Large dividend increases and leverage

Ian A Cooper
London Business School
Sussex Place, Regent's Park, London NW1 4SA, United Kingdom
+44-2070008259
icooper@london.edu
(corresponding)

Neophytos Lambertides
Cyprus University of Technology
Department of Commerce, Finance and Shipping
140 Ayiou Andreou Street, P.O.Box 50329, 3603 Lemesos, Cyprus
n.lambertides@cut.ac.cy

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Abstract

We study the leverage of firms making large dividend increases. Over the five years following the dividend increase they raise leverage enough to finance the entire dividend increase for that period with debt. This is not explained by trade-off variables or the pecking order. The effect is greatest for big firms with low-powered incentives, suggesting an agency effect whereby they make large dividend increases with the intention of paying for them with debt as a means of controlling the agency problem. This suggests that debt and dividends are complementary in controlling agency problems, not substitutes as has been found elsewhere.

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I. Introduction

Recent work in modelling the dynamics of capital structure has raised the concern that tests of capital structure theories using panel data regressions can give misleading results (Strebulaev (2007)). A related strand of the literature has found that traditional models of capital structure fail to explain much of the cross-sectional variation in leverage ratios (Lemmon, Roberts, and Zender (2008)). Together, these problems have re-opened many questions about the factors that determine capital structure.

One new empirical approach designed to deal with these issues is to calibrate dynamic models that include particular imperfections and see what observed regularities in leverage behavior they can explain. A second approach has been to look closely at the subset of firms that are making significant financing decisions at any given time, on the basis that their behavior should reveal the factors affecting active leverage choices. Neither of these approaches has yet provided a satisfactory explanation for most of the variation in capital structure choices. Indeed, the latter approach has even raised doubts about the standard partial adjustment/trade-off model that is used as the empirical workhorse of much leverage research (Hovakimian and Li (2010)).

In this study we adopt the second approach. We examine leverage behaviour around the time that firms make a major financing choice: specifically a large dividend increase. The goal is to understand whether the leverage choices made by this subset of firms can be explained by conventional theories and, if not, what additional factors appear to influence them. There are several benefits of focusing on this subset of firms. First, it avoids the possible confounding effects of firms that are not making active leverage choices. The leverage of these firms should reflect active choices, not the passive effects of circumstance. Second, it can accommodate greater conditionality than calibrating a dynamic model which tries to explain the behaviour of all firms. The leverage of these firms may have a different response to certain factors than other firms. Also, we can track over time the way that they implement any leverage change, in order to give insights into why a partial adjustment model might fail. Third, the approach offers the possibility of using as a control group firms that decrease dividends by a large amount. They are also making active financing choices, and we use their behaviour to isolate the factors that differentially affect the leverage choices of firms that increase dividends.

We begin by showing that firms making large dividend increases have a subsequent large increase in leverage. On average this takes place over five years and is sufficient to finance the entire dividend increase for that period. The effect is not explained by a standard target leverage/partial adjustment model. Nor is it explained when we augment that model with variables that are known to be correlated with large dividend increases. Instead, the explanation is that firms making dividend increases respond differently to financing deficits and surpluses than do other firms. Thus the conditionality in leverage behaviour for this group takes two forms. First, their target leverage appears to change at the time of the dividend increase. Second, the way they move towards the new target is via a subtle change in future behaviour, whereby their asymmetric leverage response to financing surpluses and deficits is more exaggerated than for other firms. They move towards the new target only in a conditional way depending on how their financing deficit evolves, not at a fixed rate.

We suggest that these findings may help in understanding two anomalies found in the literature. First, Hovakimian and Li (2010) find that firms making large financing decisions do not behave as standard models suggest. They suggest that a model with a moving target leverage ratio may be required to explain behaviour. Our results suggest that a possible explanation for this finding is that firms that are making large financing decisions may also be changing their leverage target at that time. Although concentrating on these firms has the benefit that it avoids firms which are acting passively, it has the cost that it selects firms where the probability of the leverage target changing at that time is likely to be high. Second, our results suggest that models with a constant rate of partial adjustment will not adequately capture the move towards the new target leverage. This takes place in a conditional way whereby the ex post rate of adjustment is correlated with the evolution of the financing deficit and not a constant rate, as partial adjustment models assume. This may be one reason why partial adjustment models appear to give varying adjustment speeds.

We then investigate the possible cause of the increased leverage target at the time of a large dividend increase. We include many ex-post variables that should explain the increase if represents an increase in debt capacity as measured by standard variables, such as profitability and asset tangibility. We find that this is not the explanation. Rather, the increase in leverage appears to be closely related to two agency variables: firm size and the level of executive compensation. In particular, large firms with low levels of stock-related executive compensation increase leverage significantly more than other firms. This suggests that the dividend increase and the leverage increase may jointly be being used to control agency problems. This finding of complementarity in the use of dividends and leverage is different to the result that is common in panel-data tests of leverage and dividend theories, that they are substitutes.

A difficulty of our analysis is that the choice to make a large dividend increase is clearly endogenous, and this limits our results in two ways. First, we cannot be sure that the results about the leverage dynamics of our sample have properties that are important in the general population. For that reason, we try to be cautious and not over-interpret our results. We treat them as indicative of what may occur in the general population, rather than definitive. Second, endogeneity may mean that both the dividend increase and the subsequent leverage increase are caused by the same omitted variable(s). Although we include in our regressions both ex ante and ex post levels of many variables that might be correlated with both, we cannot be sure that we have captured all possibilities.

One way we try to deal with this problem is by including two sets of firms as control groups. As the basic control group we use firms that either do not change dividends or change them by less than a threshold amount. We also include as a separate control group firms that make large dividend decreases, to ensure that we are not simply capturing an effect caused by large dividend changes regardless of direction. We find that firms with large dividend decreases also have a large leverage increase following the dividend change, but the leverage change of the dividend decrease firms is fully explained by standard trade-off variables augmented with cash flow and rating targets. This suggests that the failure of the standard model to explain the leverage behaviour of firms that increase dividends is not coming from endogeneity that is simply related to large dividend changes.

More formally, we check for the impact of endogeneity using a Heckman selection model. We use the EBITDA in the five years prior to the dividend change to instrument the probability of a dividend change. The results for dividend-increasing firms are unchanged, although interestingly the dummy variable for dividend-decreasing firms shows a leverage decrease rather than an increase. We also run a large number of robustness checks and find that the main results survive these.

Also, concerns about endogeneity have a limited importance for some of our results. The fact that firms pay for large dividend increases largely with debt is interesting regardless of whether there is a common factor leading to both the dividend and leverage increases. Similarly, the fact that the move to a new leverage ratio depends on the evolution of the financing deficit has implications for debt dynamics independent of concerns about endogeneity.

While we do not claim that our results constitute a test of leverage theories, they appear to be inconsistent with certain theories. For example, although the financing deficit drives the leverage change in our sample, as would be the case under the pecking order, the behavior we observe is not consistent with a standard interpretation of the pecking order. First, the use of debt to finance dividends is inconsistent with a pecking order where internal equity is preferred to debt. Second, the cross-sectional response of leverage to the financing deficit is only 20%, much less than the coefficient of 1.0 that the pecking order implies (Shyam-Sunder and Myers (1999)). Third, the effect is greater for large firms and less for high risk firms, both of which are inconsistent with asymmetric information being the explanation for the pecking order.

Our results also appear to be inconsistent with the primacy given to taxes in certain models of dividends and leverage. It is hard to think of a tax-based model whereby it is rational to make large dividend increases with the intention of paying for them with debt. They are also inconsistent with information-based models, since the effect is much stronger for large than for small firms.

Instead, our results are consistent with two important results. First, the fact that firms pay for large dividend increases principally with debt and that this debt appears to be the result of a changed leverage target unrelated to future profit means that large dividend increases do not have to be supported by increased future earnings. This is consistent with the result that changes in dividends contain only limited information about future earnings (Benartzi, Michaely, and Thaler (1997), Grullon et al (2005)). Second, our results are consistent with studies of leverage that emphasize agency effects (Barclay, Smith, and Watts (1995), Morellec et al (2012)). For our sample it appears that agency considerations are a first-order determinant of the leverage choice and, like Morellec et al, we find that it is hard to explain the magnitude of some results without including agency variables.

II. Literature review

This study relates to several different strands of literature. First, it relates to the growing literature which shows that trade-off theories with partial adjustment to target have difficulty in explaining many important features of leverage behaviour (Leary and Roberts (2005), Lemmon, Roberts, and Zender (2008), Parsons and Titman (2008), Hovakimian and Li (2010)). To eliminate from our study the leverage changes that are explained by the standard target leverage ratio/partial adjustment approach we use the two-stage method of Kayhan and Titman (2007) ("KT"). The KT procedure captures medium-term leverage changes, and so is the partial adjustment model that is most likely to explain the 5-year leverage change if conventional methods can provide the explanation.

Our study is also related to the literature on dynamic capital structure modelling and testing (Leary and Roberts (2005), Hennessy and Whited (2005, 2007), Strebulaev (2007), DeAngelo, DeAngelo, and Whited (2011), Morellec, Nikolov, and Schürhoff (2012), Strebulaev and Whited (2012)). This emphasizes that panel data regression tests of capital structure theories may be biased when they pool the leverage behaviour of firms that are actively rebalancing their capital structure with those that are not. There is debate about how to take this into account when examining capital structure choices (Welch (2013)). One approach, which we follow, is to concentrate on firms when they are making active financing choices (Marsh (1982), Hovakimian and Li (2010)).

Our work also uses the literature on variables that are related to dividend and leverage choices. We use these to augment the KT method in order to control for some possible sources of endogeneity. These variables include debt rating (Charitou et al 2011), market timing (Baker and Wurgler (2002)), improvements in earnings quality and volatility (Skinner and Soltjes (2011)), cash flow increases (Brook et al (1998), Faulkender and Wang (2006)), firm maturity (Koch and Sun (2004)), loss-making firms (DeAngelo et al (2002)), and tax (Graham (2000), Hennessy and Whited (2005)), and firm age.

Our results are related to a number of papers that test the link between dividend and leverage policies. Fama and French (2002) examine the relationship between leverage and a number of variables for firms sorted by dividend policy. They find that the rate of reversion to the target leverage ratio differs for dividend-paying and non-dividend-paying firms but find little evidence for the negative relationship between leverage and the target payout ratio they say is predicted by the trade-off and pecking order models. In contrast, we find a strong positive relationship between large dividend *changes* and leverage *changes*. This is in the opposite direction to the known negative relationship between leverage and dividend *levels* (Frank and Goyal (2009)). We also find that a very large portion of big dividend increases is financed with debt, on average. This effect is much greater than the finding that 37% of dividends are financed with debt using a test based on dividend levels (Frank and Goyal (2003)).

The remainder of the paper is organized as follows. Section III discusses methodology and variable construction. In Section IV we describe the data, and in Section V the empirical results. Section VI reports the results of robustness checks, and Section VII presents the conclusions.

III. Methodology and variable construction

Following Grullon, Michaely and Swaminathan (2002) we divide firms with large changes in dividends into three groups: dividend increases greater than 12.5% ("dividend increasing firms"), dividend decreases greater than 12.5% ("dividend decreasing firms"), and dividend initiating firms. We examine changes in both book value and market value leverage over the 5 years following the dividend change. Following KT, book leverage is defined as the ratio of book debt to total assets, where book debt is defined as total assets minus book equity, and book equity is equal to total assets less total liabilities and preferred stock plus deferred taxes and convertible debt. Similar to KT, we drop firm-year observations where this ratio is greater than one. Market leverage is the ratio of the book value of debt to the sum of the book value of debt and the market value of equity.

We test the factors affecting leverage changes in four ways. First, we test whether the raw leverage change over the 5 years following a dividend change is significantly different from zero. Second, we use the KT procedure to predict the 5-year leverage change based on the trade-off model and measure the effect net of this control. Third, we augment the KT control with variables that are known to be predicted by dividend changes which could also be related to leverage changes. Finally, we further augment the controls with interactions between the dummy variables for the dividend change and variables including the financing deficit and risk, to test for differential responsiveness of the dividend increasing firms to these variables which are important in the pecking order model.

The KT procedure is a two-stage process. The first stage creates a proxy for target leverage at year 0, the date of the dividend change, using a regression of leverage on firm variables. The second stage estimates the relationship between the 5-year leverage change (over the period from year 0 to year 5) and *ex post* values of variables measuring financial deficits, market conditions, and profitability, after controlling for the leverage deficit at the beginning of the period and the change in target leverage over the 5-year period.

The proxy for the target debt ratio estimated in Stage 1 is the fitted value from a Tobit regression of observed debt ratios on variables which proxy for benefits of leverage such as tax deductibility of interest and agency costs of free cash flow, and others which proxy for costs of leverage such as potential financial distress and bankruptcy costs. The variables are profitability (EBITD), asset tangibility (PPE), research and development expense (R&D), selling expense (SE), firm size (SIZE), and the market-to-book ratio (M/B). We also include industry dummies to capture the industry-specific determinants of leverage not captured by the above variables.[1]

Stage 2 of KT is a regression of the change in leverage over 5 years on variables which should be related to the change in the target leverage or the rate of moving towards the target (Shyam-Sunder and Myers (1999), Frank and Goyal (2003), Baker and Wurgler (2002), Kayhan and Titman (2007)). These variables are the leverage deficit (LevDef) at the beginning of the period measured as actual minus target leverage, the 5-year change in the target leverage ratio (ΔTarget)) measured as the difference between the year 5 target debt ratio and the target debt ratio measured in year 0, the 5-year financial deficit (FD), two timing measures: yearly timing (YT) and long-term timing (LT) which capture variations in the market-to-book ratio, the 5-year cumulative stock return (r), and 5-year cumulative profitability (EBITD).

The financial deficit (FD) is the net amount of debt and equity the firm issues or repurchases in a given year. Specifically, the financial deficit (FD) is defined as the sum of investments (I), dividends (D), and changes in working capital (ΔWC), net of net cash flow (CF):

[1] See Kayhan and Titman (2007) for a detailed description of the measurement of these variables.

Financial Deficit (FD) = ΔWC + I +D – CF

From the accounting identity, this sum is identical to net debt issues plus net equity issues. When this variable is positive the firm invests more than it internally generates. When it is negative, the firm generates more cash than it invests; in other words, the firm has positive cash flow measured net of dividends, capex, and working capital. To capture the different behavior we include the variable FDd, which is the financial deficit interacted with a dummy variable that takes the value one when FD is positive. The profitability measure (EBITD) is defined as the sum of earnings before interest, taxes, and depreciation over 5 years scaled by the beginning firm value. This variable captures the availability of internal funds.

The two timing measures, yearly timing (YT) and long-term timing (LT), are based on the relationship between market-to-book ratios and leverage (Baker and Wurgler (2002)). The modified measures used by KT are:

$$\text{Yearly Timing (YT)} = \left(\sum_{\mathrm{h}=0}^{4} \mathrm{FD}_{\mathrm{h}} * \left(\frac{M}{B} \right)_h \right) \Big/ t - \overline{FD} * \frac{M}{B}$$

$$\text{Long-term Timing (LT)} = \left(\sum_{\mathrm{h}=0}^{4} \left(\frac{M}{B} \right)_h \Big/ t \right) * \left(\sum_{\mathrm{h}=0}^{4} FD_h / t \right)$$

The sums are taken over years 0 to 4, so they measure the average market-to-book, financial deficit, and the interaction of these two variables over the 5-year period. The yearly timing measure is the covariance between external financing and the market-to-book ratio, which measures the propensity to decrease leverage when the stock price is high. The long-term timing measure captures the idea that the average propensity to finance with debt is related to the level of the share price. KT show that a combination of these measures is essentially equivalent to the measure used by Baker and Wurgler.

We also use the 5 year cumulative log return on the stock (r) to control for direct effects of stock price changes on the debt ratio (Welch (2004)).

To measure the fixed effects of leverage changes for firms changing dividends by a large amount, we augment Stage 2 of KT by including three dummy variables. The first variable DIV_INCR takes the value 1 if the firm has a dividend increase at time zero, and zero otherwise. The variable DIV_DECR takes the value 1 if the firm is dividend-decreasing at time zero, and zero otherwise. The variable DIV_INIT takes the value 1 if the firm is dividend-initiating at time zero, and zero otherwise. This procedure is a stringent test of how leverage is related to dividend changes since it includes in the second-stage regression the *ex post* values over the 5 years following the dividend change of many variables that are known to be related to leverage. The dividend dummies are measured at the time of the dividend change. For the dummies to be significant they must contain information about future leverage that is incremental to the KT stage 2 variables measured in the period (0,5) and the leverage deficit at date zero. [2]

To allow for other possible links between dividend changes and leverage, we then augment KT with variables that are known to be related to dividend changes which could also be related to leverage changes. These are the level of operating cash flows (CF) (Brook et al (1998), Faulkender and Wang (2006)), the variability of return on equity (SD

[2] An alternative specification is given in Bae et al (2011), which is a partial adjustment model towards a target leverage ratio. However, the KT specification includes in Stage 2 the ex post values of variables for which a large dividend change could be a proxy.

ROE) (Skinner and Soltjes (2011)), and credit rating (Charitou et al 2011). The cash flow measure (CF(0,5)) is defined as the sum of cash flows from operations before capex over 5 years after the dividend change scaled by the beginning firm value. The variability of return on equity SD ROE is measured over the 5 years after the dividend change. We also include the changes in CF and SD ROE. We proxy the debt rating by a probability of default based on the Merton risky debt model (Charitou et al., 2011). To control for the effect of dividend status on leverage behavior we also augment the KT model by including a dummy variable called DIV_PAY in stage 1 and the interaction between this dummy and the leverage deficit in stage 2. DIV_PAY is equal to one for dividend paying firm-years, and zero otherwise. Finally, we interact the dividend change dummies with LevDef and CF to allow for different trade-off behavior of the firms changing dividends.

Our fourth procedure includes all the above controls plus interaction terms between the dividend change dummies and four variables: LT, SDROE, FD, and FDd. The idea is to capture the extent to which firms with large dividend changes respond to these pecking order variables differently to other firms.

IV. Data

Our data selection procedure broadly follows that of KT. Our sample consists of firms listed in the Center for Research in Securities Prices (CRSP) files in the period 1979-2010 which also have records in the Compustat Industrial Annual Files. We exclude financial firms (SIC codes 6000-6999) and utilities (SIC codes 4900-4999). We also exclude firms with book values of assets below $10 million and market-to-book ratios above 10 or below -100. We require that firms have at least 5 year of data so that we can track leverage over that period subsequent to a dividend change.

Following the procedure in Grullon, Michaely and Swaminathan (2002) our dividend change firms meet the following requirements:

a) The dividend payout refers to quarterly cash dividends in U.S. dollars.

b) The stocks on which the dividends are paid are ordinary common shares. Thus, we exclude shares of American Trust components, closed-end funds or real estate investment trusts.

c) The previous cash dividend payment was paid within a window of 20-90 trading days prior to the current dividend announcement.

d) The percentage change in dividends is between 12.5 % and 500% for the dividend increase sample. This criterion ensures that we include economically significant dividend changes at the lower bound and exclude outliers at the upper bound. For the decrease sample the range is -12.5% to -100%.

e) The dividend announcement is not an omission or an initiation.

This sample selection process yields 4,374 cash dividend increases and 2,522 decreases.

Similar to Grullon et al (2002) and Michaely, Thaler, and Womack (1995) we define a dividend initiation as the first quarterly cash dividend payment on ordinary common shares reported in CRSP. Reinstitution of a cash dividend is not considered as a dividend initiation. The resulting sample contains 394 cash dividend initiation events.

Firms which do not fall into the dividend increase, decrease, or initiation groups are classified as firms that do not change dividends.

The event year for a dividend change, T=0, is set as the corresponding fiscal year end of the quarter of the dividend change or initiation. We drop event observations with mixed (initiation, increase and decrease) dividend changes within a 5-year period. When a firm has succeeding dividend changes in the same direction within a 5-year period we keep only the first dividend change in the series.[3] The percentage change in quarterly cash dividends for firm *i*, is defined as the percentage difference between the quarterly cash dividend payout reported in CRSP on the event quarter ($\mathrm{DIV}_{i,0}$) minus the corresponding dividend payment of the previous quarter ($\mathrm{DIV}_{i,-1}$):

$$\Delta\mathrm{DIV}_{i,0} = \frac{\mathrm{DIV}_{i,0} - \mathrm{DIV}_{i,-1}}{\mathrm{DIV}_{i,-1}}$$

This gives a pool of 7,290 dividend changes and initiations from a sample of 2,072 firms. Additional to these dividend change and initiation firms our sample contains other 3,526 firms that pay dividends but they do not exhibit significant dividend changes during the examined period. This makes a total of 5,598 dividend paying firms. Additional to the dividend paying firms, our sample contains other 11,310 not dividend paying firms. Therefore, the resulting sample consists of 16,908 dividend paying and non-dividend paying firms. These figures are consistent with the general fact that the average fraction of firms that pay dividends is close to 30% in the last 3 decades. Skinner

[3]Our robustness tests show qualitatively similar results when keeping the last dividend change in the series, instead.

and Soltes (2011) provide evidence of a substantial reduction of U.S. firms that pay regular dividends, from 60% in 1975 to 20% in 2002 and 29% in 2005.

Tables 1 and 2 show summary statistics for our sample firms. Table 1 shows summary statistics for the full sample and separately for the dividend paying and non-dividend paying samples. Dividend-paying firms are significantly different to non-payers, having higher asset tangibility (PPE) and profitability, but lower market-to-book, selling expense, and R&D. The dividend-paying firms also have higher average book and market leverage. However, as we show below the difference is reversed once differences in other characteristics are controlled for in the KT Stage 1 regression.

Table 2 shows summary statistics for the dividend change samples and the sample of firms that pay regular dividends but do not make significant dividend changes. Summaries in Panel 2A show that all three groups which change dividends have significantly different characteristics. In particular, firms which initiate dividends have lower leverage than firms which increase dividends, which have lower leverage than firms which decrease dividends. However, the other characteristics which affect leverage also differ between these groups so it is difficult to predict the effect of the differences in current leverage levels on future leverage changes without controlling for the other factors. In particular, the market-to-book ratio is significantly higher for the dividend increase sample, causing a greater difference between the book leverage and market leverage for these firms than for the other two samples.

Panel 2B shows the comparison between the dividend change firms and those that pay dividends which change by less than the threshold amount (firms which “do not change dividends”). Firms which increase or initiate dividends have lower leverage than those which do not change dividends. Firms which decrease dividends have higher book value leverage than the no-change firms, but lower market value leverage as a result of their higher market-to-book ratio. The three groups also differ from the no-change group in other characteristics. Dividend increase and initiation firms have higher market-to-book, PPE, profit, and R&D than no-change firms. The dividend increase firms are bigger than the no-change firms and the initiation firms smaller. The dividend decrease firms are larger and have higher market-to-book ratios than the no-change firms.

Stage 1 of KT's procedure gives estimates of the target leverage ratio and the leverage deficit at date zero. Stage 2 of their procedure uses these as inputs, along with other variables measured for the period (0,5), to explain leverage changes during that period. Panel 2B shows summary statistics for these variables for the three dividend-change samples as well as the no-change sample.[4] All three groups of dividend-change firms have book and market value leverage deficits at date zero. Apart from the book value leverage deficit of dividend decreasing firms, the leverage deficits are also significantly greater than the average for dividend-paying firms. Hence the dividend-increase and dividend-initiation groups have spare leverage capacity available, based on this estimate of the leverage target. Somewhat surprisingly, the dividend-decreasing group also has leverage capacity available, based on its market value leverage.

The three groups also differ from each other and from the no-change group in other characteristics. The dividend increase sample shows significantly higher five-year cumulative stock returns and profitability than dividend decrease and initiation firms. They also differ from the no-change group in multiple characteristics, in particular with all three groups having higher stock market returns (r) and lower long-term timing (LT).

[4]The sample for the KT procedure is slightly more restricted than that shown in Table 1.

V. Empirical results

A. Raw leverage changes

Table 3 shows the evolution of leverage and other firm characteristics over the period following a dividend change. We examine both book value and market value leverage because they can show different effects (Welch (2004)). The 5-year changes in book value leverage for the dividend increase, decrease, and initiation samples are +5.0%, +2.0%, and +5.6% respectively, and +5.7%, +2.7%, and +9.4% respectively for market value leverage. These are all highly statistically significant. There are also significant changes in other characteristics of the firms over the 5-year period. In particular, all three groups show significant declines in profitability, as measured by EBITD scaled by net assets, and the dividend increase group shows a significant increase in its market-to-book ratio.

B. Controlling for trade-off variables

To control for trade-off variables we measure the leverage changes incremental to the KT model. Table 4 shows the estimation of Stage 1 of the KT model, which relates leverage to contemporaneous firm characteristics using a Tobit regression.[5] The predicted leverage from this regression is taken as an indication of the target leverage of the firm at

[5] The regression also includes 48 industry dummies.

date zero. Despite the different data period (1980-2010 rather than 1960-2003 used by KT), the results are very similar to KT's. The variables are all highly significant and have the same sign as in KT. The average target leverage is also similar to KT's. In our regression we augment the KT variables with a dummy variable (DIV_PAY) which takes the value 1 if the firm is dividend-paying. This is significantly negative, consistent with the result in Frank and Goyal (2009) that dividend-paying firms tend to have lower leverage.

Table 5 shows the result of Stage 2 of the KT procedure.[6] This relates the change in leverage over 5 years to variables which include the leverage deficit at time zero and changes in firm characteristics over the same 5 years. This replicates the result in KT, and gives very similar results to their paper.

Table 6 shows the results of testing the leverage changes of dividend-changing firms using various controls. The column "KT model control" augments the KT variables with dummy variables taking the value 1 for dividend increases, decreases, and initiations, and zero for other firms. All three dummies are highly significantly positive in both the book leverage and market leverage regressions, indicating that the partial adjustment model is not the explanation for the leverage increases following large dividend changes.

C. Controlling for variables associated with a dividend change

The KT procedure does not include all variables which might be related to dividend changes. For instance, the level of future cash flow and earnings stability are

[6] We estimate standard errors by bootstrapping using 500 replications.

both predicted by dividends (Brook et al (1998), Skinner and Soltjes (2011)). Table 6 shows in column "Augmented KT control" the result of augmenting the KT Stage 2 regressions with the levels and changes of these variables. The level and change of cash flow are significantly negatively related to changes in both leverage measures, but the earnings stability variables are insignificant.

We also augment the KT procedure in other ways. To capture the interaction between being dividend paying and the speed of leverage adjustment found by Fama and French (2002), we interact the dividend-paying dummy with the leverage deficit. This coefficient is significantly positive, indicating that dividend-paying firms adjust more slowly to their leverage targets than non-payers, as found by Fama and French. We also include interactions between the dividend change dummies and the leverage deficit, to allow for different responses to deficits by the dividend-change firms. This might arise because firms which change their dividends are in an adjustment phase of their leverage policy, which could indicate faster reversion to target (Hovakimian and Li (2010)). In the book value regression these interactions are insignificant, but in the market leverage regressions the interaction of the leverage deficit with the dividend increase dummy and the dividend initiation dummies are significantly positive. This indicates that the dividend increasing and initiating firms respond more slowly to their market leverage deficits than do other firms. Thus although these firms have larger leverage deficits than other firms and they are making a major financial choice in the form of a major change in dividend policy, they appear to adjust more slowly towards their leverage targets.

In the augmented KT test, the dummies for dividend increases and initiations are still highly significant for both the book value and market value regressions. A dividend increase predicts a subsequent 5-year book leverage increase of 4.0% and market leverage increase of 5.9%. A dividend initiation predicts increases of 4.9% and 10.8%. Hence the statistically and economically significant increases found in tests using raw averages and the KT procedure are robust to this augmented specification of the KT procedure. However, the dividend decrease dummies are now insignificant, suggesting that the augmented trade-off model explains the leverage increase for these firms.

D. The effect of financing deficits

As discussed above, dividend-increasing and dividend-initiating firms have significant financing deficits following the dividend change. If a normal response to these deficits were causing the leverage increase it should be captured by the partial adjustment model. To capture the possibility that these firms are responding to financing deficits in a different way to other firms we interact the dividend change dummies with the deficit. We also interact the dividend change dummies with the market timing measure (LT) and risk (SDROE) to allow for the possibility that firms changing dividends by a large amount respond differently to these variables.

The results are shown in the final column of Table 6 (“Augmented KT with pecking order interactions2”). The coefficient of DIVI_INC*FDd is highly significant and much larger than the coefficient of FDd, indicating that the leverage of dividend increase firms is much more responsive to financing deficits than is the case for other firms. The results also show that leverage of dividend increase firms is significantly less responsive to risk than other firms. Together, these explain the entire leverage increase following the dividend increase, and the coefficient of the DIVI_INC dummy becomes insignificant. Similar results hold for dividend initiating firms, and for market leverage for both dividend increasing and initiating firms. For example, the coefficient of DIVI_INC*FDd in the book value regression is 0.12 and the average value of FDd for dividend increase firms is 0.244. So the incremental responsiveness of these firms to positive financial deficits explains 2.9% of the fixed book value leverage effect of 4.0% for these firms. For market value leverage it explains 2.7%. Thus most of the leverage increase is explained by the different response to financing deficits.

The average SDROE for the dividend increase firms is 0.063. Multiplying this by the coefficients of DIVI_INC*SDROE in the final column of Table 6 shows that this explains a further 0.5% (0.7%) of the book value (market value) leverage increase. Hence in total the differential response to financing deficits and risk explains 3.4% of the leverage change for both book value and market value leverage.

Figure 1 illustrates, for book value leverage, the difference between the responses to a financing deficit of firms that increase dividends and those that do not. The firms that increase dividends reduce leverage less when there is a financing surplus (negative financing deficit) and increase leverage more when there is a financing deficit.

Hence the explanation for the leverage increase following large dividend increases and dividend initiations is that these firms raise leverage in response to financing deficits more than do other firms. A significant portion of the financing deficit following a large dividend increase is predictable, since it is caused by the dividend change. So these firms are, essentially, raising dividends with the intention of paying for a large part of the increase with debt. However, although the financing deficit is a pecking order variable, this does not look like a standard pecking order effect because the coefficient of the leverage change on the financing deficit is significantly less than one, the coefficient predicted by the pecking order (Shyam-Sunder and Myers (1999)). That being said, there is ambiguity regarding what the pecking order implies when measured over a period of 5 years as is the case with the leverage change studied here.

E. The effect of firm size

We investigate the effect of firm size by splitting the sample into equal numbers of large and small firms based on market capitalization. Table 7 shows the regression results. In all cases the fixed effect leverage change for the dividend-increase sample is significant in all regressions other than the final one with the financial deficit interacted with the dividend change dummies. The fixed effect leverage change is not different for the large and small firms. In no case does either the KT version of the trade-off model or the augmented version of KT provide the explanation for the dividend increase for either sample. This is true for both book value leverage (Panel 7A) and market value leverage (Panel 7B). The pattern for dividend-initiating firms is similar and in all cases the leverage change for dividend-decreasing firms is explained by the augmented trade-off model.

Although the leverage changes in Table 7 for large and small firms are similar, they are different when we scale them by the size of the dividend change. To measure the relationship between them we measure in Table 8 the number of years of the dividend increase which are paid for by the leverage increase. If the target leverage ratio did not change subsequent to the dividend change, we would expect the dividend increase to be financed with a proportion of debt equal to the target ratio. So we calculate the ratio of the dollar equivalent of the leverage ratio increase to the dollar equivalent of the dividend increase multiplied by (1-target leverage ratio). This gives the number of years of the dividend increase that are being financed with debt. We measure the leverage ratio increase by the residual of the KT regression.

Table 8 shows the results of this calculation for firms divided first by size and then into terciles by the financing deficit. On average the dividend increase firms are paying for 4.6 years' worth of the increase in dividends with increased debt. However, this effect is largely concentrated in the large firms, which are paying for 7.2 years' worth of the dividend increase with debt, compared with 2.0 years for small firms. The effect of financing deficit is also striking. Firms with large financing deficits are paying for 7.6 years of the dividend increase with debt. Large firms with big financing deficits are paying for 11.7 years. Thus using debt to finance large dividend increases is particularly prevalent for large firms with big financing deficits. The concentration of the effect in large firms makes it unlikely that it is the result of asymmetric information effects.

We also calculated the same results with no adjustment for target leverage. The pattern of coefficients and their statistical significance of coefficients is exactly the same as shown in Table 8, although their magnitudes are smaller by the target adjustment factor discussed above.

F. Agency effects

Hail, Tahoun and Wang (2014) show evidence consistent with agency theories that firms are less likely to increase dividends following an exogenous positive shock to the information asymmetry problem between managers and investors. It is possible that the willingness to pay for dividend increase with leverage is caused by an agency effect (Barclay, Smith, and Watts (1995)). To test this we do two things. First, we include in the augmented stage 2 KT regression the ratio of total executive compensation to total assets. The sample of dividend-increasing firms for which we have executive compensation data (783 observations) is much smaller than the whole sample of dividend increases (4,374). The results (untabulated) are that the agency variable has a highly significant negative coefficient, with p-value of 0.3% in the book value regression and 6.8% in the market value regression. Hence firms which have high-powered incentives have less inclination to fund dividend increases with increased leverage.

To evaluate the effect of incentives, we split the sub-sample for which we have compensation data into terciles by the level of compensation and size. The result is shown in Panel B of Table 8. Large firms with poor incentives have a ratio of leverage increase to dividend increase of 5.7 times, significant at the 1% level. In contrast, smaller firms with more high-powered incentives have an increase that is insignificantly different from zero. The relationship between compensation and the leverage change is present for all sizes of firm. It appears that the willingness to pay for a large dividend increase with debt is related to a lack of high-powered incentives, suggesting that an agency problem may be the cause of this apparently suboptimal behavior.

VI. Robustness tests[7]

To check the robustness of the results to a different measure of the dividend change, we estimated the Lintner dividend model as in Fama and French (2002) and defined dividend changes using the residuals from this model with the same thresholds described above. The dividend dummies using the Stage 2 KT control are still all highly significant. In the book (market) leverage regressions the coefficients of the dividend increase and initiation dummies are 3.1% (2.0%) and 3.8% (4.7%), respectively and the results are essentially unchanged.

We also test whether the explanation for the link between dividend and leverage changes is the effect of tax (Hennessy and Whited (2005)). The effect of taxes is already reflected to some degree in the KT procedure by including profit variables, which should be related to tax status. In addition, to check whether the tax status of companies could be changing in a way which explains the results, we also include in the KT Stage 2 regression the change in the effective tax rate, measured as taxes paid divided by profits. This is insignificant and has no effect on the results.

In our replication of KT Stage 1 we include a dummy for dividend-paying firms. This is highly significant, and consistent with the literature on the link between leverage and dividend levels. However, this variable is not included in the version of the target leverage regression used by KT. We replicate the results omitting this variable from Stage 1 and find that the results are insignificantly different to those with the dividend dummy in Stage 1.

[7] Tables of all the results in this section are available on request from the corresponding author.

It is possible that the relationship between dividend changes and leverage is caused by an omitted common factor, such as negative earnings or firm maturity. To capture the link between negative earnings and dividend decreases (DeAngelo, DeAngelo and Skinner (1992)), we included in the Stage 2 regression a dummy variable LOSS which takes the value one if there is a loss in the year prior to the dividend change, as well as its interaction with the dividend change dummies.[8] As a measure of firm maturity we included in the Stage 2 regression a dummy variable ESTAB which takes the value one if there are at least 10 years of positive earnings and dividend payments prior to the first annual loss (Koch and Sun (2004)), and its interaction with the dividend change dummies. Although the variables LOSS and ESTAB are significant with the correct signs in both book and market leverage regressions they do not significantly change the magnitude and significance of the fixed effect associated with dividend increases. The coefficient of DIV_INC is 4.7% with a p-value of 0.0% in the book value regression and 7.4% with a p-value of 0.0% in the market value regression.

To investigate further the long-term effects of dividend changes we ran the augmented model by using the future cash flow variable in the 5-years period from 5 to 10 years after the dividend change event. The level and change of this variable is significant in the market value leverage regression but not in the book value leverage regression. The results corroborate our previous findings. For both book value and market value leverage the fixed effects associated with dividend increases and initiations are still highly significant and similar to those without this control.

[8] DeAngelo, DeAngelo and Skinner (1992) show that dividend decreases are more likely given greater current losses, less negative unusual items, and more persistent earnings difficulties.

We also examine the robustness of our results to the inclusion of mixed event observations (rather than excluding them). This gave only small differences in the economic significance of the leverage changes for the dividend-increasing and initiating firms. However, this result should be interpreted with caution. For example, if a firm initiated and increased dividends within a 5-year period, and if both events have positive impact on subsequent leverage, then it would not be clear if the leverage increase should be attributed to dividend initiation or increase. Hence the results for the sample including mixed events depend on the relative frequencies of different types of mixed events as well as the effects of different events. We also included dividend changes subsequent to the leverage change in the second stage regression, as a way of checking whether the leverage change is proxying future dividend policy, and found this to be insignificant.

As a way of checking our results we examined the effect of including dummy variables for issuing or repurchasing equity in the second stage KT regression. We expect the coefficient on the issuance dummy to be zero (consistent with augmented partial adjustment/trade-off theories explaining issuance) and the coefficient on the repurchase dummy to be positive and significant. However, since we expect repurchases to have a smaller effect in controlling agency problems than dividend increases, which are more permanent, we expect the coefficient of the repurchase dummy to be smaller than the coefficient of the dividend increase dummy. We find results consistent with both predictions.

To attempt to deal with endogeneity in a formal way, we ran a Heckman procedure. We use the EBITDA in the five years prior to the dividend change to instrument the probability of a dividend change. We replaced the dividend change dummies in the second stage KT regression with the fitted probabilities. The second stage regression includes the EBITDA in the 5-years following the dividend change, so the instrumental variable is unlikely to be capturing a part of the leverage change residual from this regression. The results for dividend-increasing firms are unchanged, although interestingly the dummy variable for dividend-decreasing firms shows a leverage decrease rather than an increase.

Finally, it is important to emphasize that the effect on leverage of the dividend increase is not just a mechanical one, whereby dividends decrease equity value when the equity goes ex the dividend. The firms with dividend increases are highly profitable, and are retaining earnings. So their equity book value is increasing, not decreasing.

VII. Conclusions

Firms which increase dividends by a large amount subsequently increase leverage by a large amount. On average over the five years following the dividend increase they borrow enough to pay for the entire dividend increase with debt. This effect is not explained by a trade-off model with adjustment to target. It is not due to variables such as credit rating, age, earnings volatility, or cash flow, which are known to be related to dividend changes as well as leverage. Nor is it explained by a simple reaction to the ex post values of variables such as profitability.

Instead, the dividend change appears to signal a change in target leverage that is not directly related to a change in future profitability. The way the dividend change is implemented is complex, consisting of a heightened response to financing deficits. The leverage of these firms is more responsive to a given deficit, indicating willingness to finance the deficit arising from the dividend increase with debt. However, although the financing deficit is a pecking order variable, this does not look like a standard pecking order effect. Paying for dividend increases with debt is inconsistent with that theory, and the coefficient is too low.

Instead, the effect looks more like an agency effect. It is bigger for large firms with large financing deficits, and for firms with low-powered incentives. It is absent for small firms with high-powered incentives. This result suggests that for these firms leverage and dividends are being used as complements in dealing with agency problems, not substitutes as other literature has found. Further, our results are consistent with the observation that the incremental signal about profitability contained in dividend changes is not large. If firms are financing large dividend increases with debt it limits the signal about future profitability they contain.

The results are robust to many alternative specifications, including augmenting the trade-off model with variables measuring tax effects, the level and change of medium term cash flow, the variability of returns, long-term cash flow, a variety of interaction terms, an agency variable, and maturity. They are also robust to the measurement of dividend changes using the Lintner model.

Although the results apply to a specific financing event, they are suggestive of broader implications. The fact that firms making major financing choices appear to change their target leverage ratio at the same time in a way that is not explained by standard variables suggests a possible explanation of why it is hard to observe predictable leverage behaviour using leverage choices made at the time of financing events. The fact that the way the leverage change is implemented is complex and conditional on the evolution of future financing deficits is a possible reason why partial adjustment models with fixed adjustment speeds may have difficulty capturing some aspects of leverage behavior. These may be fruitful areas for wider investigation.

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Figure 1: Response of book value leverage to financial deficits of dividend-increasing firms relative to firms with no dividend change

The figure shows the average response to a financial deficit of the book value leverage of firms that increase dividends relative to those that do not change dividends. The leverage change is measured over the 5 years following the dividend change.

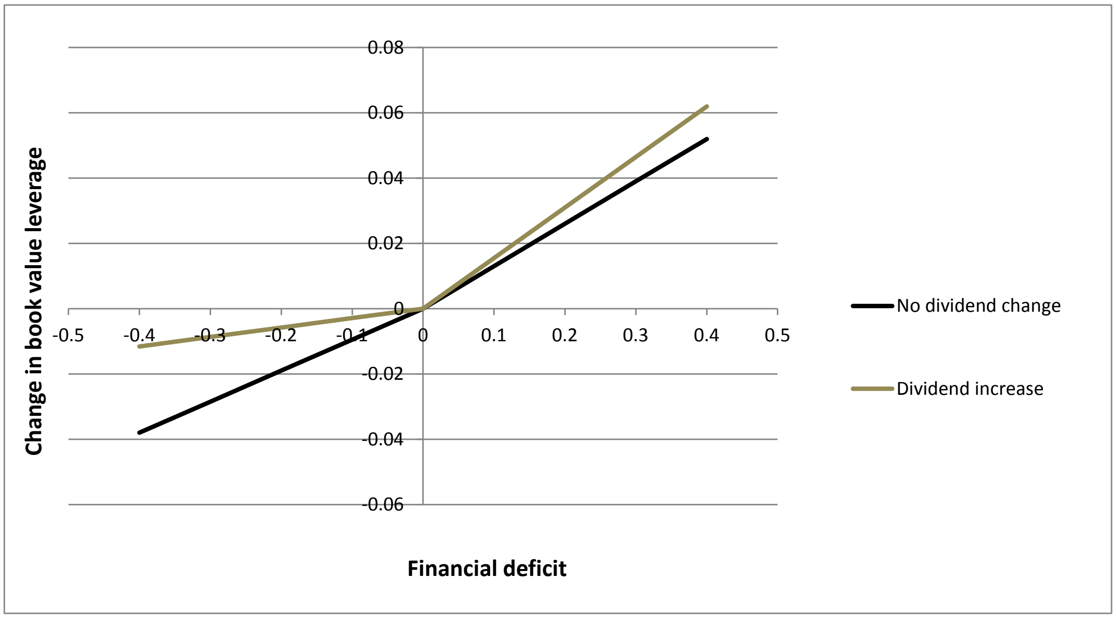

Table 1. Summary statistics

The table presents summary statistics for the full sample, the dividend paying and non-dividend paying samples. Book leverage (BLEV) is book debt to book assets and market leverage (MLEV) is book debt to the sum of book debt and market equity. Other variables are: market-to-book ratio (M/B), asset tangibility (PPE, net property, plant, and equipment scaled by total assets), profitability (EBITD, operating income before depreciation scaled by total assets), research and development expense (R&D scaled by net sales), selling expense (SE, selling expense scaled by net sales), and firm size (SIZE, logarithm of net sales). Last two columns include tests of differences between the dividend paying and non-dividend paying samples.

	all firms (16,908)		Dividend paying firms (5,598)		Non-Dividend paying firms (11,310)		Dividend-paying minus Non-Div. paying	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Dif.	p-value
Book leverage	0.444	0.211	0.456	0.175	0.435	0.231	0.020	0.000
Market leverage	0.378	0.237	0.399	0.207	0.363	0.255	0.036	0.000
Market-to-book	1.903	1.373	1.667	1.160	2.065	1.480	-0.398	0.000
Prop, Plant & Equip	0.316	0.231	0.368	0.213	0.280	0.236	0.088	0.000
Profitability	0.101	0.157	0.158	0.082	0.063	0.182	0.095	0.000
Selling Expense	0.477	12.34	0.209	2.098	0.664	15.993	-0.456	0.000
R&D	0.769	37.10	0.013	0.077	1.293	48.260	-1.280	0.000
Size	5.076	2.019	6.116	1.893	4.349	1.771	1.767	0.000

Table 2. Leverage ratios and other characteristics of firms with dividend increases, decreases, initiations and no dividend change

Panel 2A shows summary statistics for dividend increases, decreases and initiations at date zero. Panel 2B show summary statistics for the sample of firms that pay regular dividends but do not exhibit significant dividend changes (no dividend change sample). Date zero (the event year) is set as the corresponding fiscal year end of the quarter of the dividend change or initiation. Mixed event observations within a 5-year period are excluded. When a firm has succeeding dividend changes in the same direction within a 5-year period only the first dividend change in the series is used. Stage 1 variables are: Book leverage (BLEV) is book debt to book assets and market leverage (MLEV) is book debt to the sum of book debt and market equity. Other variables are: market-to-book ratio (M/B), asset tangibility (PPE, net property, plant, and equipment scaled by total assets), profitability (EBITD, operating income before depreciation scaled by total assets), research and development expense (R&D scaled by net sales), selling expense (SE, selling expense scaled by net sales), and firm size (SIZE, logarithm of net sales). Stage 2 variables are: the change in (book and market) leverage between year t and t-5, financial deficit (FD) is total external financing between year t and t-5, positive financial deficit (FDd) is the total financial deficit interacted with a dummy variable that takes the value one when FD is positive, Yearly timing (YT) is the covariance between the financial deficit and the market-to-book ratio from year t to t-5. Long-term timing (LT) is the product of the average market-to-book ratio and average external financing between year t and t-5. Five-year cumulative stock return (R) is the cumulative log return on stock between year t and t-5. Five-year cumulative profitability (EBITD) is the sum of earnings before interest, taxes, and depreciation between year t and t-5, scaled by the beginning-period firm value. Leverage deficit (LevDef) is the difference between leverage and target leverage at t-5, the target leverage is the predicted value of the leverage ratio, Change in Target (ΔTarget) is the difference target leverage between between t and t-5. Comparison columns show tests of differences between the difference categories.

Panel 2A: Dividend increases, decreases and initiations

	Dividend increase sample (4,374)		Dividend decrease sample (2,522)		Dividend initiations sample (394)		Dividend increases minus decreases		Dividend increases minus initiations	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Dif.	p-value	Dif.	p-value
Book leverage	0.430	0.173	0.469	0.179	0.383	0.189	-0.039	0.000	0.045	0.000
Market leverage	0.296	0.177	0.351	0.200	0.286	0.198	-0.054	0.000	0.010	0.352
Market-to-book	2.356	1.318	2.182	1.341	2.200	1.297	0.154	0.000	0.156	0.058
Prop, Plant & Equip	0.352	0.209	0.372	0.213	0.288	0.214	-0.020	0.001	0.064	0.000
Profitability	0.185	0.071	0.156	0.085	0.167	0.084	0.028	0.000	0.018	0.000
Selling Expense	0.204	0.123	0.196	0.130	0.213	0.141	0.008	0.037	-0.009	0.272
R&D	0.017	0.036	0.013	0.028	0.018	0.041	0.004	0.000	-0.002	0.482
Size	6.846	1.806	6.704	1.890	5.818	1.725	0.143	0.054	1.028	0.000
FD	0.205	0.311	0.193	0.351	0.257	0.342	0.011	0.343	-0.052	0.044
FDd	0.244	0.246	0.249	0.266	0.294	0.290	-0.005	0.591	-0.050	0.014
YT	0.004	0.037	0.005	0.047	0.013	0.052	-0.001	0.723	-0.009	0.007
LT	0.105	0.160	0.106	0.187	0.125	0.183	-0.001	0.867	-0.020	0.128
R	0.429	0.997	0.327	0.991	0.159	0.978	0.101	0.005	0.270	0.001
EBITD	0.848	0.310	0.765	0.323	0.758	0.363	0.083	0.000	0.090	0.000
LevDef (book)	-0.052	0.136	-0.028	0.144	-0.072	0.145	-0.023	0.000	0.020	0.073
ΔTarget (book)	0.015	0.030	0.010	0.032	0.016	0.037	0.005	0.000	-0.001	0.722
LevDef (market)	-0.111	0.139	-0.081	0.160	-0.115	0.149	-0.030	0.000	0.004	0.706
ΔTarget (market)	0.013	0.048	0.008	0.049	0.012	0.056	0.006	0.001	0.002	0.684
Target BLEV	0.487	0.078	0.495	0.071	0.471	0.081	-0.008	0.006	0.016	0.013
Target MLEV	0.412	0.106	0.429	0.095	0.407	0.113	-0.017	0.000	0.005	0.582

Panel 2B: No dividend change sample compared with increases, decreases, and initiations

	No dividend change sample (3,526)		No dividend change minus increase		No dividend change minus decrease		No dividend change minus initiations	
	Mean	Std. Dev.	Dif.	p-value	Dif.	p-value	Dif.	p-value
Book leverage	0.457	0.175	0.028	0.000	-0.012	0.004	0.072	0.000
Market leverage	0.410	0.207	0.114	0.000	0.059	0.000	0.124	0.000
Market-to-book	1.588	1.113	-0.769	0.000	-0.615	0.000	-0.613	0.000
Prop, Plant & Equip	0.369	0.213	0.017	0.000	-0.002	0.629	0.081	0.000
Profitability	0.156	0.083	-0.029	0.000	-0.001	0.716	-0.011	0.027
Selling Expense	0.210	2.229	0.005	0.904	0.013	0.806	-0.004	0.978
R&D	0.013	0.081	-0.004	0.007	0.000	0.962	-0.006	0.246
Size	6.037	1.884	-0.810	0.000	-0.667	0.000	0.218	0.053
FD	0.213	0.333	0.008	0.289	0.020	0.046	-0.044	0.099
FDd	0.256	0.265	0.012	0.048	0.007	0.348	-0.038	0.074
YT	0.005	0.039	0.000	0.740	0.000	0.877	-0.008	0.008
LT	0.085	0.146	-0.020	0.000	-0.021	0.000	-0.040	0.000
R	0.525	1.132	0.096	0.000	0.198	0.000	0.366	0.000
EBITD	0.736	0.322	-0.112	0.000	-0.029	0.002	-0.022	0.399
LevDef (book)	-0.025	0.145	0.027	0.000	0.003	0.431	0.047	0.000
ΔTarget (book)	0.014	0.032	-0.001	0.164	0.004	0.000	-0.002	0.446
LevDef (market)	-0.025	0.167	0.086	0.000	0.056	0.000	0.090	0.000
ΔTarget (market)	0.012	0.048	-0.002	0.137	0.004	0.007	0.000	0.979
Target BLEV	0.488	0.074	0.001	0.458	-0.006	0.004	0.017	0.003
Target MLEV	0.433	0.096	0.021	0.000	0.003	0.229	0.026	0.000

Table 3: Leverage ratios and firm characteristics of firms changing dividends

This table presents leverage and other firm characteristics over time for firms which increase, decrease, or initiate dividends in panels 3A, 3B and 3C, respectively. Date zero (t=0) is set as the corresponding fiscal year end of the quarter of the dividend change or initiation. Dif(5, 0) is the change between year +5 and 0. Sign. Dif is the corresponding statistical test of significance. Book leverage (BLEV) is book debt to book assets and market leverage (MLEV) is book debt to the sum of book debt and market equity. EBITD is operating income before depreciation scaled by total assets, BE is the book value of equity, ME is the market value of equity, SIZE is the natural logarithm of net sales, R&D is research and development expense scaled by net sales, SE is selling expense scaled by net sales, PPE is net property, plant, and equipment scaled by total assets, M/B is the market-to-book ratio.

Panel 3A. Dividend increases

YEAR	0	1	2	3	4	5	Change from 0 to 5	p-value
BLEV	0.430	0.439	0.449	0.459	0.469	0.479	0.050	0.000
MLEV	0.298	0.312	0.327	0.339	0.349	0.355	0.057	0.000
EBITD	0.185	0.175	0.166	0.158	0.156	0.155	-0.030	0.000
BE	2753.8	2892.7	2928.4	2917.8	2790.7	2700.8	-53.0	0.818
ME	6634.8	7022.9	7513.6	7614.9	7692.4	7701.8	1066.9	0.077
SIZE	6.9644	7.0539	7.1068	7.1041	7.1180	7.1370	0.173	0.000
RD	0.019	0.018	0.017	0.019	0.020	0.017	-0.002	0.323
SE	0.206	0.207	0.209	0.222	0.560	0.217	0.011	0.015
PPE	0.351	0.351	0.349	0.347	0.345	0.345	-0.006	0.272
M/B	2.360	2.242	2.390	2.201	2.373	2.544	0.184	0.003

Panel 3B. Dividend decreases

YEAR	0	1	2	3	4	5	Change from 0 to 5	p-value
BLEV	0.469	0.476	0.480	0.487	0.485	0.488	0.020	0.002
MLEV	0.354	0.368	0.376	0.384	0.383	0.381	0.027	0.000
EBITD	0.154	0.150	0.149	0.148	0.146	0.145	-0.009	0.003
BE	2863.9	2603.1	2486.1	2604.2	2582.1	2544.8	-319.0	0.348
ME	5887.7	5794.9	6145.2	6304.8	6423.7	6855.5	967.8	0.176
SIZE	6.7769	6.8339	6.8943	6.9562	6.9849	7.0315	0.255	0.000
RD	0.013	0.013	0.012	0.012	0.012	0.012	-0.002	0.094
SE	0.197	0.197	0.197	0.199	0.201	0.205	0.007	0.106
PPE	0.367	0.365	0.361	0.357	0.357	0.351	-0.016	0.026
M/B	2.177	2.309	2.060	2.253	2.129	2.514	0.338	0.232

Panel 3C. Dividend initiations

YEAR	0	1	2	3	4	5	Change from 0 to 5	p-value
BLEV	0.382	0.389	0.411	0.442	0.443	0.438	0.056	0.004
MLEV	0.282	0.300	0.330	0.358	0.374	0.376	0.094	0.000
EBITD	0.167	0.162	0.155	0.144	0.143	0.139	-0.028	0.002
BE	771.2	791.4	922.7	965.3	1136.1	806.9	35.64	0.877
ME	2001.2	1902.8	1958.1	1717.9	2155.4	2026.1	24.94	0.975
SIZE	5.8483	5.9256	5.9965	6.1063	6.1497	6.0724	0.224	0.192
RD	0.021	0.020	0.022	0.021	0.021	0.015	-0.006	0.108
SE	0.219	0.220	0.228	0.239	0.293	2.683	2.464	0.189
PPE	0.276	0.281	0.288	0.293	0.302	0.314	0.038	0.056
M/B	2.214	2.230	2.146	1.894	1.734	1.989	-0.225	0.319

Table 4: Tobit regression of leverage on contemporaneous variables (Stage 1 of KT)

This table shows estimates of Stage 1 of the KT model. This relates leverage to contemporaneous firm characteristics using a Tobit regression. Specifically, this model explains the leverage ratio with market-to-book ratio (M/B), asset tangibility (PPE, net property, plant, and equipment scaled by total assets), profitability (EBITD, operating income before depreciation scaled by total assets), research and development expense (R&D scaled by net sales), R&D dummy (a dummy variable that is set to one if the firm has no R&D expense), selling expense (SE, selling expense scaled by net sales), and firm size (SIZE, logarithm of net sales). The predicted value of the leverage ratio is restricted to be between 0 and 100. Panel 5A presents estimates of KT model specification. Panel 5B augments the KT model specification with a dummy variable (DIV_PAY) which takes the value 1 if the firm is dividend-paying.

Dependent variable: Book Leverage		Dependent variable: Market Leverage	
	Coef.(p-value)		Coef.(p-value)
DIV_PAY	-0.0433(0.00)	DIV_PAY	-0.0475(0.00)
Market-to-book	-0.0041(0.00)	Market-to-book	-0.0157(0.00)
Prop, Plant & Equip	0.1161(0.00)	Prop, Plant & Equip	0.1516(0.00)
Profitability	-0.3593(0.00)	Profitability	-0.4653(0.00)
Selling Expense	-0.0510(0.00)	Selling Expense	-0.0821(0.00)
R&D	-0.0623(0.00)	R&D	-0.0710(0.00)
R&D dummy	0.0305(0.00)	R&D dummy	0.0460(0.00)
Size	0.0259(0.00)	Size	0.0140(0.00)
Number of obs	101,523	Number of obs	105,117
Prob.>X^2	0.00	Prob.>X^2	0.00
LR X^2 (49)	22134.5	LR X^2 (49)	33423.7

Table 5: Regression of leverage changes on explanatory variables (Stage 2 of KT)

This shows the result of Stage 2 of the KT procedure. This relates the change in leverage over 5 years to variables which measure changes in firm characteristics over the same period. The dependent variable is the change in leverage between year t and t-5. Financial deficit (FD) is total external financing between year t and t-5, positive financial deficit (FDd) is the total financial deficit interacted with a dummy variable that takes the value one when FD is positive, Yearly timing (YT) is the covariance between the financial deficit and the market-to-book ratio from year t to t-5. Long-term timing (LT) is the product of the average market-to-book ratio and average external financing between year t and t-5. Five-year cumulative stock return (r) is the cumulative log return on stock between year t and t-5. Five-year cumulative profitability (EBITD) is the sum of earnings before interest, taxes, and depreciation between year t and t-5, scaled by the beginning-period firm value. Leverage deficit (LevDef) is the difference between leverage and target leverage at t-5, the target leverage is the predicted value of the leverage ratio, Change in Target (ΔTarget) is the difference target leverage between between t and t-5. The statistics are obtained from 500 bootstrap replications resampled from the actual dataset. The standard error is the sample standard error of the 500.

Dependent variable: Change in Book Leverage (0,5)					
Obs 46461 (clusters 5339)	Coef.	Std. Err.	p-value	[95% Conf. Interval]	
Financial deficit (FD)	0.0972	0.0076	0.0000	0.0823	0.1120
Financial deficit for positive (FDd)	0.0284	0.0096	0.0030	0.0097	0.0472
Yearly timing (YT)	-0.0663	0.0182	0.0000	-0.1019	-0.0308
Long-term timing (LT)	-0.1317	0.0067	0.0000	-0.1448	-0.1185
Five-year cum. Stock return (r)	-0.0190	0.0008	0.0000	-0.0206	-0.0173
Five-year cum. profitability (EBITD)	-0.0426	0.0031	0.0000	-0.0488	-0.0364
Book leverage deficit (LevDef)	-0.3257	0.0067	0.0000	-0.3389	-0.3125
Change in book target (ΔTarget)	0.5181	0.0243	0.0000	0.4705	0.5657

Dependent variable: Change in Market Leverage (0,5)					
Obs 46697 (clusters 5394)	Coef	Std. Err.	p-value	[95% Conf. Interval]	
Financial deficit (FD)	0.1107	0.0076	0.0000	0.0957	0.1257
Financial deficit for positive (FDd)	0.0348	0.0096	0.0000	0.0160	0.0536
Yearly timing (YT)	-0.0730	0.0173	0.0000	-0.1070	-0.0390
Long-term timing (LT)	-0.1056	0.0072	0.0000	-0.1197	-0.0916
Five-year cum. Stock return (r)	-0.0668	0.0010	0.0000	-0.0687	-0.0649
Five-year cum. profitability (EBITD)	0.0018	0.0033	0.5860	-0.0046	0.0082
Market leverage deficit (LevDef)	-0.3785	0.0068	0.0000	-0.3918	-0.3651
Change in Market target (ΔTarget)	0.6459	0.0182	0.0000	0.6102	0.6817

Table 6: Factors explaining the change in book leverage over the 5 years following a large dividend change

This table shows the change in book leverage of firms that increase (DIV_INC), decrease (DIV_DEC), and initiate (DIV_INI) dividends. Leverage changes are measured over the 5 years following the dividend change. "No controls" measures the average change for each group. "KT model control" includes stage 2 of the KT model as a control. The KT variables are as described in Tables 4 and 5. "Augmented KT control" includes stage 2 of KT augmented with the level and change of 5-year cumulative cash flow (CF), level and change of variability of return on equity (SD ROE), rating proxy (CREDIT RISK), interaction of the leverage deficit with a dividend-paying dummy (DIV_PAY*BevDef), and interactions between the dividend change dummies and the leverage deficit and cash flow. "Augmented KT control with pecking order interactions" further adds interactions between the dividend change dummies and long-term timing (LT), variability of return (SD ROE), fiscal deficit (FD), and the positive fiscal deficit (FDd). The statistics are obtained from 500 bootstrap replications resampled from the actual dataset. The standard error (in parenthesis) is the sample standard error of the 500. Significance levels are ***1%, **5%, *10%.
(continued on next page)

Panel 6A: Dependent variable: Change in book value leverage

	No controls	KT model control	Augmented KT control	Augmented KT control with pecking order interactions
	av. chg. (Std. Err.)	Coeff.(Std. Err.)	Coeff.(Std. Err.)	Coeff.(Std. Err.)
Fixed effects of:				
Dividend increase (DIV_INC)	0.05(0.002)***	0.031(0.003)***	0.040(0.010)***	0.003(0.012)
Dividend decrease (DIV_DEC)	0.02(0.003)***	0.016(0.004)***	0.006(0.011)	-0.024(0.013)
Dividend initiation (DIV_INI)	0.056(0.011)***	0.058(0.009)***	0.049(0.027)*	-0.008(0.034)
Control variables:				
Book leverage deficit (BlevDef)		-0.324(0.007)***	-0.348(0.011)***	-0.348(0.011)***
DIV_PAY*BlevDef			0.045(0.015)***	0.047(0.015)***
Chg in book target (BlevΔtarget)		0.518(0.024)***	0.32(0.033)***	0.319(0.033)***
Ficial deficit (FD)		0.097(0.007)***	0.092(0.010)***	0.095(0.010)***
Ficial deficit for positive (FDd)		0.03(0.009)***	0.041(0.012)***	0.035(0.011)***
Yearly timing (YT)		-0.064(0.018)***	-0.052(0.026)**	-0.052(0.027)*
Long-term timing (LT)		-0.133(0.006)***	-0.139(0.010)***	-0.144(0.011)***
Five-year cum. Stoc return (r)		-0.019(0.001)***	-0.018(0.001)***	-0.018(0.001)***
Five-year cum. Profit. (EBITD5y)		-0.045(0.003)***	0.024(0.010)**	0.024(0.010)**
CF (5years after)			-0.083(0.014)***	-0.084(0.014)***
ΔCF (after - before)			-0.07(0.007)***	-0.069(0.007)**
SD ROE (5years after)			-0.009(0.012)	-0.009(0.013)
ΔSD ROE (after - before)			0.009(0.005)*	0.009(0.006)
Rating target (CREDIT RISK)			0.016(0.003)***	0.015(0.004)***
Interactions:				
DIV_INC * BlevDef			0.031(0.025)	0.007(0.024)
DIV_INC * CF			-0.014(0.015)	0.006(0.016)
DIV_INC * LT				0.032(0.040)
DIV_INC * SDROE				0.082(0.032)**
DIV_INC * FD				-0.066(0.035)*
DIV_INC * FDd				0.12(0.041)***
DIV_DEC * BlevDef			0.031(0.031)	0.007(0.032)
DIV_DEC * CF			0.017(0.019)	0.03(0.019)
DIV_DEC * LT				0.043(0.036)
DIV_DEC * SDROE				0.083(0.028)***
DIV_DEC * FD				0.014(0.036)
DIV_DEC * FDd				0.033(0.042)
DIV_INI * BlevDef			-0.109(0.069)	-0.135(0.074)*
DIV_INI * CF			-0.001(0.043)	0.008(0.046)
DIV_INI * LT				0.228(0.095)**
DIV_INI * SDROE				0.106(0.078)
DIV_INI * FD				-0.195(0.125)
DIV_INI * FDd				0.196(0.134)
Adj R^2	0.003	0.264	0.279	0.282

Panel 6B: Dependent variable: Change in market value leverage

	No controls	KT model control	Augmented KT control	Augmented KT control with pecking order interactions
	av. chg. (Std. Err.)	Coeff.(Std. Err.)	Coeff.(Std. Err.)	Coeff.(Std. Err.)
Fixed effects of:				
Dividend increase (DIV_INC)	0.057(0.003)***	0.022(0.002)***	0.059(0.009)***	0.014(0.011)
Dividend decrease (DIV_DEC)	0.027(0.005)***	0.014(0.003)***	0.019(0.013)	-0.013(0.014)
Dividend initiation (DIV_INI)	0.094(0.012)***	0.075(0.010)***	0.108(0.026)***	0.051(0.034)
Control variables:				
Book leverage deficit (BlevDef)		-0.375(0.006)***	-0.431(0.012)***	-0.433(0.012)***
DIV_PAY*BlevDef			0.040(0.014)***	0.041(0.014)***
Chg in book target (BlevΔtarget)		0.647(0.017)***	0.543(0.022)***	0.544(0.022)***
Ficial deficit (FD)		0.111(0.007)***	0.106(0.009)***	0.107(0.010)***
Ficial deficit for positive (FDd)		0.036(0.009)***	0.049(0.011)***	0.044(0.012)***
Yearly timing (YT)		-0.071(0.016)***	-0.061(0.026)**	-0.061(0.027)**
Long-term timing (LT)		-0.106(0.007)***	-0.117(0.009)***	-0.121(0.010)***
Five-year cum. Stoc return (r)		-0.067(0.001)***	-0.066(0.001)***	-0.066(0.001)***
Five-year cum. Profit. (EBITD5y)		0.000(0.003)	0.049(0.010)***	0.050(0.009)***
CF (5years after)			-0.084(0.013)***	-0.085(0.014)***
ΔCF (after - before)			-0.032(0.007)***	-0.032(0.007)***
SD ROE (5years after)			-0.014(0.009)	-0.014(0.010)
ΔSD ROE (after - before)			0.014(0.006)**	0.014(0.006)**
Rating target (CREDIT RISK)			0.059(0.004)***	0.058(0.004)***
Interactions:				
DIV_INC * BlevDef			0.041(0.0220)*	0.017(0.021)
DIV_INC * CF			-0.051(0.014)***	-0.024(0.014)*
DIV_INC * LT				0.015(0.027)
DIV_INC * SDROE				0.116(0.029)***
DIV_INC * FD				-0.040(0.030)
DIV_INC * FDd				0.110(0.039)***
DIV_DEC * BlevDef			-0.010(0.033)	-0.008(0.034)
DIV_DEC * CF			-0.002(0.021)	0.014(0.022)
DIV_DEC * LT				0.073(0.037)*
DIV_DEC * SDROE				0.101(0.028)***
DIV_DEC * FD				0.054(0.041)
DIV_DEC * FDd				-0.018(0.048)
DIV_INI * BlevDef			0.136(0.072)*	0.157(0.070)**
DIV_INI * CF			-0.016(0.046)	0.013(0.044)
DIV_INI * LT				0.177(0.094)*
DIV_INI * SDROE				0.111(0.070)
DIV_INI * FD				-0.160(0.100)
DIV_INI * FDd				0.152(0.105)
Adj R^2	0.006	0.417	0.418	0.419

Table 7: Factors explaining the change in book and market leverage over the 5 years following a large dividend change, large and small firms

The table shows the level and significance of the leverage change following a large dividend change. The fixed effects are measured as the coefficients of dummy variables for firms that increase (DIV_INC), decrease (DIV_DEC), and initiate (DIV_INI) dividends. Leverage changes are measured over the 5 years following the dividend change. "No controls" measures the average change for each group. "KT model control" includes stage 2 of the KT model as a control. "Augmented KT control" includes stage 2 of KT augmented with the variables described in Table 6. "Augmented KT control plus pecking order interactions" further adds interactions between the dividend change dummies and long-term timing (LT), return volatility (SD ROE), the fiscal deficit (FD), and the positive fiscal deficit (FDd). Large firms are the larger half of firms in the sample, and small firms the smaller half. The statistics are obtained from 500 bootstrap replications resampled from the actual dataset. The standard error (in parenthesis) is the sample standard error of the 500. Significance levels are ***1%, **5%, *10%.

Panel 7A: Book value leverage

	No controls	KT model as control	Augmented KT as control	Augmented KT plus pecking order interactions
	av. chg. (Std. Err.)	Coeff.(Std. Err.)	Coeff.(Std. Err.)	Coeff.(Std. Err.)
Full sample:				
Dividend increase (DIV_INC)	0.05(0.002)***	0.031(0.003)***	0.04(0.010)***	0.003(0.012)
Dividend decrease (DIV_DEC)	0.020(0.003)***	0.016(0.004)***	0.006(0.011)	-0.024(0.013)
Dividend initiation (DIV_INI)	0.056(0.011)***	0.058(0.009)***	0.049(0.027)*	-0.008(0.034)
Large firms:				
Dividend increase (DIV_INC)	0.057(0.003)***	0.026(0.003)***	0.042(0.011)***	0.001(0.014)
Dividend decrease (DIV_DEC)	0.022(0.004)***	0.013(0.004)***	0.007(0.013)	-0.017(0.013)
Dividend initiation (DIV_INI)	0.061(0.014)***	0.053(0.012)***	0.032(0.036)	-0.046(0.038)
Small firms:				
Dividend increase (DIV_INC)	0.029(0.006)***	0.021(0.006)***	0.031(0.019)*	-0.015(0.021)
Dividend decrease (DIV_DEC)	0.019(0.007)***	0.011(0.007)	0.008(0.018)	-0.028(0.022)
Dividend initiation (DIV_INI)	0.046(0.018)***	0.084(0.014)***	0.049(0.037)	-0.022(0.061)

Panel 7B: Market value leverage

	No controls	KT model as control	Augmented KT as control	Augmented KT plus pecking order interactions
	av. chg. (Std. Err.)	Coeff.(Std. Err.)	Coeff.(Std. Err.)	Coeff.(Std. Err.)
Full sample:				
Dividend increase (DIV_INC)	0.570(0.003)***	0.022(0.002)***	0.059(0.009)***	0.014(0.011)
Dividend decrease (DIV_DEC)	0.027(0.005)***	0.014(0.003)***	0.019(0.013)	-0.013(0.014)
Dividend initiation (DIV_INI)	0.094(0.012)***	0.075(0.010)***	0.108(0.026)***	0.051(0.034)
Large firms:				
Dividend increase (DIV_INC)	0.068(0.003)***	0.021(0.003)***	0.045(0.012)***	-0.003(0.014)
Dividend decrease (DIV_DEC)	0.035(0.005)***	0.016(0.004)***	0.016(0.016)	-0.009(0.016)
Dividend initiation (DIV_INI)	0.108(0.014)***	0.071(0.012)***	0.104(0.040)***	0.046(0.040)
Small firms:				
Dividend increase (DIV_INC)	0.043(0.007)***	0.018(0.007)**	0.063(0.021)***	0.026(0.021)
Dividend decrease (DIV_DEC)	0.027(0.009)***	0.003(0.008)	0.018(0.025)	-0.011(0.028)
Dividend initiation (DIV_INI)	0.092(0.021)***	0.090(0.016)***	0.097(0.042)**	-0.039(0.058)

Table 8: The number of years of large dividend increases paid for by the leverage increase over the 5 years following the dividend change

The table shows averages of the ratio between the dollar equivalent of the residuals from the KT stage 2 book value regression shown in Panel 6A and the annualized dollar dividend change adjusted for the target leverage ratio. It measures the number of years of the dividend change which are financed by debt. In panel A firms are first sorted by size into two groups and then into terciles of financial deficit (FD). In Panel B the subsample of firms (783) for which we have executive compensation data are sorted into terciles by the level of executive compensation. Standard errors in parentheses. Significance levels are ***1%, **5%, *10%.

Panel A: Whole sample sorted by size and financial deficit

	Small size	Large size	All
Small FD	0.055(0.793)	6.259(1.546)***	3.157(1.279)***
Med FD	2.497(1.140)*	3.541(1.042)***	3.019(1.169)***
Big FD	3.481(0.780)***	11.670(3.203)***	7.575(1.802)***
Average	2.01(0.602)***	7.17(2.351)***	4.590(1.216)***

Panel B: Executive compensation subsample sorted by size and compensation

	Small size	Medium size	Large size
Low compensation	2.096(0.891)***	3.170(1.418)**	5.676(1.628)***
Medium compensation	1.022(0.471)**	2.794(1.289)**	5.012(1.139)***
High compensation	0.195 (0.447)	1.320(0.765)*	3.225(1.279)***