income statement consistency, we require non-missing and non-zero and positive data on revenues (saleq).

[h] For cash-flow data consistency, we first set missing entries for items in the cash flow statement to zero, then group all sources and uses of funds and finally drop observations in case total sources or uses of funds equal zero or deviate by more than 1% from each other.

[i] The sample size changes when we vary the number of required quarters T to compute *Risk*. For example, when $T = 4$ the sampling algorithm sets the first three quarters (= estimation period - 1) for *Risk* as missing.

Table 2: Variable construction using Compustat mnemonics

Symbol	Variable Name	Compustat mnemonics
A. Balance sheet and income statement variables[a]		
D	Total debt	$dlcq + dlttq$
MV	Market value of firm	$dlcq + dlttq + prccq * cshoq$
C	Cash holdings	$cheq$
A	Total book assets	atq
L	Market leverage	$(dlcq + dlttq)/(prccq * cshoq + dlcq + dlttq)$
L^N	Net market leverage	$(dlcq + dlttq - cheq)/(prccq * cshoq + dlcq + dlttq - cheq)$
BL	Book leverage	$(dlcq + dlttq)/atq$
ΔD^e	Change long-term debt	$dlttq - lag(dlttq)$
CR	Cash ratio	$cheq/atq$
ΔC	Change in cash holdings	$cheq - lag(cheq)$
Π	Profitability	$oibdpq/atq$
$Risk$	St. dev. of Π (over at least T periods)	
$Size$	Firm size	$log(atq)$
M/B	Tobin's Q	$(prccq * cshoq + dlcq + dlttq)/(atq)$
Tan	Tangibility	$ppentq/atq$
B. Cash flow statement variables[b,c]		
EI	Equity Issues	$sstkq$
ER	Distributions to equity-holders	$dvq + prstkcq$
ER^e	Equity issue minus equity distributions	ER - EI
DI^e	Net debt issues (CF)	$dltisq + dlcchq - dltrq$
CH	Cash component of ΔC	$chechq$
$IVSTCH$	Short-term securities component of ΔC	$ivstchq$
$Capex$	Capital expenditures	$capxq/atq$
OCF	Operating cash flow	$oancfq + exreq$
INV	Total investment	$capxq + aqcq + ivchq - sivq - sppeq - ivacoq$
OTH	Other	$fiaoq + txbcofq$
C. Rebalancing definitions (dummy variables)		
a_t	Debt-financed rebalancing (ignores ΔC)	=1 if $\frac{\Delta D^e_t}{A_t} > s$ and $\frac{ER^e_t}{A_t} > s$ (=0 otherwise)
a'_t	Debt-only financed rebalancing (no cash draw-down)	=1 if $a_t = 1$ and $\Delta C_t \geq 0$ (=0 otherwise)
a^N_t	Mixed cash-and-debt-financed rebalancing	=1 if $\frac{\Delta D^e_t - \Delta C_t}{A_t} > s$ and $\frac{ER^e_t}{A_t} > s$ (=0 otherwise)
a^c_t	Cash-financed rebalancing (ignores ΔD^e)	=1 if $\frac{-\Delta C_t}{A_t} > s$ and $\frac{ER^e_t}{A_t} > s$ (=0 otherwise)
$a^{c'}_t$	Cash-only financed rebalancing (no net debt issue)	=1 if $a^c_t = 1$ and $\Delta D^e_t \leq 0$ (=0 otherwise)

[a] Size is adjusted for inflation using the consumer price index provided by CRSP for September 1983 (the date of the first quarterly report in our sample) as a deflator. The continuous variables ($Size$, M/B, Π, $Risk$, L^N) are winsorized at the 1(99) percent level, and naturally bounded variables (L, Tan, CR) are set to be within the unit interval.

[b] The continuous variable $Capex$ is winsorized at the 1(99) percent level.

[c] Quarterly cash flow statement variables in Compustat end with the letter "y" to signal that Compustat records those variables in a year-to-date format (e.g. a second quarter cash flow statement item is the sum of cash flows in quarters one and two). We therefore compute quarterly changes in order to obtain the actual quarterly cash flow statement item (once done, we denote this variable by adding a q to the mnemonic).

Table 3: Characteristics of firms undertaking capital structure rebalancings

The table displays selected firm characteristics conditional on the rebalancing event. In Panel A, firms undertake debt-financed rebalancings (of type a_t), while in Panel B firms undertake cash-and-debt-financed rebalancings (of type a_t^N), where

$$\text{Debt-financed rebalancings: } a_t = 1 \text{ if } \quad \frac{\Delta D_t^e}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$
$$\text{Cash-and-debt-financed rebalancings: } a_t^N = 1 \text{ if } \quad \frac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%.$$

ΔD^e is the change in long-term debt, ΔC is change in cash balances, ER^e is equity retirement in excess of equity issues, and A is book value of total assets. Within each Panel, results are shown for all available observations (All) as well as after increasing the minimum number of observations (T) required to compute the variable $Risk$. The table shows values of market leverage (L), book leverage (BL), cash ratio (CR), operating profitability (Π), market to book ratio (M/B), ratio of property, plant and equipment to assets (Tan) and the ratio of capital expenditures to assets ($Capex$). The variables L^N, Π, M/B and $Capex$ are winsorized at the 1(99) percent level, and naturally bounded variables (L, BL, CR, Tan) are set to be within the unit interval. See Table 2 for the variable construction and Compustat mnemonics. Sample period 1984-2016.

	Period $t-1$				Period t								
	L	BL	L^N	CR	L	BL	L^N	CR	$Prof$	M/B	Tan	$Capex$	N
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Panel A: Debt-financed rebalancings (type a_t)													
All	0.15	0.26	0.06	0.12	0.24	0.40	0.18	0.12	0.04	2.20	0.32	0.02	1,339
$T=4$	0.15	0.26	0.05	0.12	0.24	0.40	0.18	0.12	0.05	2.22	0.32	0.02	1,297
$T=20$	0.14	0.25	0.06	0.12	0.22	0.39	0.16	0.12	0.05	2.25	0.32	0.02	870
Panel B: Cash-and-debt-financed rebalancings (type a_t^N)													
All	0.08	0.15	-0.30	0.30	0.12	0.19	-0.06	0.24	0.04	2.50	0.25	0.02	4,046
$T=4$	0.08	0.15	-0.31	0.30	0.12	0.19	-0.06	0.24	0.04	2.49	0.25	0.02	3,895
$T=20$	0.08	0.14	-0.35	0.30	0.11	0.19	-0.07	0.24	0.04	2.52	0.24	0.02	2,673

Table 4: Sources and uses of funds of firms undertaking capital structure rebalancings

The table displays components of a firm's cash flow identity conditional on the rebalancing event. In Panel A, firms undertake debt-financed rebalancings (of type a_t), in Panel B firms undertake cash-and-debt-financed rebalancings (of type a_t^N), while in Panel C firms undertake cash financed leverage rebalancings (of type a_t^c), where

$$\begin{aligned}
\text{Debt-financed rebalancings: } a_t = 1 \text{ if } &\quad \frac{\Delta D_t^e}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\% \\
\text{Cash-and-debt-financed rebalancings: } a_t^N = 1 \text{ if } &\quad \frac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\% \\
\text{Cash-only financed rebalancings: } a_t^c = 1 \text{ if } &\quad \frac{-\Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%
\end{aligned}$$

ΔD^e is the change in long-term debt, ΔC is change in cash balances, ER^e is equity retirement in excess of equity issues, and A is book value of total assets. Within each Panel, results are shown for all available observations (All) as well after increasing the minimum number of observations (T) required to compute the variable $Risk$. The table shows the following components of a firm's cash flow identity

$$OCF - INV + OTH + \underbrace{(-CH + IVSTCH)}_{\text{Cash and cash equivalents}} = \underbrace{ER^e - DI^e}_{\text{Debt-financed equity payout}}$$

where OCF is operating cash flow, INV is total net investment outlays, and OTH denotes (generally small) other financing cash flows. The contribution of cash and cash equivalents can be broken down into the drawdown of cash balances ($-CH$) and the net sale of short-term marketable securities ($IVSTCH$). On the right-hand side, ER^e is (again) the net equity retirement (dividends and share repurchases net of equity issues) and DI^e are debt issues in excess of debt retirements. All variables are scaled by the book value of assets. See Table 2 for the variable construction and Compustat mnemonics. Sample period 1984-2016.

				Cash and cash equivalents		Debt Financed Rebalancing	
	OCF	INV	OTH	$-CH$	$IVSTCH$	ER^e	DI^e
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Debt-financed rebalancings (type a_t)							
All	0.03	0.03	0.00	0.00	0.00	0.17	0.16
$T = 4$	0.03	0.03	0.00	0.00	0.00	0.16	0.16
$T = 20$	0.03	0.03	0.00	0.00	0.00	0.16	0.15
Panel B: Cash-and-debt-financed rebalancings (type a_t^N)							
All	0.02	0.02	0.00	0.08	0.02	0.16	0.05
$T = 4$	0.02	0.02	0.00	0.08	0.02	0.16	0.05
$T = 20$	0.03	0.01	0.00	0.08	0.02	0.15	0.05
Panel C: Cash-only financed rebalancings (type a_t^c)							
All	0.02	0.01	0.01	0.12	0.02	0.16	0.01
$T = 4$	0.02	0.01	0.00	0.12	0.03	0.16	0.01
$T = 20$	0.02	0.01	0.00	0.11	0.02	0.16	0.01

Table 5: Leverage-profitability regressions with debt-financed rebalancing events

The table reports coefficient estimates from the following panel regression:

$$L_t = \alpha + \gamma_0 \Pi_{t-1} + \gamma_1 \Pi_{t-1} a_t + \gamma_2 a_t + \beta X_{t-1} + \epsilon_t$$

$$\text{Debt-financed rebalancing events: } a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > s \text{ and } \frac{ER_t^e}{A_t} > s$$

$L \equiv D/MV$ is the market leverage ratio, D is book value of total debt debt, MV is D plus the market value of total equity, ΔD^e is the change in long-term debt, ER^e is equity retirement in excess of equity issues, A is book value of total assets, Π is operating profitability scaled by A, and the constant issue-size threshold s is in percent of A. The vector X of control variables include $Risk$ (the standard deviation of Π measured over T contiguous quarters), M/B (the market to book ratio), Tan (the ratio of tangible assets to A), and $Size$ (the natural logarithm of A adjusted for inflation). The variables M/B, Π, $Size$ and $Risk$ are winsorized at the 1(99) percent level, and naturally bounded variables (L, Tan) are set to be within the unit interval. Superscript ** (*) indicates significance at the 1% (5%) level. See Table 2 for the variable construction and Compustat mnemonics. Sample period 1984-2016.

Issue size threshold s:	$s = 5\%$		$s = 1.25\%$		$s = 7.5\%$	
Contiguous quarters T for $Risk$:	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$
	(1)	(2)	(3)	(4)	(5)	(6)
Firm profitability and rebalancing						
Π (γ_0)	-0.724**	-0.574**	-0.718**	-0.569**	-0.724**	-0.574**
	(0.010)	(0.007)	(0.010)	(0.007)	(0.010)	(0.007)
a	0.050**	0.052**	0.015**	0.015**	0.080**	0.084**
	(0.011)	(0.008)	(0.005)	(0.004)	(0.013)	(0.010)
$a \times \Pi$ (γ_1)	-0.018	-0.043	-0.298**	-0.346**	-0.012	-0.065
	(0.177)	(0.126)	(0.091)	(0.069)	(0.220)	(0.162)
Firm controls						
$Risk$	-0.328**	-0.241**	-0.327**	-0.239**	-0.328**	-0.241**
	(0.018)	(0.014)	(0.018)	(0.014)	(0.018)	(0.014)
$Size$	0.015**	0.017**	0.015**	0.017**	0.015**	0.017**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.054**	-0.049**	-0.053**	-0.049**	-0.054**	-0.049**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tan	0.220**	0.220**	0.220**	0.220**	0.220**	0.220**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Quarter FE	yes	yes	yes	yes	yes	yes
Adj. R^2	0.26	0.26	0.26	0.26	0.26	0.26
Rebalancings	849	1,251	4,935	6,944	477	722
Total obs.	205,559	325,296	205,559	325,296	205,559	325,296
Trade-off hypothesis H1: $\gamma_0 < 0$ and $\gamma_0 + \gamma_1 > 0$						
$\gamma_0 + \gamma_1$	**-0.742****	**-0.617****	**-1.016****	**-0.915****	**-0.736****	**-0.639****
Wald test ($\gamma_0 + \gamma_1 = 0$)	0.000	0.000	0.000	0.000	0.001	0.000

Table 6: Regressions with restricted samples of debt-financed rebalancings

The table reports coefficient estimates from the following panel regression:

$$L_t = \alpha + \gamma_0 \Pi_{t-1} + \gamma_1 \Pi_{t-1} a_t + \gamma_2 a_t + \beta X_{t-1} + \epsilon_t$$

$$\text{Debt-financed rebalancing events: } a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

$L \equiv D/MV$ is the market leverage ratio. The event indicator a is set to zero if the firm simultaneously draws down cash ($\Delta C < 0$, columns 1 and 2), if operating profits are negative ($\Pi_{t-1} < 0$, columns 3 and 4), if $Ecapex = 1$ (columns 5 and 6) or total net investment outlays INV exceed one percent of book assets ($INV/AT > 0.01$, columns 7 and 8). $Ecapex$ is the ratio of capital expenditures to assets ($Capex$) for a firm exceeds the quarter's industry median value of $Capex$ (defined using the 3-digit SIC code), and zero otherwise. The remaining control variables in X are as described in Table 5. See also Table 2 for the variable construction and Compustat mnemonics. Superscript ** (*) indicates significance at the 1% (5%) level. Sample period 1984-2016.

	Event indicator a_t set to 0 if							
Additional restriction: Exclude if	$\Delta C_t < 0$		$\Pi_{t-1} < 0$		$Ecapex_t = 1$		$INV/AT > 0.01$	
Contiguous quarters T for $Risk$:	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm profitability and rebalancing								
Π (γ_0)	-0.723**	-0.574**	-0.725**	-0.575**	-0.723**	-0.574**	-0.722**	-0.573**
	(0.010)	(0.007)	(0.010)	(0.007)	(0.010)	(0.007)	(0.010)	(0.007)
a	0.076**	0.075**	0.012	0.030**	0.083**	0.091**	0.092**	0.091**
	(0.017)	(0.012)	(0.013)	(0.010)	(0.014)	(0.011)	(0.014)	(0.011)
$a \times \Pi$ (γ_1)	-0.143	-0.155	0.614**	0.314	-0.121	-0.166	-0.403	-0.299
	(0.289)	(0.190)	(0.216)	(0.170)	(0.235)	(0.175)	(0.238)	(0.188)
Firm controls								
$Risk$	-0.328**	-0.241**	-0.328**	-0.241**	-0.328**	-0.240**	-0.328**	-0.240**
	(0.018)	(0.014)	(0.018)	(0.014)	(0.018)	(0.014)	(0.018)	(0.014)
$Size$	0.015**	0.017**	0.015**	0.017**	0.015**	0.017**	0.015**	0.017**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.054**	-0.049**	-0.054**	-0.049**	-0.054**	-0.049**	-0.054**	-0.049**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tan	0.220**	0.220**	0.220**	0.220**	0.220**	0.221**	0.220**	0.221**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Quarter FE	yes	yes	yes	yes	yes	yes	yes	yes
Adj. R^2	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Rebalancings	457	656	817	1,184	392	596	298	439
Total obs.	205,559	325,296	205,559	325,296	205,559	325,296	205,559	325,296
Trade-off hypothesis H1: $\gamma_0 < 0$ and $\gamma_0 + \gamma_1 > 0$								
$\gamma_0 + \gamma_1$	**-0.866****	**-0.729****	**-0.111**	**-0.261**	**-0.844****	**-0.74****	**-1.125****	**-0.872****
Wald test ($\gamma_0 + \gamma_1 = 0$)	0.003	0.000	0.609	0.125	0.000	0.000	0.000	0.000

Table 7: Regressions with debt-financed rebalancings: Rebalancing firms only

The table reports coefficient estimates from the following panel regression:

$$L_t = \alpha + \gamma_0 \Pi_{t-1} + \gamma_1 \Pi_{t-1} a_t + \gamma_2 a_t + \beta X_{t-1} + \epsilon_t$$

$$\text{Debt-financed rebalancing events: } a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > s \text{ and } \frac{ER_t^e}{A_t} > s$$

$L \equiv D/MV$ is the market leverage ratio, D is book value of total debt debt, MV is D plus the market value of total equity, ΔD^e is the change in long-term debt, ER^e is equity retirement in excess of equity issues, A is book value of total assets, Π is operating profitability scaled by A, and the constant issue-size threshold s is in percent of A. The vector X of control variables include $Risk$ (the standard deviation of Π measured over T contiguous quarters), M/B (the market to book ratio), Tan (the ratio of tangible assets to A), and $Size$ (the natural logarithm of A adjusted for inflation). The variables M/B, Π, $Size$ and $Risk$ are winsorized at the 1(99) percent level, and naturally bounded variables (L, Tan) are set to be within the unit interval. Superscript ** (*) indicates significance at the 1% (5%) level. See Table 2 for the variable construction and Compustat mnemonics. Sample is restricted to firms performing at least one gross rebalancing (a), sample period 1984-2016.

Issue size threshold s:	$s = 5\%$		$s = 1.25\%$		$s = 7.5\%$	
Contiguous quarters T for $Risk$:	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$
	(1)	(2)	(3)	(4)	(5)	(6)
Firm profitability and rebalancing						
Π (γ_0)	-1.014**	-0.879**	-1.191**	-1.026**	-0.956**	-0.845**
	(0.030)	(0.023)	(0.023)	(0.017)	(0.036)	(0.027)
a	0.027**	0.037**	-0.009	-0.004	0.049**	0.062**
	(0.010)	(0.008)	(0.005)	(0.004)	(0.012)	(0.010)
$a \times \Pi$ (γ_1)	0.430**	0.370**	0.378**	0.295**	0.335	0.283
	(0.166)	(0.121)	(0.095)	(0.071)	(0.202)	(0.154)
Firm controls						
$Risk$	0.228**	0.147**	-0.104**	-0.118**	0.065	0.059
	(0.043)	(0.036)	(0.031)	(0.025)	(0.048)	(0.041)
$Size$	0.010**	0.010**	0.008**	0.009**	0.011**	0.012**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
M/B	-0.054**	-0.052**	-0.063**	-0.060**	-0.052**	-0.050**
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Tan	0.156**	0.161**	0.180**	0.175**	0.147**	0.157**
	(0.004)	(0.004)	(0.003)	(0.002)	(0.005)	(0.004)
Quarter FE	yes	yes	yes	yes	yes	yes
Adj. R^2	0.27	0.27	0.27	0.27	0.25	0.26
Rebalancings	849	1,251	4,935	6,944	477	722
Total obs.	40,984	57,758	99,064	141,748	27,034	38,479
Trade-off hypothesis H1: $\boldsymbol{\gamma_0 < 0}$ **and** $\boldsymbol{\gamma_0 + \gamma_1 > 0}$						
$\boldsymbol{\gamma_0 + \gamma_1}$	**-0.584****	**-0.509****	**-0.813****	**-0.731****	**-0.621****	**-0.562****
Wald test ($\gamma_0 + \gamma_1 = 0$)	0.000	0.000	0.000	0.000	0.002	0.000

Table 8: Regressions with net leverage and debt-financed rebalancing events

The table reports coefficient estimates from the following panel regression:

$$L_t^N = \alpha + \gamma_0 \Pi_{t-1} + \gamma_1 \Pi_{t-1} a_t + \gamma_2 a_t + \beta X_{t-1} + \epsilon_t$$

$$\text{Debt-financed rebalancing events: } a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > s \text{ and } \frac{ER_t^e}{A_t} > s$$

$L \equiv (D - C/(MV - C)$ is the net market leverage ratio, D is book value of total debt debt, MV is D plus the market value of total equity, ΔD^e is the change in long-term debt, ER^e is equity retirement in excess of equity issues, A is book value of total assets, Π is operating profitability scaled by A, and the constant issue-size threshold s is in percent of A. The vector X of control variables include $Risk$ (the standard deviation of Π measured over T contiguous quarters), M/B (the market to book ratio), Tan (the ratio of tangible assets to A), and $Size$ (the natural logarithm of A adjusted for inflation). The variables M/B, Π, $Size$ and $Risk$ are winsorized at the 1(99) percent level, and naturally bounded variables (L, Tan) are set to be within the unit interval. Superscript ** (*) indicates significance at the 1% (5%) level. See Table 2 for the variable construction and Compustat mnemonics. Sample period 1984-2016.

Issue size threshold s:	$s = 5\%$		$s = 1.25\%$		$s = 7.5\%$	
Contiguous quarters T for $Risk$:	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$
	(1)	(2)	(3)	(4)	(5)	(6)
Firm profitability and rebalancing						
Π (γ_0)	-0.234**	0.002	-0.225**	0.010	-0.235**	0.002
	(0.024)	(0.018)	(0.024)	(0.018)	(0.024)	(0.018)
a	0.126**	0.125**	0.086**	0.077**	0.145**	0.154**
	(0.013)	(0.011)	(0.007)	(0.007)	(0.017)	(0.013)
$a \times \Pi$ (γ_1)	-0.830**	-0.730**	-1.171**	-1.004**	-0.602*	-0.631**
	(0.210)	(0.166)	(0.134)	(0.124)	(0.263)	(0.198)
Firm controls						
$Risk$	-1.062**	-0.593**	-1.061**	-0.592**	-1.062**	-0.593**
	(0.045)	(0.034)	(0.045)	(0.034)	(0.045)	(0.034)
$Size$	0.037**	0.038**	0.036**	0.038**	0.037**	0.038**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
M/B	-0.017**	-0.016**	-0.016**	-0.016**	-0.017**	-0.016**
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Tan	0.491**	0.501**	0.491**	0.500**	0.491**	0.501**
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Quarter FE	yes	yes	yes	yes	yes	yes
Adj. R^2	0.15	0.15	0.15	0.15	0.15	0.15
Rebalancings	849	1,251	4,935	6,944	477	722
Total obs.	205,559	325,296	205,559	325,296	205,559	325,296
Trade-off hypothesis H1: $\boldsymbol{\gamma_0 < 0}$ and $\boldsymbol{\gamma_0 + \gamma_1 > 0}$						
$\boldsymbol{\gamma_0 + \gamma_1}$	**-1.064****	**-0.728****	**-1.396****	**-0.994****	**-0.837****	**-0.629****
Wald test ($\gamma_0 + \gamma_1 = 0$)	0.000	0.000	0.000	0.000	0.001	0.001

Table 9: Net leverage and debt-financed rebalancing events: Robustness

The table reports coefficient estimates from the following panel regression:

$$L_t^N = \alpha + \gamma_0 \Pi_{t-1} + \gamma_1 \Pi_{t-1} a_t + \gamma_2 a_t + \beta X_{t-1} + \epsilon_t$$

$$\text{Debt-financed rebalancing events: } a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

$L^N \equiv (D-C)/(MV-C)$ is the market leverage ratio. The event indicator a is set to zero if the firm simultaneously draws down cash ($\Delta C < 0$, columns 1 and 2), if operating profits are negative ($\Pi_{t-1} < 0$, columns 3 and 4), if $Ecapex = 1$ (columns 5 and 6) or total net investment outlays INV exceed one percent of book assets ($INV/AT > 0.01$, columns 7 and 8). $Ecapex$ is equal to one if the ratio of capital expenditures to assets ($Capex$) for a firm exceeds the quarter's industry median value of $Capex$ (defined using the 3-digit SIC code), and zero otherwise. The remaining control variables in X are as described in Table 5. See also Table 2 for the variable construction and Compustat mnemonics. Superscript ** (*) indicates significance at the 1% (5%) level. Sample period 1984-2016.

	Additional restriction: Event indicator a_t set to 0 if							
	$\Delta C_t < 0$		$\Pi_{t-1} < 0$		$Ecapex_t = 1$		$INV/AT > 0.01$	
Contiguous quarters T for *Risk*:	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm profitability and rebalancing								
Π (γ_0)	-0.234**	0.003	-0.236**	0.001	-0.234**	0.003	-0.233**	0.003
	(0.024)	(0.018)	(0.024)	(0.018)	(0.024)	(0.018)	(0.024)	(0.018)
a	0.136**	0.134**	0.087**	0.114**	0.173**	0.189**	0.177**	0.173**
	(0.023)	(0.016)	(0.017)	(0.014)	(0.019)	(0.014)	(0.018)	(0.018)
$a \times \Pi$ (γ_1)	-0.916**	-0.829**	-0.188	-0.547*	-0.925**	-0.977**	-1.062**	-0.781**
	(0.348)	(0.238)	(0.268)	(0.213)	(0.290)	(0.220)	(0.286)	(0.261)
Firm controls								
Risk	-1.062**	-0.593**	-1.061**	-0.592**	-1.062**	-0.593**	-1.062**	-0.593**
	(0.045)	(0.034)	(0.045)	(0.034)	(0.045)	(0.034)	(0.045)	(0.034)
Size	0.037**	0.038**	0.037**	0.038**	0.037**	0.038**	0.037**	0.038**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.017**	-0.016**	-0.017**	-0.016**	-0.017**	-0.016**	-0.017**	-0.016**
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Tan	0.491**	0.501**	0.491**	0.501**	0.492**	0.501**	0.492**	0.501**
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Quarter FE	yes	yes	yes	yes	yes	yes	yes	yes
Adj. R^2	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Rebalancings	457	656	817	1,184	392	596	298	439
Total obs.	205,559	325,296	205,559	325,296	205,559	325,296	205,559	325,296
Trade-off hypothesis H1: $\boldsymbol{\gamma_0 < 0}$ **and** $\boldsymbol{\gamma_0 + \gamma_1 > 0}$								
$\gamma_0 + \gamma_1$	**-1.15****	**-0.826****	**-0.424**	**-0.546****	**-1.159****	**-0.974****	**-1.295****	**-0.778****
Wald test ($\gamma_0 + \gamma_1 = 0$)	0.001	0.001	0.112	0.010	0.000	0.000	0.000	0.003

Table 10: Regressions with net leverage and alternative cash-financed rebalancings

The table reports coefficient estimates using the sample of a^N-type rebalancing events in Table 8 and the following generic regression specification:

$$L_t^N = \alpha + \gamma_0 \Pi_{t-1} + \gamma_1 \Pi_{t-1} a_t^* + \gamma_2 a_t^* + \beta X_{t-1} + \epsilon_t,$$

where $L^N \equiv (D - C)/(MV - C)$ and the alternative event-indicators a_t^* are as follows:

$$\begin{aligned} \text{Cash-and-debt-financed rebalancings: } a_t^N = 1 &\quad \text{if } \tfrac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \tfrac{ER_t^e}{A_t} > 5\% \\ \text{Cash-financed rebalancings: } a_t^c = 1 &\quad \text{if } \tfrac{-\Delta C_t}{A_t} > 5\% \text{ and } \tfrac{ER_t^e}{A_t} > 5\% \\ \text{Cash-only rebalancings: } a_t^{c'} = 1 &\quad \text{if } a_t^c = 1 \text{ and } \Delta D_t^e \leq 0 \end{aligned}$$

The vector X of control variables are as described in Table 5. See also Table 2 for the variable construction and Compustat mnemonics. Superscript ** (*) indicates significance at the 1% (5%) level. Sample period 1984-2016.

Event indicator:	a^N		a^c		$a^{c'}$	
Contiguous quarters T for *Risk*:	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$
	(1)	(2)	(3)	(4)	(5)	(6)
Firm profitability and rebalancing						
Π (γ_0)	-0.239**	0.003	-0.235**	0.007	-0.232**	0.009
	(0.024)	(0.018)	(0.024)	(0.018)	(0.024)	(0.018)
a^*	-0.136**	-0.114**	-0.193**	-0.174**	-0.224**	-0.203**
	(0.019)	(0.013)	(0.021)	(0.015)	(0.024)	(0.017)
$a^* \times \Pi$ (γ_1)	1.445**	0.888**	1.605**	0.930**	1.715**	0.984**
	(0.287)	(0.190)	(0.318)	(0.212)	(0.353)	(0.238)
Firm controls						
Risk	-1.062**	-0.588**	-1.059**	-0.584**	-1.059**	-0.585**
	(0.045)	(0.034)	(0.045)	(0.034)	(0.045)	(0.034)
Size	0.037**	0.038**	0.037**	0.038**	0.037**	0.038**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.016**	-0.016**	-0.016**	-0.016**	-0.016**	-0.016**
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Tan	0.490**	0.500**	0.489**	0.499**	0.489**	0.499**
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Quarter FE	yes	yes	yes	yes	yes	yes
Adj. R^2	0.15	0.15	0.15	0.15	0.15	0.15
Rebalancings	2,630	3,800	1,965	2,819	1,615	2,282
Total obs.	205,559	325,296	205,559	325,296	205,559	325,296
Trade-off hypothesis H1: $\boldsymbol{\gamma_0 < 0}$ **and** $\boldsymbol{\gamma_0 + \gamma_1 > 0}$						
$\boldsymbol{\gamma_0 + \gamma_1}$	**1.206****	**0.891****	**1.370****	**0.937****	**1.483****	**0.993****
Wald test ($\gamma_0 + \gamma_1 = 0$)	0.000	0.000	0.000	0.000	0.000	0.000

Table 11: Regressions with the sample of Danis, Rettl, and Whited (2014)

Columns (1)-(4) implement DRW's main regression specification (in their Table 2), while columns (5)-(8) apply DRW's sample to our gross leverage specification. The generic regression specification is:

$$Y_t = \alpha + \gamma_0 \Pi_{t-1} + \gamma_1 \Pi_{t-1} a_t^* + \gamma_2 a_t^* + \beta X_{t-1} + \epsilon_t$$

The market leverage ratio Y_t and the rebalancing indicator is either a^N or a_t, as follows:

$$\text{Columns } (1)-(4): \quad Y_t \equiv L^N = (D-C)/(MV-C) \quad \text{and} \quad a_t^N = 1 \text{ if } \frac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

$$\text{Columns } (5)-(8): \quad Y_t \equiv L = D/MV \quad \text{and} \quad a_t = 1 \text{ if } \frac{\Delta D_t^e}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

With the exception of L and a, all variables are taken directly from DRW's sample which is based on $T = 20$ quarters used to compute *Risk*. In columns (2) and (6), additional variables include *Rating* (a dummy indicating that the firm has an S&P rating in quarter t), HHI (the Herfindahl industry concentration measure), and *Ilev* (mean industry leverage). Size is based on the logarithm of sales. DRW's sample is from the web site of *Journal of Financial Economics*, 1984–2011).

	Replicating DRW Net leverage regression $Y = L^N$ and a^N-type events				**This paper only** Gross leverage regression $Y = L$ and a-type events			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm profitability and rebalancing								
Π (γ_0)	-0.263**	-0.172**	-0.311**	-0.378**	-0.567**	-0.489**	-0.567**	-0.469**
	(0.015)	(0.015)	(0.015)	(0.033)	(0.010)	(0.010)	(0.010)	(0.020)
a^*	-0.174**	-0.149**	-0.163**	-0.054**	0.048**	0.044**	0.041**	0.037**
	(0.016)	(0.016)	(0.015)	(0.015)	(0.010)	(0.010)	(0.010)	(0.007)
$a^* \times \Pi$ (γ_1)	1.628**	1.485**	1.468**	0.720**	0.15	0.109	0.169	0.062
	(0.226)	(0.215)	(0.206)	(0.215)	(0.167)	(0.165)	(0.167)	(0.119)
Firm controls								
Risk	-0.004	-0.003	0.004	-0.059*	-0.002	-0.003	0.001	-0.033*
	(0.002)	(0.002)	(0.002)	(0.027)	(0.001)	(0.001)	(0.001)	(0.016)
Size	0.035**	0.006**	0.028**	0.057**	0.016**	-0.005**	0.011**	0.038**
	(0.000)	(0.001)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.003)
M/B	-0.031**	-0.027**	-0.021**	0.007**	-0.050**	-0.048**	-0.044**	-0.022**
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.001)
Tan	0.417**	0.371**	0.459**	0.545**	0.197**	0.165**	0.188**	0.193**
	(0.003)	(0.004)	(0.005)	(0.028)	(0.002)	(0.002)	(0.003)	(0.016)
Rating		0.184**				0.134**		
		(0.002)				(0.002)		
HHI		0.096**				0.019**		
		(0.004)				(0.003)		
Ilev		0.109**				0.057**		
		(0.002)				(0.001)		
Quarter FE	yes	yes	yes	yes	yes	yes	yes	yes
Industry FE	no	no	yes	no	no	no	yes	no
Firm FE	no	no	no	yes	no	no	no	yes
Adj. R^2	0.17	0.21	0.22	0.06	0.24	0.29	0.29	0.15
Recapitalizations	1,583	1,569	1,569	1,583	648	643	643	648
Total obs.	193,924	190,889	190,889	193,924	193,632	190,611	190,611	193,632
Trade-off hypothesis H1: $\boldsymbol{\gamma_0 < 0}$ and $\boldsymbol{\gamma_0 + \gamma_1 > 0}$								
$\boldsymbol{\gamma_0 + \gamma_1}$	**1.365****	**1.313****	**1.157****	**0.342**	**-0.417***	**-0.38***	**-0.398***	**-0.407****
Wald test ($\gamma_0 + \gamma_1 = 0$)	0.000	0.000	0.000	0.114	0.012	0.021	0.017	0.001

Table 12: **Net leverage and cash-and-debt-financed events: Role of target cash balances**

The table reports coefficient estimates from the following panel regression:

$$L_t^N = \alpha + \gamma_0 \Pi_{t-1} + \gamma_1 \Pi_{t-1} a_t^N + \gamma_2 a_t^N + \beta X_{t-1} + \epsilon_t$$

$$\text{Cash-and-debt-financed rebalancings: } a_t^N = 1 \text{ if } \frac{\Delta D_t^e - \Delta C_t}{A_t} > 5\% \text{ and } \frac{ER_t^e}{A_t} > 5\%$$

$L^N \equiv (D-C)/(MV-C)$ is the net market leverage ratio. In columns (1) to (4), the event indicator a^N is set to zero if the firm had no excess cash ($C_{t-1} - C_{t-1}^* < 0$) in the quarter preceding the rebalancing. In columns (5) to (8), the event indicator a^N is set to zero if the firm had excess cash ($C_{t-1} - C_{t-1}^* \geq 0$) in the quarter preceding the rebalancing. Target cash holdings $C*$ are either based on the industry median cash ratio (columns 1, 3, 5 and 7) or estimated using the target cash model of Bates, Kahle, and Stulz (2009) (columns 2, 4, 6 and 8). The remaining control variables in X are as described in Table 5. See also Table 2 for the variable construction and Compustat mnemonics. Superscript ** (*) indicates significance at the 1% (5%) level. Sample period 1984-2016. Superscript ** (*) indicates significance at the 1% (5%) level. Sample period 1984-2016.

	Positive excess cash $a^N = 0$ if $C_{t-1} - C_{t-1}^* \leq 0$				**Negative excess cash** $a^N = 0$ if $C_{t-1} - C_{t-1}^* > 0$			
	C^* (industry)		C^* (reg, BKS)		C^* (industry)		C^* (reg, BKS)	
	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$	$T = 20$	$T = 4$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm profitability and rebalancing								
Π (γ_0)	-0.238**	0.005	-0.238**	0.004	-0.233**	0.004	-0.233**	0.004
	(0.024)	(0.018)	(0.024)	(0.018)	(0.024)	(0.018)	(0.024)	(0.018)
a^N	-0.225**	-0.201**	-0.259**	-0.227**	0.065**	0.087**	0.034**	0.046**
	(0.025)	(0.018)	(0.029)	(0.021)	(0.018)	(0.011)	(0.013)	(0.010)
$a^N \times \Pi$ (γ_1)	2.275**	1.454**	2.776**	1.784**	-0.472	-0.542**	-0.193	-0.278
	(0.386)	(0.264)	(0.468)	(0.322)	(0.261)	(0.164)	(0.188)	(0.144)
Firm controls								
Risk	-1.063**	-0.585**	-1.061**	-0.585**	-1.062**	-0.593**	-1.061**	-0.593**
	(0.045)	(0.034)	(0.045)	(0.034)	(0.045)	(0.034)	(0.045)	(0.034)
Size	0.037**	0.038**	0.037**	0.038**	0.037**	0.038**	0.037**	0.038**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
M/B	-0.016**	-0.016**	-0.017**	-0.016**	-0.017**	-0.016**	-0.017**	-0.016**
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Tan	0.490**	0.499**	0.489**	0.499**	0.491**	0.501**	0.491**	0.501**
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Quarter FE	yes	yes	yes	yes	yes	yes	yes	yes
Adj. R^2	0.153	0.146	0.153	0.146	0.15	0.15	0.152	0.15
Rebalancings	1,788	2,612	1,545	2,231	842	1,188	1,085	1,569
Total obs.	205,559	325,296	205,559	325,296	205,559	325,296	205,559	325,296
Trade-off hypothesis H1: $\gamma_0 < 0$ and $\gamma_0 + \gamma_1 > 0$								
$\gamma_0 + \gamma_1$	**2.037****	**1.459****	**2.538****	**1.788****	**-0.705****	**-0.538****	**-0.426***	**-0.274***
Wald test ($\gamma_0 + \gamma_1 = 0$)	0.000	0.000	0.000	0.000	0.007	0.001	0.022	0.055
L^N (lagged)	-0.54	-0.47	-0.61	-0.54	0.05	0.05	0.02	0.03
L^N (current)	-0.14	-0.15	-0.16	-0.17	0.10	0.12	0.07	0.08