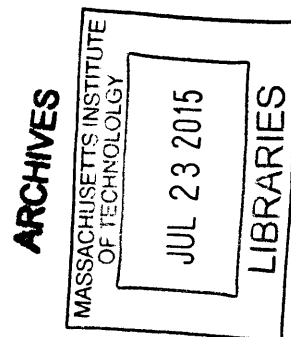# The Dividend Initiation Decision: Theory and Evidence

by

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SUBMITTED TO THE MIT SLOAN SCHOOL OF MANAGEMENT IN PARTIAL
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ABSTRACT

This paper develops and tests a dynamic, sequential equilibrium model of corporate cash payout policy that endogenizes a firm's dividend initiation decision, and its extreme reluctance to subsequently cut dividends in a sequential equilibrium. After payment of dividends, all excess cash is disgorged via stock repurchases that elicit no price reactions. The theoretical model generates results consistent with many stylized facts related to dividend initiations, including: a positive announcement effect associated with a dividend initiation; a larger (in absolute value) negative announcement effect for a dividend cut/omission than for an initiation; and a probability of dividend initiation that is increasing in the firm's profitability and assets in place, and decreasing in the personal tax rate on dividends relative to capital gains. The model also generates additional novel predictions, one of which is that the probability of dividend initiation is decreasing in managerial ownership of the firm, and this effect is stronger the weaker is (external) corporate governance. A second novel prediction is that the dividend initiation probability is decreasing in the potential loss in value from the "two-audience-signaling" information disclosure costs associated with secondary equity issues. These new predictions are tested empirically using a predictive logit model of dividend initiations. Moreover, the paper tests and finds additional empirical support for the information-disclosure result using a regression discontinuity design.

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1 Introduction

When and why does a firm decide to initiate dividend payments? And why are firms so reluctant to cut a dividend, once it is initiated? These are important questions about firm financial policy that are addressed in this paper, both theoretically and empirically. The theory produces results that rationalize existing stylized facts and also generates new predictions with respect to the interactive impact of managerial ownership and corporate governance on the dividend initiation probability, and the effect of proprietary-information-disclosure costs on the likelihood of initiating a dividend. I find strong empirical support for the novel predictions.

There are some prominent stylized facts about dividend policy. First, firms smooth dividends (Lintner (1956)) and are reluctant to cut dividends (Brav, Graham, Harvey, and Michaely (2005)). Second, managers view dividends as less flexible than repurchases and initiate dividends only when they can be maintained (Brav et. al. (2005)). Third, dividend initiations/increases have positive announcement effects (+3.4% to +3.7% for initiations according to Asquith and Mullins (1983) and +0.4% for increases from Allen and Michaely (1994)), but associated dividend omissions/cuts have larger negative effects (-7% for omissions according to Michaely, Thaler, and Womack (1995) and -1.3% for cuts from Allen and Michaely (1994)). And finally, there is a life-cycle effect—firms initiate dividends when they are mature enough to be consistently profitable.

There is no existing theory that *simultaneously* explains all of these empirical regularities. In this paper, I develop a dynamic model of corporate payout policy that generates results consistent with these stylized facts, as well as new predictions. The model has three key elements. One is that there is an agency problem—the manager may make investments that yield him private benefits at the expense of shareholder value (e.g. as in Aghion and Bolton (1992)), and that this agency problem can be controlled with the market discipline provided by the (mandatory) information disclosure that accompanies secondary equity issues. A second feature is that this market discipline comes at a cost because of the "two-audience" signaling problem—any information disclosed to the financial market is also unavoidably disclosed to product-market competitors, creating real cash-flow/value losses (e.g. Bhattacharya and Ritter (1983), and Gertner, Gibbons, and Scharfstein (1988)). The third feature is that there are two kinds of asymmetric information problems. One problem is that "fly-by-night" operators may be observationally indistinguishable from viable firms at the outset; these lemons are sorted from the viable firms on the basis of realized cash flows over time.[1] The other problem is unobservable heterogeneity among viable firms based

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[1]For example, it has been recently reported that numerous Chinese firms have become publicly listed

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on expected future cash flows. The firm's manager knows whether his firm is viable and what its future expected cash flows are, but outsiders do not. The firm must decide in the first period whether to repurchase stock, initiate a dividend, what project to invest in, and whether to finance it internally or with an equity issue. Then in the second period, the manager has another project-choice decision, financing decision and also whether to initiate a dividend or continue/cut a previously-initiated dividend.

The main results are as follows. First, initiating a dividend signals high expected future cash flows and will generate a positive announcement effect, whereas an open market repurchase is used only to disgorge excess cash, so it will elicit no price reaction.[2] Second, there is a negative price reaction in response to a dividend cut, and it is larger in absolute magnitude than the positive announcement effect of a dividend initiation. In equilibrium, the viable firms never cut dividends, which also rationalizes dividend smoothing (e.g. Lintner (1956)). Lemons, however, do cut dividends, so cuts will be observed in equilibrium as well. But I show in an extension of the model that the highly negative price reaction to a dividend cut will be observed even if a dividend cut is only an out-of-equilibrium phenomenon. Third, the probability of initiating a dividend is increasing in the firm's profitability, retained earnings, assets in place, and magnitude of agency problems (for empirical evidence, see Fama and French (2001) and DeAngelo, DeAngelo, and Stulz (2006)), and decreasing in the personal effective dividend tax relative to the capital gains tax (for empirical evidence, see Chetty and Saez (2005), and Brown, Liang, and Weisbenner (2007)). Fourth, the probability of initiating a dividend is decreasing in the manager's stock ownership in the firm, and this effect is weaker when corporate governance is stronger. Fifth, the dividend initiation probability is decreasing in the potential loss in value from the information disclosure associated with secondary equity issues. The fourth and fifth predictions of the model are novel, with no existing empirical support. These novel predictions will be the focus of my empirical tests.

The core intuition of the model can be seen as follows. Suppose the firm's manager can unobservably choose between an efficient project and an inefficient project that gives him

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on U.S. exchanges through "reverse mergers", wherein a Chinese firm acquires a financially-distressed U.S. public firm, merges its Chinese operations with the U.S. firm, and then takes on the name of the U.S. firm. In some cases, the financials of these firms—including revenue figures—have been found to be fraudulent or hard to verify. See Hansen and Oqvist (2012) who discuss the difficulty investors have in distinguishing between fraudulent and legitimate U.S.-listed Chinese firms.

[2]The notion that open-market stock repurchases do not convey any private information (and hence should elicit no price reactions) has been around for some time, e.g. Comment and Jarrell (1991) show that open-market repurchases are substantially weaker information signals than tender-offer repurchases. The survey evidence in Brav, Graham, Harvey, and Michaely (2005) suggests that managers do not use open-market repurchases to signal. Further support is provided by Grullon and Michaely (2004) who find *no* evidence of the post-repurchase operational improvement that one would expect if an open-market repurchase was conveying positive private information.

private benefits. The board of directors, acting in the shareholders' interest, has cannot *directly* control the manager's project choice. If the board decides not to initiate a dividend, the initial pool of liquidity can be used to invest in a project. This allows the firm to avoid the disclosure costs of external finance. But the downside is that the manager may choose the inefficient project, with the probability of this moral hazard being smaller the larger the manager's ownership in the firm. To drive this probability down for any given level of managerial ownership, the board can authorize a dividend initiation that uses up the initial pool of liquidity and forces the firm to raise external (equity) financing. The benefit of this is that the information disclosure that accompanies this financing forces the manager's hand, creating a form of market discipline that compels choice of the efficient (value-maximizing) project. The cost is that the disclosed information also dribbles out to the firm's competitors, causing a decline in real cash flows. The shareholders and the board thus prefer to avoid two-audience signaling costs by not initiating a dividend when the manager's ownership in the firm is high and moral hazard is low; otherwise, a dividend is initiated.

The model is dynamic, so the dividend decision is made in two consecutive periods. This enables an examination of the firm's decision to either cut or maintain a dividend decision made earlier. Market discipline is more valuable for the viable firms with higher values of expected future cash flows and assets in place because there is more in these firms for the manager to expropriate for private gain. Thus, holding fixed managerial ownership, these firms are more likely to initiate dividends. This generates positive announcement effects for dividend initiations.

The lemons pool with the viable firms they are the most observationally similar to in order to escape detection. Thus, there are lemons being pooled with dividend initiators as well as non-initiators. But the lemons are less capable of *sustaining* dividends than viable firms, and thus more likely to cut dividends in the second period. The market therefore interprets a dividend cut as very bad news. This generates highly adverse price reactions to dividend cuts and an endogenous reluctance of viable firms to cut dividends.[3]

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[3]One might wonder whether one could replace "dividends" by "repurchases" throughout the theoretical analysis. After all, a repurchase disgorges cash and forces a future reliance on equity issuance, just the way a dividend does. The answer is no, primarily because of the institutional features of dividends and repurchases, which I take as a given in my analysis. What I specifically have in mind is that a promise to pay a dividend, as well as the payment (or non-payment) of a dividend at a known, pre-determined time is *visible* to the market. The market thus reacts to what it observes with respect to a dividend initiation as well as the subsequent continuation/discontinuation *when these events actually occur*. This institutional feature is essential to my theory. In contrast, with open-market repurchases, all that the market knows is the aggregate amount of repurchase approved by the board of directors, with neither the exact timing of the repurchase nor the volume being repurchased at a given point in time being known. Moreover, the completion rates of approved open-market repurchase programs vary substantially in the cross-section. See, for example, Stephens and Weisbach (1998).

This paper then empirically tests the two novel predictions of the theory through a predictive logit model of dividend initiations. The empirical results strongly support the predictions, and are robust to alternative specifications. To provide evidence of the causal relation between disclosure costs and dividend initiations, a regression discontinuity approach, which exploits an information-reporting-requirement discontinuity introduced by the Sarbanes-Oxley Act, is used. The results survive various robustness checks, including potential threshold manipulation and the impact of earnings management, as well as a falsification test that mis-specifies the disclosure threshold.

The structure of the paper is as follows. Section 2 reviews the related literature and the marginal contributions of this paper. Section 3 presents the theoretical model. Section 4 analyzes the results of the model and discusses the empirical predictions. Section 5 contains the empirical analysis. Section 6 concludes. All proofs are included in the Appendix.

2 Related Literature

This section briefly surveys first the various theories and then the empirical studies that are most relevant, using the discussion to point out the main contribution of this paper to the literature.

2.1 Theoretical Explanations for Dividends

In light of the Miller and Modigliani (1961) dividend irrelevance theorem, explanations of dividend policy relevance based on signaling, agency costs, and behavioral considerations have had the lion's share of the theoretical literature.

The central insight of dividend signaling is that firms with private information about higher expected future earnings will pay higher dividends. Bhattacharya (1979) was the first to make this point,[4] and was followed by Miller and Rock (1985), John and Williams (1985), Ofer and Thakor (1987), and Lucas and McDonald (1998).[5] Guttman, Kadan, and Kandel (2010) develop an extension of Miller and Rock (1985) in which dividend signaling equilib-

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[4]This follows an earlier contribution by Ross (1977), that debt could serve as a signal of firm value.

[5]Ofer and Thakor (1987) develop a model in which both dividends and *tender-offer* repurchases act as potential signals and firms choose an optimal combination. The paper explains the relative announcement effects of dividends and tender-offer repurchases. Brennan and Thakor (1990) provide a non-signaling information-based explanation for dividends and *open-market* repurchases, and show theoretically that large shareholders who find it privately-optimal to invest in information production, will prefer cash distribution via repurchases, whereas smaller shareholders, who choose to remain uninformed, prefer dividends. Corporate payout policy is then determined by whether small or large shareholders hold the majority of shares. Lucas and McDonald (1998) show that, in an environment with adverse selection and heterogeneous shareholder preferences, a certain mix of dividends and repurchases will be used to signal firm quality.

ria that partially pool across subsets of earnings realizations dominate perfectly separating signaling equilibria because they involve less underinvestment; such pooling is interpreted as "dividend stickiness".

Agency explanations for dividends involve firms paying dividends in order to disgorge cash that would otherwise be used inefficiently by managers. (e.g. Jensen (1986) and Zweibel (1996)). Related to this, Myers (2000) builds a model of how outside equity financing works, where dividends are set to represent a sufficient payment to ensure outside investor participation.

Behavioral explanations include Baker and Wurgler (2004), who argue that managers cater to investors by initiating dividends when investors put a premium on the stocks of dividend payers versus non-payers (see also Allen, Bernardo, and Welch (2000)). In Lambrecht and Myers (2012), habit formation leads to the kind of target-adjustment behavior posited by Lintner (1956).

While existing theories have enhanced our understanding of different aspects of dividend policy, it is a challenge to build a theory that is consistent with the majority of stylized facts on dividends and open-market repurchases. From this perspective, the marginal contribution of this paper can be described as follows. First, unlike static dividend signaling models (e.g. Bhattacharya (1979), Miller and Rock (1985), and John and Williams (1985)), this is a *dynamic* sequential equilibrium model. Thus, this model *endogenizes* the stock market's extremely negative reaction to a dividend cut and the firm's consequent reluctance to cut dividends, and provides an economic rationale for a dividend omission/cut generating a larger price decline than the positive price reaction to a dividend initiation. This is something that static signaling models cannot explain. In these models, the promised dividend payment is an ex ante efficient binding precommitment that is honored even in states in which it is ex post inefficient to do so because distress financing costs must be incurred. The decision to actually make the promised dividend is *not* endogenized. Moreover, because these are static models, one cannot talk about "cutting" dividends or price reactions to such moves.[6] There is only one dividend payment that is promised and made. By contrast, in my model there are two dividend payments, so one can endogenize the dividend initiation decision, the subsequent (subgame perfect) dividend omission/continuation decision, and the price reactions to dividend cuts.

Second, as a consequence of the result that a viable firm will not cut its dividend in equilibrium, the model also implies downward rigidity of dividends and smoothing.

Third, static signaling models imply that the likelihood of a dividend initiation is higher when information asymmetry is greater, since this is when dividend signaling has a higher

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[6]This includes Gutman, Kadan, and Kandel (2010).

"bang for the buck" (see Bernheim and Wantz (1995)). My theory predicts the opposite—when information asymmetry is high, so the costs of information disclosure with external equity issues are also high, the probability of dividend initiation is low. This permits an empirical horse race between the two approaches.

Fourth, unlike static signaling models, my theory implies that firms that initiate dividends will subsequently be more reliant on equity issues. Brav et. al. (2005) also note in their paper that firms will generally prefer equity issuance to make dividend payments rather than cut dividends; see Gan and Wang (2012) for recent empirical evidence. Fama and French (2005) document that most firms issue equity every year and that these issuances are material.

Finally, the predicted dependence of the dividend initiation decision on managerial ownership, the inverse relationship between the strength of this relationship and the strength of corporate governance, and the dependence of the dividend initiation decision on the potential firm-value loss resulting from the incremental information disclosure associated with external financing are novel aspects of my theory, and are all new results that have not been formalized in the signaling, agency, or behavioral theoretical models of dividends thus far.[7]

These results also point to the two new empirical contributions of this paper: (i) the dividend initiation decision depends on managerial ownership, but only when governance is poor enough, and (ii) empirical evidence provided for the relevance of information disclosure costs associated with secondary equity issues.

2.2   Empirical Evidence on Dividends

In a classic study, Asquith and Mullins (1983) documented large positive excess returns for firms initiating dividend payments, consistent with signaling. Similarly, Healy and Palepu (1988), Michaely, Thaler, and Womack (1995), and Petit (1972) show significant negative excess returns and negative earnings changes for firms that omit dividend payments. Moreover, the evidence shows that the excess returns are asymmetric for initiations relative to omissions—on average, excess returns are around +3% for initiations and -7% for omissions (Allen and Michaely (1994)). Bernheim and Wantz (1995) provide strong evidence in support of dividend signaling. The theoretical model developed in this paper is consistent with these empirical regularities.[8]

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[7]While Rozeff (1982) and Easterbrook (1984) argue informally that dividend payments may be used to reduce agency costs through subsequent external financing, they do not focus on two-audience signaling costs due to proprietary information disclosure and do not present a formal theory as this paper does.

[8]Grullon, Michaely, and Swaminathan (2002) document that firms that increase dividends experience subsequent declines in earnings, casting doubt on the signaling hypothesis. They find that dividend increases are followed by significant declines in systematic risk, so the positive dividend announcement effect may be due to a decline in the firm's cost of capital. This raises an interesting possibility that I leave for future research. It may be that as firms mature they decide to reduce their R&D investments (e.g. the way IBM

Lintner (1956) provides survey and empirical evidence that managers smooth dividends. Brav, Graham, Harvey, and Michaely (2005) provide similar evidence based on a survey of CFOs. In addition, they present evidence that managers view repurchases as more flexible, and will only start to pay or increase dividends when they are reasonably sure that they will be able to maintain them permanently at the new level. In more comprehensive tests of the Lintner (1956) model, Fama and Babiak (1968) also find that the model performs well empirically, and Skinner (2008) shows that the target adjustment model still holds for total payout.[9] Michaely and Roberts (2012) provide evidence that private firms smooth dividends less than comparable (propensity-score-matched) public firms and also pay lower dividends. This evidence is consistent with my model on two counts. First, to the extent that ownership and management are closer in private firms—in one group of firms labeled as "private" by Michaely and Roberts (2012), the main owner is also the manager—than in public firms, there is a lesser need for dividends to resolve an agency problem. Second, there is usually less information disclosure by private firms. So, they face higher *incremental* two-audience disclosure costs and find dividends less attractive than public firms.[10]

Other empirical work has tested some of the predictive implications of my model. Consistent with my theory, Fama and French (2001) and Bulan, Subramanian, and Tanlu (2007) showed that greater size and profitability imply a higher probability of dividend initiation.

In terms of taxes and dividend policy, a number of papers have shown that a lower tax rate on dividend income (relative to capital gains income) implies a higher likelihood of dividend payments—a pattern that is also generated by my model. For example, Chetty and Saez (2005) examine the effect of the large tax cut enacted in 2003 on individual dividend income, and find a large increase in dividend payments and in the number of firms initiating dividend payments.

Empirical papers linking managerial stock ownership to payout policy include Brown, Liang, and Weisbenner (2007), who show that, after the reduction in personal dividend tax rates in 2003, there is a positive relationship between executive stock holdings and rates of dividend initiation.[11] They suggest that managers with high levels of stock ownership find

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did when Lou Gerstner took over as CEO in the 1990s) and thus they have less proprietary information to protect, which encourages a dividend initiation/increase, as predicted by my theory. It is also possible that reduced R&D means less systematic risk, e.g. R&D generates proprietary knowledge about products that represent highly discretionary spending for the firm's customers, and this spending covaries positively with the state of the economy—information technology spending by firms is a good example of this.

[9]Specifically, Skinner (2008) shows that the Lintner model works when payout is defined as dividends + repurchases - issues for mature firms.

[10]The lower smoothing in private firms is clearly consistent with my model since these firms are not deterred by an adverse stock price reaction when they consider cutting dividends.

[11]They find a negative relationship between executive option holdings and dividend initiations and increases, which they relate to the fact that options lose value when cash dividends are paid as a result in the

it less costly to initiate dividends after the tax cut. In contrast, my model predicts that managerial stock ownership and the probability of dividend initiation should be negatively related, especially when governance is poor. I do not know of any paper that has specifically tested this prediction.[12]

Finally, the empirical prediction of my model connecting payout policy to information disclosure costs is also novel, and has not been tested empirically. In addition to using a proxy for information disclosure costs in my logit model, I also attempt to isolate the effects of disclosure costs related to external financing on the dividend initiation decision, by employing a regression discontinuity approach that relies on a discontinuous change in reporting requirements for firms based on public float values that was introduced by the Sarbanes-Oxley Act of 2002.

3   The Model

In this section, I develop the theoretical model. Consider a five-date model, $t = 0, 1, 2, 3, 4$, with two consecutive time periods: Period 1 starting at $t = 0$ and ending at $t = 2$, and period 2 starting at $t = 2$ and ending at $t = 4$. In each period, there is a board of directors, representing the shareholders, who instruct the firm's manager about whether to initiate a dividend and whether to repurchase stock. The manager makes a visible project choice whose quality is unobservable to all except the manager himself. Dividends serve both an information-communication role and an agency-costs-reduction role. The details are described below.

3.1   Preferences, Types of Firms and Projects, and Strategy Spaces

Preferences: All agents are risk-neutral and the riskless rate is zero. Firms operate in a competitive capital market in which securities are priced to give investors an expected return of 0. Each firm has initial non-managing shareholders who collectively own a fraction $\alpha_0 \in (0, 1)$ of the firm, and a manager who owns $1 - \alpha_0$ of the firm. These ownership fractions are publicly observable. Firms are all-equity financed. Each firm starts out with a total of $C + I$ in cash (with $C < I$) at $t = 0$. This cash position is publicly observable. Of this, I can be used to invest in a project at an interim date $t = 1$ in the first period; this project

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decline in share price.

[12]Fenn and Liang (2001) find a negative relationship between managerial ownership of stock and stock options (as a percentage of total shares outstanding) and dividend *payout*. Hu and Kumar (2004) show a strong negative relationship between managerial stock ownership and the likelihood of dividend payment in a logit analysis. However, neither of these papers focuses specifically on dividend *initiations* or on the interactive effect of managerial ownership and corporate governance on the dividend initiation decision.

will yield its only payoff at date $t = 2$, the end of the first period. The amount C is "excess cash" that is not needed for investment. If kept within the firm, its value at a future date (either $t = 1$ or $t = 2$) will be δC, with $\delta \in (0, 1)$. This assumption is meant to capture the idea that idle cash is prone to inefficient use (e.g. Jensen (1986)).[13]

Firms Types and Projects: There are *two types of firms*: "normal" (N) firms and "lemons" (L). Only the firm's manager knows at $t = 0$ whether his firm is a type N or type L. What is common knowledge is that the prior probability is $g \in (0, 1)$ that a randomly-chosen firm is type N and $1 - g$ that it is type L. A firm's type is intertemporally unchanging.

A type-N firm can choose between two mutually-exclusive projects at $t = 1$ with identical initial investment needs: a good (G) project and a private-benefit or empire-building (P) project. The G project yields an observable payoff of $V \in (0, 2I)$ with probability $\theta \in (0, 1)$ and 0 with probability $1 - \theta$ at $t = 2$. There are two possible values of θ: θ^- and θ^+, with $1 > \theta^+ > \theta^- > 0$. The manager as well as the board of directors (who represent the interests of the initial shareholders)—called "insiders"—know whether $\theta = \theta^-$ or $\theta = \theta^+$, conditional on the firm being type N; others do not and have a prior belief that $\Pr(\theta = \theta^+) = r \in (0, 1)$ and $\Pr(\theta = \theta^-) = 1 - r$. The P project yields a commonly-observed payoff of 0 with probability 1 and a random private benefit of $\tilde{B}$ to the manager at $t = 2$. Viewed at $t = 0$, $\tilde{B}$ is uniformly distributed with support $(0, B_{max}] \subset \mathbb{R}_+$, with $B_{max} < I$, so P is inefficient.[14] The probability distribution of $\tilde{B}$ is common knowledge, and will depend on a variety of factors, including the quality of corporate governance in the firm. Suppose ξ indicates the quality of (commonly-known) corporate governance in the firm, with high values of ξ indicating stronger governance being exercised on the manager. Then $\partial B_{max}/\partial \xi < 0$, $\inf B_{max}(\xi) = 0$, and assume that $\sup B_{max}(\xi) < I$. The manager privately observes the realization of $\tilde{B}$ before deciding whether to invest in G or P. No one but the manager can observe this project choice. A type-L firm has access to *only* project P. To the market, type-L firms appear observationally identical to type-N firms.

The type-N firms also exhibit another form of *ex ante* unobservable *intra-group* heterogeneity. The type-N firms with $\theta = \theta^+$—call them type-N^+—have assets in place worth A if carried until $t = 4$. If these assets are liquidated prior to $t = 4$, then they are worth $0 < A_l = I < A$. Moreover, these assets in place represent another source of private ben-

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[13]This value dissipation from "storage" does not apply to the investment needed for the project.

[14]P can be thought of as an empire-building or perquisites-consumption project. For example, it could be a poor acquisition that expands firm size and the CEO's social prestige and compensation, or a "castle-in-the-sky" new product investment that has little change of success. The assumption that the success probability is zero can be easily relaxed to allow a small success probability.

efits for the manager. Thus, if he invests in the P project, it also enables him to consume perquisites out of the assets in place (he cannot do this with the G project). This means that investing in P yields the manager a total private benefit of $\tilde{B} + A$. The idea is that the more resource-rich the firm, the greater the opportunity for the manager to consume perks. The type-N firms with $\theta = \theta^-$—call them type-N^-—have assets in place that are observationally identical to the assets in place of the firms with $\theta = \theta^+$, but these assets essentially get exhausted in helping produce project cash flows and are thus worthless at $t = 4$, with zero liquidation value at prior dates. Similarly, the type-L firms have assets in place that are observationally identical to those of the type-N firms, but are worthless at any date.

Although the manager is privately informed about whether the firm is type N or type L, he can credibly communicate the information to the board of directors, but not to investors at large, at a personal cost of $K > 0$. Moreover, the initial ($t = 0$) shareholders *cannot* provide the firm financing beyond their initial investment, due to limited personal resources, diversification motives, etc.

Information Structure: The manager is the most informed party here. He knows whether his firm is type N or type L, whether $\theta = \theta^+$ or $\theta = \theta^-$ conditional on the firm being type N, and the project chosen if the firm is type N. The firm's board of directors (acting on the initial shareholders' behalf) represent the second-most informed party. The board does *not* know whether the firm is type N or L, but knows whether the firm has $\theta = \theta^+$ or $\theta = \theta^-$ if it is type N. That is, mixed in with type-N^- firms, there are type-L firms—call them type-L^-—that appear to the board of directors of any type-N^- firm to be observationally identical to a type-N^- firms, so that the board's prior probability that its own firm is type N^- is g. Similarly, mixed in with the type-N^+ firms, there are type-L firms—call them type-L^+—that appear to the board of directors to be observationally identical to a type-N^+ firm, so that the board's prior probability that its own firm is type N^+ is g. The stock market (represented by other investors) knows the least. The market cannot distinguish between type-L and type-N firms, does not know the type-N firm's θ, and does not observe the manager's project choice.

Second-period Events: After the project payoff is observed at $t = 2$, the second period begins. The project payoff becomes common knowledge when realized at $t = 2$. Whether the firm will have the necessary funds at $t = 2$ to invest in a project at $t = 3$ (the interim date of the second period) depends on whether the first period project paid off. At $t = 3$, the manager has the same choice of one of two mutually-exclusive projects that he did in

the first period. The payoffs on the first-period and second-period P projects are identical and independently distributed (i.i.d.). However, the second-period G project pays off $\hat{V} > V$ with probability θ and 0 with probability $1 - \theta$.[15] The value of θ for the second period is the same as that for the first period for any firm. The second-period project, regardless of type, pays off at $t = 4$, at which date the world ends.

Strategy Spaces: The *strategy spaces* are as follows. At the start of each period, *shareholders* delegate to the board of directors the authority to decide whether to ask the manager to initiate a dividend payment (if no dividends were paid in earlier periods) or to continue/discontinue a previous dividend. The manager could also go to the board with a dividend policy proposal of his own, but the authority for approval rests with the board; in a part of the analysis the manager takes the lead in proposing a dividend policy for board approval. The assumption that approval authority rests with the board is in line with practice.[16] Similarly, the board also decides on behalf of the shareholders whether to instruct the manager to repurchase stock. I restrict attention to open-market stock repurchases.[17] The assumption that shareholders (via the board) must authorize any open-market repurchase is also in line with practice. All repurchases are strictly proportional in that all shareholders (including the manager) participate in direct proportion to their ownership shares.

3.2 Objective Functions, Payout and Financing Choices, and Parametric Restrictions

At the start of each period, the board makes the dividend/repurchase decision to maximize the expected value at that date of the shareholders' wealth over the remaining time. The manager makes his project choice to maximize the sum of the value of this stock ownership in the firm at different dates and his private benefit. For simplicity, it is assumed that if

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[15]This means that the second-period project has higher value than the first-period project, conditional on the *same* beliefs about the firm's type. First-period projects can be feasibly externally financed at prior beliefs. But if there is first-period project failure, then it may not be possible to externally finance the second-period project at the now-lower posterior belief that the firm is type N, if the type G project has the same value across the two periods conditional on the same beliefs. Giving the second-project a higher value eases the parametric restrictions for the firm to get external finance in the second period after project failure (but is not necessary).

[16]This is consistent with evidence provided by La Porta, Lopez de Silanes, Shleifer, and Vishny (2000), who show that firms around the world (in countries with good legal systems) pay dividends because minority shareholders pressure insiders to disgorge cash.

[17]Tender-offer repurchases, whereby the board authorizes the firm to repurchases a certain number of shares at a pre-determiend price above the current stock price, serve a different purpose (signaling firm value) and are beyond the scope of this paper. See Ofer and Thakor (1987) and Vermaelen (1981).

the firm pays a dividend, it is $d \in \{0, I\}$.[18] It is also assumed that dividend payments are subject to personal taxation at the rate of $\tau \in (0, 1)$. Stock repurchases are not subject to taxes.[19]

Since $C < I$, a dividend payment by the firm at $t = 0$ means that it will have to seek external financing at $t = 1$ for its first-period project. External financing typically involves information disclosure, and this can generate a real loss in the value of the project. This loss can be due to a variety of reasons: the transaction cost of raising financing,[20] and a decline in project cash flows due to the "two-audience signaling" problem wherein any project-related information that is communicated to investors is also unavoidably communicated to the firm's product-market competitors.[21] The focus is on the information disclosure costs related to the two-audience signaling problem, so transaction costs are ignored, and it is assumed that this loss in firm value due to external financing is proportional to the observable value of the project: λV, with $\lambda \in (0, 1)$.[22] Thus, the G project's payoff distribution with external financing becomes $[1 - \lambda]V$ with probability θ and 0 with probability $1 - \theta$ if it is a first-period project, and it becomes $[1 - \lambda]\hat{V}$ with probability θ and 0 with probability $1 - \theta$ if it is a second-period project. In the second period, external financing may become necessary because the first-period project fails to produce a visible payoff.

While external financing involves a cost, it also has a benefit. Because the information disclosure accompanying external financing allows investors to detect the manager's project choice with probability $q \in (0, 1)$. If the manager is discovered to have chosen P, financing is denied and the firm is extinguished. This disciplining role of external financing to reduce agency costs is familiar from the previous literature on "outside equity".[23] This also means that the manager *cannot* raise outside financing and then not invest in the project.

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[18] Allowing the size of the dividend to be endogenously determined from a continuum introduces complexity without yielding additional insight.

[19] This is not a restrictive assumption. In practice, investors are only taxed on their capital gains resulting from selling their shares to the firm, and that too at the capital gains rate, which is lower than the personal income tax rate for most investors.

[20] The costs of raising external capital are large, and investment banking fees constitute a significant portion of these costs. For example, Lee, Lochhead, Ritter, and Zhao (1996) find that the average firm pays about 7% of the total proceeds to raise capital through a seasoned equity offering, and investment banking fees represent 76% of total flotation costs.

[21] See Bhattacharya and Ritter (1983), for example. The idea that dividends create market discipline due to the increased need to raise costly outside equity in the future is also advanced by Rozeff (1982) and Easterbrook (1984).

[22] Thus, it is clear that these are not intended to be just floation costs of a seasoned equity issue—which would be proportional to I—but rather information-disclosure costs that dissipate firm value.

[23] See Myers (2000) and Fluck (1999). In Myers (2000), insiders have incentives to capture the cash flows of the firm, but long-lived projects in the firm need funding from outsiders in order to continue. Insiders have an incentive to expend effort and work, and pay dividends, in order to induce the outside investors to contribute capital to the project and thus maximize firm value (which in turn allows insiders to capture more cash flow in the future).

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I impose some restrictions on the exogenous parameters of the model in order to confine attention to the case of most interest to this analysis. These are listed and discussed below.

1. *Project NPV*: It is assumed that the first-period project has positive NPV regardless of whether it is internally or externally financed:

$$\min \left\{ \theta^-(1-\lambda)V, \; [\theta^- V]^2 \left[1 - \alpha_0\right] [B_{max}]^{-1} \right\} > I, \tag{1}$$

It is next assumed that the second-period project of a type-N^- firm if externally financed has a sufficiently high NPV to make it worthwhile for the firm to raise financing for the project, but not high enough to also pay a dividend should it choose to do so:

$$g_f \theta^- [1 - \lambda] \hat{V} \in (I, 2I), \tag{2}$$

2. *Incentive Compatibility for the Manager*: These restrictions establish that the detection probability associated with external financing is high enough to guarantee incentive compatibility—the manager will not choose project P when faced with this market discipline:

$$q > 1 - [1 - \alpha_0] \left\{ [1 - \lambda]\theta^- \hat{V} + V - 2I \right\} B_{max}^{-1}, \tag{3}$$

where $g_f \equiv [1 - \theta^-] g \left\{ [1 - \theta^-] g + [1 - g] \right\}^{-1}$, and

$$q > 1 - [1 - \alpha_0] \left\{ [1 - \lambda]\theta^+ \hat{V} + V[1 - \lambda] - 2I + A \right\} [B_{max} + A]^{-1}. \tag{4}$$

3. *Financing Constraints*: It is assumed that, conditional on first-period project failure, the type-N^+ firm cannot raise enough financing for both a dividend payment and project financing in the second period, unless there is asset liquidation:

$$g_2 \left\{ [1 - \lambda]\theta^+ \hat{V} + A \right\} < 2I, \tag{5}$$

where $g_2 \equiv [1 - \theta^+] g_1 \left\{ [1 - \theta^+] g_1 + [1 - g_1] \right\}^{-1}$ and $g_1 \equiv g \left\{ g + [1 - q][1 - g] \right\}^{-1}$. Thus, it is assumed that when the firm has a failed project, the market responds by no longer allowing it to raise enough financing for both a dividend and another project.

4. *Communication to the Board*: The final restriction guarantees that it will pay for the manager to expend personal effort at cost K to convince the board of the type-N^+

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firm to liquidate assets in place to pay a second-period dividend following first-period project failure:

$$[1 - \alpha_0] \left\{ [1 - \lambda]\theta^+ \hat{V} + I\tau \right\} > K. \tag{6}$$

3.3 Timeline and Summary of Key Events

This section describes the timeline of the model and key events, summarized in *Figure 1*.

[Insert Figure 1 Here]

At $t = 0$, the start of the first period, non-managing shareholders own $\alpha_0 \in (0, 1)$ of the unlevered firm and the manager owns $1 - \alpha_0$. The firm starts with $C + I$ in cash, of which I can be used for investment at $t = 1$ in a project and C is "excess cash" that is not needed to operate the firm. If this cash is kept idle in the firm until $t = 1$ or $t = 2$, it will be worth only δC, with $\delta \in (0, 1)$. The firm can choose to initiate a dividend payment $d \in \{0, I\}$ at $t = 0$. The firm can also undertake an open-market repurchase to disgorge any fraction of its available cash $C + I$ at $t = 0$. Dividends are taxed at the ordinary income tax rate of $\tau \in (0, 1)$ when investors receive them. Repurchases involve no taxation.

At $t = 1$, the manager must decide whether to invest in a project and which project to invest in: P or G. The choice depends on the realized value of the manager's private benefit, $\tilde{B}$. If the firm paid a dividend, then it raises this financing by issuing equity. If it decided to not pay a dividend, then the project can be financed with internal funds. External financing leads to reduction in the payoff in the successful state of the G project from V to $(1 - \lambda)V$.

The project payoff is realized at $t = 2$. After this the second period begins. The firm must decide whether to initiate a dividend (assuming it did not do so at $t = 0$), and whether to continue dividend payment if it paid a dividend at $t = 0$. It may also repurchase stock at $t = 2$.

At $t = 3$, the firm must again choose between P and G. The choice depends on the realized value, $\tilde{B}$, of the manager's private benefit with project P. How the project is financed (externally or internally) depends on whether the first period project paid off and whether a dividend was paid at $t = 2$. The payoff on G in the second period is $(1 - \lambda)\hat{V}$ with probability θ and 0 with probability $1 - \theta$ if it is externally financed. If internally financed, the payoff in the successful state is $\hat{V}$. The second-period project pays off at $t = 4$. Section 4.6 discusses why all the elements of the model are needed.

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4 Analysis of the Model

This is a dynamic model in which there is both private information (the firm's manager privately knows whether the firm is type L or type N, and if it is type N then whether $\theta = \theta^+$ or $\theta = \theta^-$, whereas the board of directors only knows whether $\theta = \theta^-$ or $\theta = \theta^+$ conditional on the firm being type N) and moral hazard (the manager can invest in the inefficient empire-building project in an unobservable way). The model will be analyzed in the usual backward induction manner. Formally, this is a game in which the informed board moves first and announces whether the firm will pay a dividend and/or repurchase stock, based on its private information about θ, conditional on the firm being type N. The uninformed market reacts by setting the firm's stock price. The board then determines whether to raise internal or external financing for the project, and subsequently the manager makes his project choice. The strategy set for the board can be written as $\{d_p, r_p, x_p; p \in \{1, 2\}\}$, where d_p is the dividend paid in period p, r_p is the amount repurchased in period p, and $x_p \in \{internal, external\}$ is the decision in period p about whether to finance the project with internal funds or via a new equity issue. Note that the dividend payments and stock repurchases occur at dates $t = 0$ and $t = 2$ in the first and second periods respectively, whereas the project financing decisions in periods 1 and 2 occur at dates $t = 1$ and $t = 3$ respectively.

4.1 Structure of the Game

It is useful to begin by establishing that the firm will not keep its excess cash on the books.

Lemma 1: *The firm will use any excess cash not needed for investment in a project at any date to repurchase its stock at the prevailing market price.*

The intuition is straightforward. Excess cash is subject to value dissipation if kept in the firm. Using this cash to pay a dividend means that shareholders incur a personal tax. Thus, the only action that does not result in any value dissipation for the shareholders is a repurchase.

Figure 2 shows the strategic choices for the board of directors which is making decisions on behalf of the shareholders. In light of Lemma 1, the repurchase decision is excluded.

[Insert Figure 2 Here]

We will see later that there are three possible equilibria, depending on the exogenous parameter values: (1) firms separate at $t = 0$ into two groups, one initating a dividend

payment and the other choosing not to do so (see the two sets of outcome nodes in *Figure 2*); (2) all firms choose not to initiate a dividend at $t = 0$; and (3) all firms choose to initiate a dividend at $t = 0$.

Initially, the focus will be on the separating equilibrium in (1). The possibility of the equilibria mentioned in (2) and (3) will be discussed later.

4.2 Analysis of the Separating Equilibrium: Firm Values in Different States at $t = 2$

Before characterizing the sequential equilibrium (Kreps and Wilson (1982)) in this game, it is useful to begin by computing firm values and the wealth of the shareholders in the eight different numbered nodes at $t = 2$ in *Figure 2*. For this, the *conjectured* sequential equilibrium is as follows. The type-N^+ firms choose to initiate a dividend at $t = 0$, while the type-N^- firms choose not to. The type-N firms that do not initiate a dividend at $t = 0$ choose to repurchase stock with their excess cash at $t = 0$. At $t = 1$, they choose G as their first-period project and finance it internally. At $t = 2$, they either initiate a dividend or don't do so. The type-N firm always invests in the G project in the second period and finances it internally if the first-period project pays off and no dividend is paid at $t = 2$; otherwise, it finances the project externally. The type-L firms mimic the strategies of the group of type-N firms (at all dates at which it is possible to do so) that they are observationally identical to in the eyes of their directors.[24] The type-N firms that do initiate a dividend at $t = 0$ also use their excess cash to repurchase stock at $t = 0$. At $t = 1$, they choose the G project in the first period and finance it through an equity issue. At $t = 2$, if the first-period project pays off, they either continue or discontinue the first-period dividend. If they continue the dividend, the project is financed externally. If they discontinue it, the project is financed internally. If the first-period project fails, the dividend is either continued or discontinued at $t = 2$, and the second-period project is externally financed in either case. The out-of-equilibrium belief that a firm that does not initiate a dividend at $t = 0$ but does so at $t = 2$ will be viewed as a type-N^- firm will also be taken as a given here, and formalized in Proposition 2.

Given this conjectured equilibrium (this conjecture will be formally verified later), I now calculate the firm value (market value of equity) in every node.

Node 3: This node arises because the first-period project pays off V and a dividend is initiated at $t = 2$, leaving the firm with $V - I$ in investible cash. Since $V < 2I$, we know

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[24]Although "pooling-in-strategies" across the type-N and type-L firms occurs in the first period at $t = 0$, there are states of the world at $t = 2$ in which it is impossible for the type-L firms to mimic their type-N look-alikes.

that $V - I < I$, implying that external equity financing will be raised for the second-period project. The external financing needed is $I - [V - I] = 2I - V > 0$. Let α_n be the ownership share sold to new shareholders at $t = 2$ to raise this amount. That is, α_n satisfies the competitive market pricing condition:

$$\alpha_n[1 - \lambda]\theta^-\hat{V} = 2I - V, \tag{7}$$

where two facts are recognized. First, because the equilibrium is separating, investors know that the type-N firm that chose not to initiate a dividend is type-N^-. Second, if a firm invests in the G project, then a fraction λ of the value is lost due to disclosure and transaction costs, so the net expected value is $[1 - \lambda]\theta^-\hat{V}$. Moreover, although the type-N^- firms are pooling with lemons at $t = 0$, so that the prior probability that the firm is type-N^- is only g, first-period project success means that the posterior probability of the firm being type N^- is 1; hence the expression in (7).

The type-N^- firm's manager's ownership now becomes $[1 - \alpha_n][1 - \alpha_0]$. Thus, substituting from (7), he computes his expected wealth if he invests in project G as:

$$[1 - \alpha_n][1 - \alpha_0][1 - \lambda]\theta^-\hat{V} = [1 - \alpha_0]\left\{[1 - \lambda]\theta^-\hat{V} - [2I - V]\right\}. \tag{8}$$

If the manager selects the P project, then his expected *maximum* wealth is

$$[1 - q]B_{max}, \tag{9}$$

where $1 - q$ is the probability that his choice of P will go undetected by investors. We now have:

Lemma 2: *The type-N^- firm's manager will prefer project G over project P when he finances the project externally at $t = 2$ having chosen not to initiate a dividend at $t = 0$ and after having observed the first-period project pay off.*

Essentially, this result says that the incentive compatibility of project choice is guaranteed because of the market discipline of external financing. Given Lemma 2, the wealth of the initial ($t = 0$) shareholders in node 3 is given by

$$W_3^S = \alpha_0\left[(1 - \lambda)\theta^-\hat{V} - 2I + V\right], \tag{10}$$

since they assess firm value as g times what the manager assesses it as.

Node 4: This node arises because the first-period project pays off and no dividend is initiated at $t = 2$, so the firm has V in investible cash. External financing is unnecessary since the project can be internally financed. Given the absence of market discipline, the manager's choice of G or P project will depend on the realized value of $\tilde{B}$ associated with P. Let B^0 be the maximum value of $\tilde{B}$ such that G is preferred to P for all $\tilde{B} \leq B^0$. That is, B^0 solves

$$[1 - \alpha_0]\left[\theta^- \hat{V}\right] = B^0. \tag{11}$$

Thus, the total expected value of an internally-financed project is:

$$\int_0^{B^0} \theta^- \hat{V} f\left(\tilde{B}\right) d\tilde{B}. \tag{12}$$

Given the assumption that $\tilde{B} \sim U(0, B_{max}]$, the wealth of the initial shareholders in node 4 (as assessed by the insiders at $t = 0$) can be written as (defining $h\left(\theta^-\right) \equiv B^0/B_{max}$):

$$W_4^S = \alpha_0 \left[\int_0^{[1-\alpha_0]\theta^- \hat{V}} \theta^- \hat{V} [B_{max}]^{-1} d\tilde{B}\right] = \alpha_0 \left[\theta^- \hat{V}\right] h\left(\theta^-\right). \tag{13}$$

Nodes 5 and 6: Failure of the first-period project means that the posterior probability that the firm is type N (type N^- in this node) is:

$$\Pr(N \mid \text{first period project fails}) = \frac{[1 - \theta^-]g}{[1 - \theta^-]g + [1 - g]} \equiv g_f < g. \tag{14}$$

Now, it is clear that, given (2), the firm will be unable to raise $2I$. However, given (2), it is also possible to raise enough financing to fund the project. Thus, the second-period project can be externally financed, but a dividend cannot be initiated. The amount of ownership that will need to be sold to new investors in order to raise I will satisfy the competitive pricing condition:

$$\alpha_n g_f [1 - \lambda]\theta^- \hat{V} = I. \tag{15}$$

The type-N manager's ownership becomes $(1 - \alpha_n)(1 - \alpha_0)$ and his wealth at $t = 3$ with G is:

$$[1 - \alpha_n][1 - \alpha_0][1 - \lambda]\theta^- \hat{V}. \tag{16}$$

If the manager selects the P project, then his expected maximum wealth is given by (9). It is easy to establish that, given (3), the manager will strictly prefer to invest in the G project.

Thus, the wealth of the initial shareholders in node 5 (as assessed by them) is

$$W_5^S = W_6^S = \alpha_0 \left[g_f [1 - \lambda] \theta^- \hat{V} - I \right]. \tag{17}$$

Given that no dividend can be paid in node 5, nodes 5 and 6 are identical.

Lemma 3: *In nodes 3-6, the manager will never incur the cost K to credibly communicate the firm's true type to the firm's board.*

The intuition is that the firm never initiates a dividend in nodes 3-6 unless it has internal funds due to first-period project success. Since the manager wants to convince the board that the firm is type N and not type L only when he needs their approval to pay a dividend, he chooses not to do so at a personal cost because the decision of whether to pay a dividend out of internal funds does not depend on the board's knowledge of whether the firm is type N or L. This is because a type-L firm with internal funds will mimic whatever an observationally-identical type-N firm does.

Node 7: This node is reached when an externally-financed project pays off, a dividend is paid and then the project is externally financed again. The analysis mirrors that for node 3. However, in the lower set of nodes, 7 through 10, because the first-period project is externally financed, market discipline screens out some lemons. Thus, at $t = 1$, *before* the project outcome is observed, the posterior belief about the firm being type N (type N^+ in this case) is:

$$\Pr(N \mid \text{project externally financed}) \equiv g_1 = \frac{g}{g + [1 - q][1 - g]} \in (g, 1). \tag{18}$$

Now, if the project pays off at $t = 2$, then the posterior belief that the firm is type N is:

$$\Pr(N \mid \text{project financed externally and successful}) = 1. \tag{19}$$

Thus, when the project is externally financed (node 7), the external financing needed is $2I - (1 - \lambda)V$, and α_n satisfies the competitive pricing condition:

$$\alpha_n \left\{ [1 - \lambda] \theta^+ \hat{V} + A \right\} = 2I - V(1 - \lambda). \tag{20}$$

The type-N firm's manager's ownership becomes $[1 - \alpha_n][1 - \alpha_0]$. Thus, his wealth if he invests in project G at $t = 3$ is:

$$[1 - \alpha_n][1 - \alpha_0] \left\{ [1 - \lambda] \theta^+ \hat{V} + A \right\} = [1 - \alpha_0] \left\{ [1 - \lambda] \theta^+ \hat{V} + A - [2I - V(1 - \lambda)] \right\}. \tag{21}$$

If the manager selects the P project, then his expected *maximum* wealth is calculated as follows. Let B_+^0 be the maximum value of $\tilde{B}$ such that the manager still prefers G to P. That is, B_+^0 solves:

$$[1 - \alpha_0] \left[\theta^+ \hat{V} \right] = B_+^0 + A. \tag{22}$$

Thus, if the manager selects the P project, then his maximum expected wealth is:

$$[1 - q] [B_{max} + A]. \tag{23}$$

For later use, it will be convenient to define $h\left(\theta^+\right) \equiv B_+^0 / B_{max}$, where $B_+^0 = [1 - \alpha_0] \left[\theta^+ \hat{V} \right] - A$. Note that the wealth of the shareholders if they choose internal financing will be

$$\alpha_0 \int_0^{[1-\alpha_0]\left[\theta^+ \hat{V}\right] - A} \left[\theta^+ \hat{V} \right] B_{max}^{-1} d\tilde{B} = \alpha_0 h \left(\theta^+ \right) \left[\theta^+ \hat{V} \right]. \tag{24}$$

We now have the following analog of Lemma 3.

Lemma 4: *The type-N^+ firm's manager will prefer project G over project P in the second period when he finances the project externally at $t = 2$ after having chosen to initiate a dividend at $t = 0$ and having observed that the first-period project has paid off.*

We can now write the wealth of the initial shareholders in node 7 as

$$W_7^S = \hat{\alpha}_0 \left[[1 - \lambda]\theta^+ \hat{V} + A - 2I + V(1 - \lambda) \right]. \tag{25}$$

Node 8: In this node, the project pays off but the dividend is discontinued, so that the project is internally financed. For now it will be assumed that this will *not* be done in equilibrium, and it will be checked later that it will indeed be optimal for any firm to avoid doing this.

Node 9: If the project fails, then

$$\Pr(N \mid \text{externally financed project fails}) = \frac{[1 - \theta^+] g_1}{[1 - \theta^+] g_1 + [1 - g_1]} \equiv g_2 < g_1. \tag{26}$$

To continue the dividend, the firm needs external financing of $2I$. However, given (5), it is impossible for the firm to raise enough financing for both a second-period dividend and second-period project funding. The only way to pay a second-period dividend is to liquidate the firm's assets in place for $A_l = I$. Then, after paying the dividend, the firm could raise I

to fund the second-period project by issuing equity at the ex-dividend price. The following result can now be proved.

Proposition 1: *Suppose a firm that cuts its dividend in the second period from what it paid in the first period is viewed by investors as type-L firm. Then, following first-period project failure, the manager of a type-N firm that had paid a first-period dividend will choose to personally incur a cost K to convince the board that the firm is type N and then the firm will liquidate assets in place to pay the same dividend in the second period. The firm will issue equity to raise I to finance the second-period project and invest it in project G. The expected wealth of the initial shareholders in node 9 (as assessed by the shareholders at $t = 2$ before assets in place are liquidated) is:*

$$W_9^S = \alpha_0 g_2 \left\{ [1 - \lambda]\theta^+ \hat{V} - I\tau \right\}. \tag{27}$$

Even though liquidating assets in place prematurely is costly—the manager must incur a personal cost K and then assets can only be liquidated at $A_l < A$—the firm will prefer to do it if not doing it and cutting its dividend leads to the most adverse possible inference about its value. It will be verified that such an inference will indeed arise in equilibrium.

Node 10: It will be proved later that this node will never be reached in equilibrium, except by a type L firm. The next result is straightforward but useful.

Lemma 5: *The firm will always choose to invest in its second-period project.*

4.3 Evaluation of the Second-Period Choices

A comparison will now be made of the values in the different nodes.

Nodes 3 and 4: The shareholders' total wealth in node 3 is

$$W_3^S + \alpha_0 I[1 - \tau] = \alpha_0 \left\{ [1 - \lambda]\theta^- \hat{V} + V - I - I\tau \right\}. \tag{28}$$

The wealth in node 4 can be written as $W_4^S + V - I$, which is:

$$\alpha_0 \left\{ \left(\theta^- \hat{V} \right)^2 [1 - \alpha_0] [B_{max}]^{-1} + V - I \right\}. \tag{29}$$

Note that, ignoring α_0, (28) and (29) also represent the market values of equity at $t = 2$ corresponding to nodes 3 and 4 respectively prior to raising equity and investing. We now have:

Lemma 6: *Assume that*

$$[1 - \alpha_0] \theta^- \hat{V} > [1 - \lambda] B_{max}. \tag{30}$$

Then the shareholders prefer to not initiate a dividend at $t = 2$ if they did not initiate it at $t = 0$ and the first-period project paid off.

The parametric restriction in (30) ensures that shareholder wealth in node 4 is higher than that in node 3. It will be assumed henceforth that (30) holds.

Nodes 5 and 6: The initial shareholders' wealth in node 5 or node 6 is W_6^S, (see (17)).

Lemma 7: *The shareholder will not initiate a dividend at $t = 2$ if they did not initiate it at $t = 0$ and the first-period project did not pay off.*

As for the lower nodes 7-10, it has already been stated that nodes 8 and 10 will not be reached in equilibrium. This will be verified as part of the equilibrium.

4.4 Analysis of the Separating Equilibrium: Choices and Firm Values at $t = 0$

I will now calculate the firm values at $t = 0$ that are associated with the two choices at that date: no dividend initiation and dividend initiation, i.e. nodes 1 and 2.

For a type-N^- firm that chooses not to initiate a dividend at $t = 0$, the initial shareholders' wealth in *node 1* can be written as:

$$
\begin{aligned}
W_1^S \left(\theta^- \right) = \\
\alpha_0 g \Bigg\{ \left\{ \Pr \left(\tilde{B} \leq [1 - \alpha_0] \theta^- V \right) [1 - \theta^-] + \Pr \left(\tilde{B} > [1 - \alpha_0] \theta^- V \right) \right\} \left(g_f [1 - \lambda] \theta^- \hat{V} - I \right) \\
+ \Pr \left(\tilde{B} \leq [1 - \alpha_0] \theta^- V \right) \theta^- \left[V - I + \left(\theta^- \hat{V} \right)^2 (1 - \alpha_0) (B_{max})^{-1} \right] \Bigg\}.
\end{aligned}
\tag{31}
$$

(31) can be understood as follows. The expression in the large braces in (31) is multiplied with g, the probability the firm is type N. There are two terms being added up inside the

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large braces in (31). The first term in (31) has two components. The first is the probability that no cash flow will be thrown off by the first-period project. This is the sum of two probabilities: (i) the probability that project G will be chosen and it will fail, which is $\Pr\left(\tilde{B} < [1 - \alpha_0]\,\theta^-V\right)[1 - \theta^-]$; and (ii) the probability, $\Pr\left(\tilde{B} > [1 - \alpha_0]\,\theta^-V\right)$, that the project P is chosen in the first period. The second component is the net value of the externally-financed second-period project in the state in which the first-period project fails. By (2), this quantity is strictly positive.

The second term in (31) is $\Pr\left(\tilde{B} \leq [1 - \alpha_0]\,\theta^-V\right)\theta^-\left[V - I + \left(\theta^-\hat{V}\right)^2(1 - \alpha_0)\,(B_{max})^{-1}\right]$. It consists of: the probability, $\Pr\left(\tilde{B} \leq [1 - \alpha_0]\,\theta^-V\right)$, that the manager will choose G in the first period if the project is internally financed; the probability, θ^-, that the G project will succeed; and a third part that has the payoff, V, due to the success of the first-period project and the net value of the internally-financed second-period project, which is $\left(\theta^-\hat{V}\right)^2(1 - \alpha_0)\,(B_{max})^{-1} - I$.

The initial shareholders' wealth in *node 2* is:

$$
\begin{aligned}
W_2^S\left(\theta^+\right) &= \alpha_0\Bigg\{I[1 - \tau] - I + \theta^+g\left[V[1 - \lambda] + I(1 - \tau) - 2I + A + [1 - \lambda]\theta^+\hat{V}\right] \\
&\quad + \left[1 - \theta^+\right]g\left[(1 - \lambda)\,\theta^+\hat{V} - I\tau\right]\Bigg\}
\end{aligned}
\tag{32}
$$

In (32), the first term inside the curly brackets, $I[1 - \tau]$, is the after-tax dividend in the first period. The second term is I, the expected cost of external financing raised for the first-period project when investors price the security using the same beliefs about the firm's type as the initial shareholders in a separating equilibrium in which the firm signals itself as a type-N^+/L through a dividend at $t = 0$. The third term, with θ^+ in it, is the expected payoff along the path that leads to node 7. It includes the first-period project payoff $V(1 - \lambda)$, the second-period dividend $I[1 - \tau]$, the $-2I$ that corresponds to the cash outflow due to the external financing raised to cover the investment in the second-period project and the second-period dividend, the value of assets in place A, and the expected value of the second-period project $[1 - \lambda]\theta^+\hat{V}$. The fourth term contains $1 - \theta^+$, the probability that the first-period project will fail, and hence refers to the path that leads to node 9.

4.5 The Separating Sequential Equilibrium

This subsection describes the separating equilibrium in this game. It is useful to first impose additional parametric restrictions that are sufficient (but not necessary) for the results:

$$\Psi > \tau > \max\left\{1 - \lambda,\ 2\theta^- g\left[\theta^+ - \theta^-\right]\left[\theta^+\right]^{-1}\right\} > 0, \tag{33}$$

where $\Psi \equiv I^{-1}\theta^+ g\left\{V[1 - \lambda] + [1 - \lambda]\theta^+\hat{V} + A - I - h\left(\theta^+\right)[V - I] - [h\left(\theta^+\right)]^2\left[\theta^+\hat{V}\right]\right\}$,

$$h\left(\theta^+\right) < 1 - \lambda < \left[h\left(\theta^-\right)\right]^2, \tag{34}$$

$$\theta^+ \text{ is sufficiently large, with } \theta^+ \leq 2\theta^-. \tag{35}$$

Restriction (33) guarantees that the value loss from the information disclosure associated with external financing is small relative to the tax disadvantage of dividends, so that using the combination of external financing and dividend payment makes sense for the firm. Restriction (34) bounds the value loss associated with external financing from below by the probability, $h\left(\theta^+\right)$, that the manager of a type-N^+ firm will choose a G project and from above by the probability, $h\left(\theta^-\right)$, that the manager of a type-N^- firm will choose a good project. The assumption that $h\left(\theta^+\right) < h\left(\theta^-\right)$ means that it is more likely that the manager of the type-N^+ firm will invest in the P project than it is that the manager of the type-N^- firm will do so. This is because there are more perks to consume in the type-N^+ firm. Finally, restriction (35) ensures that the type-N^+ firm faces a sufficiently low risk of project failure that initiating a dividend is not excessively "risky".

It is also helpful to note the following result as a preamble to the sequential equilibrium.

Lemma 8: *If investors knew as much as the firm's board of directors at the outset, the type-N^- firms would prefer a strategy of not paying dividends at $t = 0$ or $t = 2$ to one of paying dividends at $t = 0$ and $t = 2$, whereas the type-N^+ firms would prefer to pay $d = I$ at $t = 0$ and $t = 2$ rather than setting $d = 0$ at $t = 0$ and $t = 2$. There would be no dividend initiation announcement effect.*

This result establishes that resolving an agency problem is the sole reason for the firm's initial shareholders to use dividends. The intuition is discussed after the next result.

Proposition 2: *Assume $\hat{V}$ is sufficiently high. Then there is a sequential equilibrium (Kreps and Wilson (1982)) in which: (i) the type-N^- firm chooses not to initiate a dividend at $t = 0$ or at any subsequent date and finances its first-period project internally and its second-period project internally (paying out any first-period cash flow in excess of its second-period*

investment need through a repurchase) if the first-period project succeeds and externally if it fails; and (ii) the type-N^+ firm chooses to initiate a dividend at $t = 0$ and continues with the dividend for the second period at $t = 2$, finances its first-period project externally, its second-period project internally if the first-period project succeeds and externally by selling its assets in place if it fails. The type-L firms mimic and pool at $t = 0$ with the type-N firms they are observationally identical to from the perspective of the board of directors. At $t = 2$, the type-L firms that were able to obtain external financing and initiate dividends at $t = 0$ end up not paying dividends in the second period. The type-L firms that pooled with the type-N^- firms and did not initiate dividends at $t = 0$ continue to mimic the type-N^- firms at $t = 2$. The only out-of-equilibrium move is for a firm to not initiate a dividend at $t = 0$ and then initiate it at $t = 2$. Investors' out-of-equilibrium beliefs are to view such a firm as being type-N^- with probability g and type-L with probability $1 - g$ in the second period.

The intuition is as follows. The type-N firm has two benefits of initiating a dividend in the first period. First, it leads to external financing of the first-period project and hence market discipline on the manager. Second, it makes mimicry by the lemons impossible in the second period, conditional on first-period project failure, as long as the type-N firm does not cut its dividend. This means that if the type-N firm can continue with a dividend in the second period, it pays a lower "lemons premium" than it did in the first period. The downside of initiating a dividend payment at $t = 0$ is that, if the first-period project fails, raising external financing to finance the second-period project *and* pay a second-period dividend may be costly or impossible. There are two reasons why initiating a dividend makes more sense for the type-N^+ firm. One is that the external-financing-related market discipline associated with dividend initiations has greater value for the type-N^+ firm than for the type-N^- firm, because there are more perquisites to consume in the former. The other reason is that the expected cost of dividend continuation in the second period is lower for the type-N^+ firm because it has a lower likelihood of first-period project failure than the type-N^- firm and also has assets in place for raising second-period financing.

Compared to the type-N^+ firm, the benefit of the market discipline associated with a dividend payment and external financing is lower for the type-N^- firm, and the cost of first-period project failure after having initiated a dividend at $t = 0$ is prohibitive. This is because such a firm cannot raise enough external financing to pay a dividend and finance its second-period project. It would thus be viewed as a lemon in the second period if it cut its dividend, and knowing this it prefers not to initiate a dividend at $t = 0$.

The overall intuition is that the firms with relatively high expected cash flows and substantial assets in place find market discipline especially valuable and thus prefer to initiate dividends and raise external financing that brings with it market discipline. Other firms

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abstain. As a consequence, the dividend initiation decision has a positive announcement effect.

Note also that investors arrive at an extremely adverse inference if a firm cuts its dividend. This is endogenously derived as part of the equilibrium since the only firms that cut dividends are lemons. This adverse inference deters type-N firms from initiating dividends unless they can be sustained. This is an endogenous rationale for the downward rigidity of dividends.

Proposition 3: *The set of exogenous parameters satisfying restrictions (1)–(6), (30), (33), (34), and (35) is non-empty.*

Corollary 1: *Suppose the inequality in (5) is reversed, and it is impossible for the manager to convince the board that the firm is not type L (i.e., $K = \infty$). Then the sequential equilibrium is the same as in Proposition 2 except that no dividend cuts occur in equilibrium. If the out-of-equilibrium move of a dividend cut is observed, investors form the belief that the firm cutting the dividend is type L, and this belief survives the univeral divinity refinement (Banks and Sobel (1987)) of sequential equilibrium.*

When the inequality in (5) is reversed, it is possible for the firm that initiated a dividend at $t = 0$ and experienced first-period project failure to raise second-period external financing without having to sell assets in place. This enables type-L firms that pooled with type-N^+ firms at $t = 0$ to also pool with them at $t = 2$ and raise external financing, so no dividend cuts are observed in equilibrium. Nonetheless, were a firm to cut its dividend (an out-of-equilibrium move), there would still be a very negative price reaction since the firm would be viewed as a lemon. Thus, the very adverse price reaction to a dividend omission/cut does not depend on the number of lemons or even whether lemons cut dividends in equilibrium. I now turn to the impact of corporate governance.

Lemma 9: *There is a threshold such that if the quality of corporate governance, ξ, is above that threshold, no firm will initiate a dividend for any given positive managerial ownership if $\theta^+ - \theta^-$ and $V^+ - V^-$ are small enough.*

The intuition is straightforward. In the limit, perfect corporate governance eliminates the private-benefit project, making a dividend payment unnecessary to resolve the agency problem. And as long as $\theta^+ - \theta^-$ and $V^+ - V^-$ are small enough, the signaling benefit of dividend initiation to the type-N^+ firm is not enough to overcome the disclosure-related value loss from initiating a dividend. This suggests that managerial ownership and corporate governance are partial substitutes.

4.6   Discussion of the Different Elements of the Model

There are a few issues related to how the model is set up that are now discussed.[25]

First, does the proportion of type-L firms in the population matter? The answer is that it does not for the theory. All that is needed is that there be some positive probability of lemons in each group: the dividend initiators and the non-initiators.[26] Empirically, however, since dividend cuts are rare, it would be reasonable to posit that the prior probability of finding a type-L firm in any group is low, but it must be *positive*. Absent lemons, the price reaction to a dividend cut would only lower the price of a type-N^+ firm to that of a type-N^- firm. In this case, there is no cost to the type-N^- firm (other than the disclosure-related cost) to initiate a dividend at $t = 0$ because, its second-period price, conditional on a dividend-cut announcement, is exactly the same as it would be if it had *not* initiated a dividend at $t = 0$. Thus, the firm prefers to get a higher price at $t = 0$ from pooling with the type-N^+ dividend initiators, and all firms initiate dividends. Of course, a deterrent to a dividend initiation is the dislosure-related cost associated with equity issuance. However, this cost is proportional to firm value, so it is higher for the type-N^+ firm that the type-N^- firm. This means if the type-N^+ firm initiates a dividend, so does the type-N^- firm. In other words, the two-layered information asymmetry is essential. Having type-N^-/type-N^+ heterogeneity is necessary for the dividend initiation announcement effect, whereas the type-N/type-L heterogeneity is necessary for both the result that the dividend omission/cut has a negative price effect that is larger than the positive price impact of a dividend initiation and the initial separation of the type-N^+ and type-N^- firms through the dividend initiation decision.

Second, why don't the type-L^+ firms prefer to "hide" with the type-N^-/type-L^- firms (i.e. not initiate a dividend) rather than pool with the type-N^+ firms? The reason is that the board of directors of a type-L^+ firm know that the firm is either type N^+ or type L^+, so if the manager proposes not paying a dividend at $t = 0$, the board will not approve.[27] It would personally cost the manager K to convince the board of the firm's true type, but at $t = 0$ the manager of neither a type-L^+ nor a type-N^+ firm would have an incentive to do so.

Third, the empire-building project is needed to generate the agency problem that a dividend initiation seeks to resolve. Without this, there is no benefit to a dividend initiation,

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[25]I thank Stew Myers for encouraging me to think about these issues.

[26]This is similar to the idea of almost any positive amount of uncertainty about players' payoffs generating reputational effects (e.g. Kreps and Wilson (1982)).

[27]Note that even the manager of a type-N^+ firm would want to propose to the board that the firm not pay a dividend, since that would shield the manager from market discipline. So the manager's desire to not pay a dividend does not tell the board whether the firm is type N^+ or type L^+.

other than signaling. One would get announcement effects and the reluctance to cut dividends from such a model, but all of the unique empirical predictions related to the impact of managerial ownership, corporate governance, and incremental information-disclosure costs would be lost.

Fourth, external financing in this model is with equity. If the firm instead relied upon a *public* debt issue, little would change, since there would be information-disclosure costs with that form of financing as well. Bank (or private) debt would change things since it would minimize disclosure costs. Introducing that possibility raises issues related to a choice between (multilateral) capital market financing and (bilateral) bank financing that are beyond the scope of this paper; see Bhattacharya and Chiesa (1995) for such an analysis.

In addition to this, an important feature of the theory is that there is a cost to the firm from issuing equity. This raises the question of whether a standard Myers and Majluf (1984) set-up with dilution costs would generate the same key results. At a theoretical level, any friction (including that in Myers and Majluf (1984)) that creates a dissipative external financing cost will suffice for the main results. In this particular setting, however, the analysis differs from Myers and Majluf (1984), where there is a pooling equilibrium in which overvalued firms also issue equity. The dividend-initiation equilibrium in this paper at date $t = 0$ is *separating*, so there is no asymmetric-information-based dilution cost. Moreover, in contrast to Myers and Majluf (1984), equity issuance *reduces* adverse selection in my model because the accompanying information disclosure allows the market to weed out the lemons more effectively. And because it is a dividend initiation that leads to a secondary equity issue, the future *continuation* of this dividend payment results in a further weeding out of lemons because they cannot sustain the dividend payment, even if they pooled with the dividend initiators at date $t = 0$. Thus, an extrapolation of the Myers and Majluf (1984) model to include dividends would imply that a dividend initiation, which increases the likelihood of a future equity issue with its adverse-selection-induced dilution costs, should reduce current shareholder wealth and have a negative announcement effect.[28] This is the opposite of my result. Moreover, my empirical tests explicitly rely on the information-disclosure aspect of my theory, rather than pooling-related adverse selection costs.

Fifth, a stock repurchase generates no price reaction. However, a small perturbation of the model can yield a positive price effect in response to a completed repurchase. That is, if it is assumed that project payoffs are privately observed, then a second-period repurchase by a firm that did not initiate a dividend at $t = 0$ and does not pay a dividend at $t = 2$ will signal to the market at $t = 2$ that the first-period project was a success (only in this case

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[28]Clearly, this extrapolation goes far outside the structure of the Myers and Majluf (1984) model. It is only meant to make the point that it is an approach that differs from the model developed here.

does a repurchase occur in equilibrium at $t = 2$), generating a positive price reaction.

Finally, the dividend choice in this model is discrete. If d were chosen in a continuum, the analysis would remain qualitatively similar but the parametric restrictions needed for incentive compatibility in Proposition 2 would be eased. This is because the type-N^+ firm is free to choose as high a dividend level at $t = 0$ as is necessary to discourage mimicry by the type-N^- firm. Moreover, even if the inequality in (5) were to be reversed (the case of Corollary 1), the type-N^+ firm would have an incentive to increase its dividend at $t = 2$ until so much external financing is needed following project failure at $t = 2$ that asset sales become essential. This would force the lemons to cut dividends and this would remove adverse selection for the type-N^+ firms.

4.7 Other Equilibria

As noted earlier (in Section 3.1), other pooling equilibria are possible as well, although it is not clear any of them would survive the univeral divinity refinement of sequential equilibrium. For example, if managerial ownership is sufficiently low, the value of market discipline may be high enough for most firms to initiate dividends, except for those with excessive information-disclosure costs. Another possibility is that managerial ownership is so high that no firm finds it beneficial to initiate a dividend. This is because the model implies that once managerial ownership goes above a threshold, the manager would never opt for the inefficient private-benefit project, in which case no firm will wish to incur the cost of initiating dividends. Thus, in the empirical tests, the focus will be on the below-average-managerial-ownership firms.

4.8 Empirical Implications

The model generates the following testable predictions:

1. The probability of dividend initiation is decreasing in the managerial ownership of the firm, and this effect becomes weaker as corporate governance gets stronger.

2. The probability of dividend initiation is decreasing in the incremental information-disclosure costs associated with secondary equity issues.

3. The probability of dividend initiation is increasing in the firm's profitability, assets in place, and magnitude of agency problems, and decreasing in the personal tax rate on dividends relative to capital gains.

4. A dividend initiation will trigger a positive announcement effect.

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5. A dividend cut/omission will trigger a negative announcement effect that is larger in absolute value than the positive announcement effect associated with a dividend initiation.

6. Firms will use stock repurchases to use up excess cash, but with no price reactions.

7. Firms with better governance will repurchase less.

The first two predictions are the novel predictions of the model and have been extensively discussed. The third prediction follows because a reason for initiating a dividend is to control an agency problem, so the bigger this problem, the higher the probability of initiating a dividend. The fourth and fifth predictions are formal results of the model (Proposition 2). The sixth prediction arises from the fact that repurchasing is done merely to get rid of excess cash in the firm, and convey no private information. The seventh prediction is related to the fact that it is the dissipation in value from keeping excess cash on the balance sheet that motivates stock repurchases. Better governance (which would imply higher market values of on-balance-sheet cash; see Dittmar and Mahrt-Smith (2007)) would lower this value dissipation and make stock repurchases less attractive.

5   Empirical Results

This section tests the new predictions (Predictions 1 and 2 above) of the theoretical model. All of the other predictions have existing empirical support, so they are not tested here, although the variables identified in Prediction 3 are included as controls. Section 5.1 describes the empirical methodology. Section 5.2 describes the data sources and summary statistics. Section 5.3 gives the results of the predictive empirical model, and tests robustness and alternative specifications. Section 5.4 provides the results of the regression discontinuity analysis.

5.1   Empirical Methodology

In order to estimate the probability that a firm will initiate a dividend in a given year, a predictive logit model is estimated using the variables predicted by the theoretical model in Sections 3 and 4. The logit specification for analyzing the likelihood of a firm paying a dividend is as follows:

$$\Pr\left\{Init_{i,t} = 1 \mid X_{i,t}, \text{nonpayer}\right\} = M\left(X_{i,t}\beta\right). \tag{36}$$

where $Init_{i,t}$ is a binary variable which takes a value of 1 if firm i initiated a dividend in year t and 0 otherwise, and $M(\cdot)$ is the standard logistic distribution function. (36) estimates the probability that a firm pays a dividend, conditional on it being a non-payer. A firm is classified as being a non-payer if it has not paid a dividend in the 5 years prior to year t, following DeAngelo, DeAngelo, and Stulz (2006). X_i is the vector of lagged explanatory variables that are predicted to influence the dividend initiation decision. The explanatory variables directly related to the predictions in the model are as follows. $Mgr\,Own_{i,t-1}$ is the percentage of total shares outstanding owned by top management in firm i in year $t-1$, taken from Execucomp, included as a measure of managerial ownership in the firm.[29] $Inst\,Own_{i,t-1}$ is the percentage of total shares outstanding owned by the top five institutional blockholders, obtained from Thomson Reuters. It is included as a measure of the quality of corporate governance—the greater the amount of top institutional ownership, the stronger the incentive for institutional investors to monitor the firm, and hence the better the corporate governance.[30] $(R\&D/TA)_{i,t-1}$ is a measure of R&D intensity in the firm, included as a proxy for information disclosure costs; firms with higher R&D intensity have more proprietary product information, and thus stand to lose more when that information is revealed (see Bhattacharya and Ritter (1983)).[31] $\ln(TA)_{i,t-1}$ is the natural logarithm of lagged total book assets of the company, included as a measure of the size of assets in place; recall that the dividend-initiating type-N firm has higher-valued assets in place than the non-initiator in the theoretical model. $Div\,Tax_{t-1}$ is the the personal tax rate on dividend income as of the end of year $t-1$, taken from the Organization for Economic Co-operation and Development (OECD).[32] $ROA_{i,t-1}$ is the lagged return on assets, used as a proxy for profitability and hence the ability to pay dividends, as in Fama and French (2001) and DeAngelo, DeAngelo, and Stulz (2006). In order to examine the interaction of corporate governance and managerial ownership, an interaction term is also added to (36) between $Mgr\,Own_{i,t-1}$ and $Low\,Inst\,Own_{i,t-1}$, which is a dummy variable that takes a value of 1 when institutional ownership is low and 0 otherwise.[33]

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[29]This measure also includes options that are exercisable within 60 days, and unvested stock ownership.

[30]Previous papers that have used institutional ownership as a governance proxy are Berger, Ofek, and Yermack (1997) and John and Litov (2008). Other commonly-used governance proxies are the number of outside directors on the board, the size of the board of directors, and the Gompers-Ishii-Metrick (GIM) governance index, which includes many of these proxies as determinants of governance quality (see Gompers, Ishii, and Metrick (2003)).

[31]Another possible proxy for two-audience signaling costs is the number of patents possessed by the firm. One drawback of this proxy is that it may understate the firm's proprietary knowledge, since portions of such knowledge may be worth protecting even though they are not patented.

[32]This is the net personal tax on dividend income, calculated from the effective statutory rax rates on distributions of domestic income to a resident individual shareholder.

[33]This is defined as ownership by the top 5 institutional blockholders equal to less than 25% of total shares outstanding, which is roughly the median value of the variable.

My theory predicts that the probability of initiating a dividend in year t is increasing in $\ln(TA)_{i,t-1}$ and $ROA_{i,t-1}$, and decreasing in $MgrOwn_{i,t-1}$, $InstOwn_{i,t-1}$, $(R\&D/TA)_{i,t-1}$ and $DivTax_{t-1}$. It also predicts that, when managerial ownership is low enough, that the probability of initiating a dividend is decreasing in $MgrOwn_{i,t-1}$. Moreover, as the effect of managerial ownership on dividend initiation is predicted to become stronger as corporate governance gets weaker, it is expected that $MgrOwn_{i,t-1} \times LowInstOwn_{i,t-1}$ will have a negative effect.

A number of other control variables, previously shown to be important for dividends, are also included. $(Debt/TA)_{i,t-1}$ is the book value of debt scaled by total assets, as included by Brown et. al. (2007) to control for the need to service debt payments. $(M/B)_{i,t-1}$ is the lagged ratio of the market value of equity to the book value of equity, and is included as a control for investment opportunities. $(RE/TE)_{i,t-1}$ is the ratio of earned equity (retained earnings) to total equity, which DeAngelo et. al. (2006) argue is a proxy for the life-cycle stage of a firm (i.e. a higher earned equity to total equity ratio implies a greater probability of dividend payout). $(Cash/TA)_{i,t-1}$ is the lagged ratio of cash holdings scaled by total assets, included as a measure of ability to pay dividends as in Fenn and Liang (2001), Fama and French (2001), and DeAngelo et. al. (2006). Finally, $Repur_{i,t-1}$ is an indicator variable that takes a value of 1 if firm i repurchases stock in the previous year, and 0 otherwise. Stock repurchases are defined as an increase in treasury stock, as in Fama and French (2001). Bulan et. al. (2007) argue that repurchases reflect firm maturity and stabilizing cash flows—a firm that has repurchased stock is thus more likely to initiate dividends.

5.2 Data and Summary Statistics

Dividend payment data come from the CRSP database. Because the model's predictions apply to regular (not one-time special) dividends, dividend payments are restricted to those classified as ordinary cash dividends of non-monthly frequency in CRSP (distribution codes 1222, 1232, 1242, and 1252). Managerial ownership data come from the Execucomp database, and institutional ownership data from Thomson Reuters. Financial data are taken from Compustat. As is standard, I exclude public utility and financial firms (SIC codes 4900-4999 and 6000-6999) because of their special regulatory restrictions. Personal dividend tax rate data are taken from the Organization for Economic Co-operation and Development (OECD). As Execucomp data only run from 1992 to 2011, and managerial ownership is a key predictive variable in the model, the data in the sample run from 1992 to 2011. All variables except for $\ln(TA)_{i,t-1}$, $DivTax_{t-1}$, and $Repur_{i,t-1}$ are winsorized at the 1% level. Summary statistics are given in *Table 1* below.

[Insert Table 1 Here]

The data from 1992 to 2011 encompass a total of 7,319 firm-year observations and 1,003 unique firms, with a sample of 272 dividend initiations. On average, firms had an R&D intensity of 5.6% as a percentage of total assets, and held 21% of debt in their capital structure, as a percentage of total assets. The mean dividend tax rate is roughly 35%, with a maximum of 46.3%. The mean level of top executive ownership is roughly 1.5% of total shares outstanding. The lower median value for this variable indicate that the distribution for ownership is skewed. Finally, the mean level of top institutional ownership for the sample is 26%, while the median level is roughly 25.6%.

5.3 Results and Robustness

5.3.1 Main Results

The results of regression (36) are included in Table 2 below.

[Insert Table 2 Here]

Columns (1) and (2) report the results of regressions run using the entire sample, and columns (3) through (6) run regressions only for firms with levels of managerial ownership that are not high.[34] Columns (1), (3), and (5) include only the main predictive variables, while columns (2), (4), and (6) also include control variables. Overall, the results are supportive of the main predictions of the model. Focusing first on columns (1)–(4), $Inst\,Own_{i,t-1}$ enters with a negative and significant coefficient, indicating that the worse the corporate governance, the more likely a firm is to initiate a dividend, as predicted by the model. $Mgr\,Own_{i,t-1}$ is negative and insignificant in specifications (1) and (2), but is negative with signficant coefficients in specifications (3) and (4). This is consistent with the model in that higher levels of managerial ownership predict a higher probability of initiating a dividend in the following year, but only when managerial ownership is low enough.[35] $(R\&D/TA)_{i,t-1}$ also has a negative and significant coefficient in all specifications. This indicates, as predicted by the model, that firms with greater R&D intensity (and therefore a higher marginal cost of information disclosure) have a lower probability of initiating a dividend. Moreover, the coefficients on $\ln(TA)_{i,t-1}$ and $ROA_{i,t-1}$ are positive and highly significant, indicating that

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[34] A high level of managerial ownership is defined as one in which the firm's top managers own more than 5% of the total outstanding stock of the firm, which corresponds to roughly the 90th percentile of the data. Thus columns (3)-(6) only include firms with managerial ownership equal to less than 5% of total shares outstanding.

[35] The results are similar when using CEO ownership instead of top managerial ownership.

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larger total assets in place and higher profitability predict a higher probability of initiating a dividend in the subsequent year, as predicted by the model. The coefficient on $Div\,Tax_{t-1}$ is negative and significant in all but specification (2), indicating that a drop in the dividend tax rate predicts a higher probability of initiating a dividend in the next year, also consistent with the model.

Columns (5) and (6) examine the interaction between managerial ownership and governance (proxied by institutional ownership), and its effect on dividend initiation. The coefficient for $Mgr\,Own_{i,t-1} \times Low\,Inst\,Own_{i,t-1}$ is negative and significant with a larger magnitude, indicating support for the hypothesis that the effect of managerial ownership on dividend initiation is stronger when governance is weaker. However, as pointed out by Powers (2005), Ai and Norton (2003), and others, the interaction effect in a logit model cannot be interpreted in the same way as an OLS model, since the marginal effect also depends on the levels of the independent variables in a logit model. An analysis of the sign and significance of the interaction effect for various levels of the covariates is given in *Figure 3* below.[36] As can be seen, the interaction effect is consistently negative for most observations, and it is statistically signficant on average over these observations and across the range of predicted dividend initiation probabilities. This provides further supporting evidence for the direct interpretation of the interaction effect coefficient.

[Insert Figure 3 Here]

Finally, as columns (2), (4), and (6) in *Table 2* indicate, the main results are robust to the inclusion of other control variables and industry fixed effects. In all specifications, $(M/B)_{i,t-1}$ and $(Cash/TA)_{i,t-1}$ enter with insignificant coefficients. $(Debt/TA)_{i,t-1}$ enters with a negative and significant coefficient, consistent with existing empirical evidence (e.g. Fenn and Liang (2001)) that firms with higher levels of debt are less likely to pay (here, initiate) dividends. There are two possible (not mutually exclusive) explanations for this. One is that debt service drains cash flow, leaving less for dividends. The other is that having debt is a source of discipline (e.g. Hart and Moore (1994)) and lessens agency problems, reducing the need to rely on dividends to do so. $(RE/TE)_{i,t-1}$, the earned/contributed capital mix, is also insignificant. This result is at odds with DeAngelo, DeAngelo, and Stulz (2006), who argue that the retained earnings ratio is a proxy for the life-cycle of the firm and is important for overall payout. This suggests that there is a difference between overall payputs and dividend *initiations* in terms of the influence of retained earnings on the decision.[37] Finally, the indicator variable for whether a firm has repurchased stock in the

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[36]All covariates from specification (6), apart from the industry fixed effects, are included.

[37]DeAngelo, DeAngelo, and Stulz (2006) report that they re-run their specification for dividend initiations in untabulated results, and find that the earned/contributed capital mix is still significant. This runs counter

previous year, $Repur_{i,t-1}$, is positive and significant, suggesting that firms that repurchase stock in a given year are more likely to initiate a dividend in the following year. This is consistent with the evidence in Bulan et. al. (2007), as well as life-cycle explanations of dividend payout.[38]

5.3.2 Robustness: Hazard Specification

An alternative way to estimate the probability of dividend initation is through survival analysis, which analyzes the time until an event of interest occurs. More specifically, define the initial state or "risk set" to be the set of firms which have not initiated a dividend since their IPO date. Define T to be firm age, or the time that a firm has spent in the initial state, i.e. the amount of time since a firm's IPO until that firm initiates a dividend. A "failure" is then defined as an event which moves a firm out of the "risk set" or initial state—in other words, a dividend initiation. The hazard function is then defined as the instantaneous probability of leaving the initial state at any point of time, i.e., the probability of a firm initiating a dividend at any time t as a function of IPO age T, given that the firm has not previously paid a dividend:

$$\psi(t) \equiv \lim_{\triangle t \to 0} \frac{\Pr\left[t \leq T < t + \triangle t \mid T \geq t\right]}{\triangle t} = \frac{q(t)}{1 - Q(t)}, \tag{37}$$

where $Q(t) = \Pr(T \leq t)$ is the probability that a dividend is initiated at or before t, and $q(t) = Q'(t)$. A Cox Proportional Hazard model allows the hazard function to depend on both IPO time and firm characteristics. It estimates the hazard function as a product of a baseline hazard function which only depends on time since IPO, and another function reflecting firm characteristics:

$$\psi\left(t, x_i\right) = \psi_0(t) \exp\left[X_i'\beta\right]. \tag{38}$$

In (38), $\psi_0(t)$ is the baseline hazard function which describes the risk of initiating a dividend solely as a function of time since the IPO (i.e. with all X_i variables equal to 0), and $\exp\left[X_i'\beta\right]$ is an adjustment factor that depends upon the firm characteristics X_i defined in section 5.1. The Cox proportional hazard model obtains maximum likelihood estimates of the β coefficients in (38), relative to the baseline hazard rate.

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to my results.

[38]One possible concern with the analysis is that the results may be partly driven by the financial crisis which began in 2007. In order to mitigate this concern, the logit analysis is re-run in untabulated results excluding the years of the financial crisis, 2007-2011. The results are qualitatively similar to those in table 2.

Table 3 below gives the results of regression (38). It reports hazard ratios, estimates of $\exp(\beta)$, for each variable, which indicate proportional changes relative to the baseline hazard ratio. The interpretation is as follows. Suppose a variable has a hazard ratio of 1.1. This indicates that firm with a one unit higher value for the variable is 10% *more* likely to initate a dividend. Alternatively, suppose the variable has a hazard ratio of 0.90. This indicates that firm with a one unit higher value for the variable is 10% *less* likely to initate a dividend. Thus, a coefficient greater than 1 in *Table 3* indicates the probability of dividend initiation is increasing in that variable, while a coefficient less than 1 indicates that the probability of dividend initiation is decreasing in that variable.

[Insert Table 3 Here]

As in Section 5.3, specifications (1) and (2) include all firms, while specifications (3) through (6) exclude firms with high levels of managerial ownership. Columns (1), (3), and (5) include only the main predictive variables from the theoretical model, while columns (2), (4), and (6) include control variables. The overall results are consistent with the pooled logit estimation in Section 5.3. In all specifications, $\ln(TA)_{i,t-1}$ has a hazard ratio that is greater than 1 and significant, indicating that the probability that a firm initiates a dividend is increasing in total assets. $DivTax_{t-1}$ and $(R\&D/TA)_{i,t-1}$ both have statistically significant hazard ratios that are less than 1 in all specifications, indicating that the probability of initiating a dividend is decreasing in R&D intensity, and in the dividend tax rate. $MgrOwn_{i,t-1}$ has a hazard ratio that is less than 1 in all specifications, indicating that the probability of initiating a dividend is decreasing in managerial ownership. However, as in Section 5.3, it is significant when managerial ownership is low enough (i.e. in columns (3) and (4)). In addition, $InstOwn_{i,t-1}$ has a hazard ratio that is less than 1 and significant in all specifications, meaning that the probability of dividend initiation is higher when corporate governance is worse. The interaction effect has a hazard ratio that is less than 1 and significant in both columns (5) and (6), again indicating that the effect of managerial ownership on dividend initiation becomes stronger as corporate governance gets weaker. The results for the various control variables, including their significance, are consistent with the results in Section 5.3.[39]

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[39] Another alternative specification is to use a Fama and MacBeth (1973) procedure, which is used in the predictive logit regressions of payout by Fama and French (2001) and DeAngelo, DeAngelo, and Stulz (2006). One drawback of the approach is that, due to the estimation of the equation each year, the dividend tax rate variable cannot be included in the regressions. In untabulated results, I confirm that the Fama-MacBeth approach yields qualitatively similar results.

5.4 A Test of Information Disclosure Costs and Dividend Initiations

5.4.1 Motivation and Graphical Analysis

A central prediction of the model is that the probability of initiating a dividend is decreasing in the potential loss in value from the information disclosure and transaction costs associated with secondary equity issues. In Sections 5.3 and 5.4, R&D intensity serves as a proxy for these information disclosure costs. However, such a proxy is not clean, as R&D costs may be related to various other characteristics related to the dividend initiation decision. Moreover, the inclusion of R&D in a panel regression does not establish causality with respect to the decision to initiate a dividend. This section attempts to overcome this endogeneity problem by employing a regression discontinuity methodology that relies on a market-value-based change in reporting requirements for firms introduced by the Sarbanes-Oxley Act (SOX) that was passed in July 2002. Compliance with the Act was required by the end of 2004.

Section 404 of the Sarbanes-Oxley Act required firms with a public float (market value of all shares held by outsiders) above $75 million to disclose additional information to the market in the form of a "management" report, which includes an assessment of the quality of the firm's financial-reporting-related controls and the risks of the firm.[40] Thus, in 2004 and beyond (when firms were officially required to be in compliance), firms faced a mandatory increase in information disclosure requirements when they reached a public float of $75 million. This means that the *incremental* cost of *discretionary* information disclosure related to the "two-audience" signaling problem of Bhattacharya and Ritter (1983) went down in 2004 for firms reaching the $75 million threshold, since they had to disclose more information anyway. The model developed here predicts that, compared to firms that are just to the left of the $75 million public-float threshold, λ decreases after 2004 for firms that are just to the right of the threshold. So for firms in the immediate neighborhood of the $75 million threshold, dividend initiations should be greater for firms just above $75 million than for those just below $75 million during 2004–2012.

A graphical analysis provides some preliminary evidence consistent with the predictions of my model. *Figure 4* shows the percentage of dividend initiations per public-float bucket

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[40]Section 404 requires all firms subject to the rule to file a "Management Report", in which the manager has to opine on the quality of the firm's "Internal Control over Financial Reporting"—potential risks in the financial reporting that may lead to misrepresentation or fraud. Examples of risks include inaccurate recordings of sales revenues. An independent auditor's report must also be included. The SEC exempted firms with public floats below $75 million from full compliance with Section 404 (specifically the independent auditor's attestation) until June, 2010; the Dodd-Frank Act then made this exemption permanent. As noted by Iliev (2010) and Cortes (2013), who also exploit this discontinuity in reporting requirements, Section 404 compliance entails significant costs for firms.

from 2004 to 2011.[41] In the figure, the focus is on public-float buckets on either side of the $75 million threshold. Overall the graph is supportive of the predictions of the model. In the post-SOX period, the rate of dividend initiations is strikingly higher for the $75-$120 public float bucket than for the adjacent bucket. These effects are consistent with the predictions of the model—as a result of Sarbanes-Oxley, firms immediately to the right of the $75 million public-float threshold experienced a decrease in the marginal cost of information disclosure, and thus a decrease in the cost of initiating dividends. These firms subsequently increased their rates of dividend initiation.

[Insert Figure 4 Here]

5.4.2 Regression Discontinuity Methodology and Data

The idea behind the regression discontinuity design is that, given that the $75 million public-float threshold is an arbitrary cutoff based on the law, a discontinuous jump in the probability of dividend initiation for firms with public floats immediately to the right of $75 million compared to firms with market values immediately to the left of $75 million can be interpreted as the causal impact of the treatment (the increased information disclosure) on firms.[42]

The mandatory nature of the well-defined $75 million threshold indicates the appropriateness of a sharp regression discontinuity design. Specifically, the following logit regression is estimated from 2004 and onwards:

$$Init_{i,t} = \Phi\left(\alpha + \rho T_{i,t} + f\left(MPFloat_{i,t}\right) + \varepsilon_{i,t}\right). \tag{39}$$

In regression (39), $MPFloat_{i,t}$ is the running maximum public float that firm i has attained from 2004 until year t. The running variable is defined in this way to reflect the fact that compliance with the law is essentially a one-way door—once a company is required to file a manager's report initially, it then must file one subsequently.[43] f represents a flexible polynomial function—the results are shown for linear (1st-order), 5th-order, and 7th-order

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[41]Percentage of dividend initiations are defined as the number of dividend initiations in a public float bucket divided by the total number of firms in that bucket in a given year. The graphs are similar if one uses the number of initiations divided by the number of firm-years in each bucket.

[42]This focus on firms around $75 million in public float is also ideal for testing the information-disclosure predictions of the model since these are smaller firms, and thus there is less information about their future prospects (so they are likely to have higher values of λ).

[43]As noted by Iliev (2010), if a firm has revenues and a public float of less than $25 million for two consecutive years, it then is no longer required to file a manager's report unless it reaches the $75 million public float threshold once again. This is accounted for in the definition of $MPFloat_{i,t}$ (i.e. $MPFloat_{i,t}$ is reset to be equal to the current public float, rather than the maximum, in years when the public float and revenues of the firm are less than $25 million for two consecutive years). Not accounting for this yields unchanged results.

polynomial terms. $T_{i,t}$ is an indicator function which takes a value of 1 if $MPFloat_{i,t}$ is greater than or equal to \$75 million. $Init_{i,t}$, as before, is a binary variable which takes a value of 1 if firm i initiated a dividend in year t and 0 otherwise. The main specification of regression (39) is estimated for firm-years where the running maximum public floats fall within the bandwidth of \$50 million and \$100 million during the sample period. This bandwidth is used by Iliev (2010) and Cortes (2013), who also exploit the introduction of Section 404 using a regression discontinuity design. Robustness with respect to alternative bandwidths is discussed later. Regression (39) is a sharp regression discontinuity design— treatment status (i.e. being required to file a manager's report) is a deterministic function of $MPFloat_{i,t}$. It is therefore not necessary to control for covariates in (39). However, for robustness, (39) is also estimated while including industry and year fixed effects, as well as various control variables from Section 5.1.[44]

A key assumption of the regression discontinuity design is no self-selection into the treatment group. In other words, firms must not be able to perfectly control passage from the control to the treatment groups. Section 5.4.5 verifies that this assumption holds.

For regression (39), I take public float data from Thomson Reuters Datastream and use all firms from the NYSE and NASDAQ for which Datastream contains data for the percentage of shares outstanding that are held by outsiders (free float shares). The public float is then calculated by multiplying this number by the market value of equity of the firm in year t (which in turn is defined by the total number of shares outstanding multiplied by the stock price). As before, I exclude public utility and financial firms (SIC codes 4900-4999 and 6000-6999). The resulting sample runs from 2004 to 2011, and contains 1,371 firm-years of data for 444 different firms when considering a running maximum public float bandwidth of \$50 million to \$100 million. The sample grows to 6,838 firm-years for 1,424 firms when expanding the bandwidth to \$0 million through \$150 million.

5.4.3 Results and Discussion

The results of regression (39) are given in Panel A of *Table 4* below:

[Insert Table 4 Here]

Column (1) gives the main specification, with $MPFloat_{i,t}$ falling within a bandwidth of \$50 million to \$100 million, and including up to 5th degree polynomial terms for $MPFloat_{i,t}$.

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[44]The controls include: $ROA_{i,t}$, $(Cash/TA)_{i,t}$, $(M/B)_{i,t}$, $(Debt/TA)_{i,t}$, $(RE/TE)_{i,t}$, and $Repur_{i,t}$. Each of these variables is winsorized at the 1% level. Ownership variables are not included because the values are missing for many of the firms in this size range. The results are similar when using a lagged specification instead of a contemporaneous one.

As can be seen in the table, the estimator is positive and significant, indicating that the probability of dividend initiation increases discontinuously immediately to the right of the $75 million public float threshold. *Figure 5* below graphically depicts this probability as a function of the maximum running public float, and shows the sharp discontinuous increase at the $75 million threshold. Column (2) includes controls, as well as industry and year fixed effects, while again using a $50 to $100 million bandwidth and up to a 5th-order polynomial.[45] The estimator is robust to the additional controls, and remains positive and significant.

[Insert Figure 5 Here]

Regression discontinuity designs are most valid for estimates in a relatively small neighborhood around the cutoff. However, the difficulty here is that the number of firms initiating dividends is relatively low for firms-years within the $50 to $100 million running maximum public float bandwidth. This raises the concern that the estimates do not have sufficient power. To address this concern, columns (3) and (4) in Panel A of *Table 4* re-estimate equation (39) using a bandwidth of $0 to $150 million for the running maximum public float, and including up to a 7th-order polynomial for the running variable.[46] Column (3) provides the base estimates, while column (4) includes controls and fixed effects. The results from both columns show that the regression discontinuity estimator is again positive and significant. These results are consistent with the previous estimates and the predictions of the theory.

The regression discontinuity estimates above are parametric, in the sense that they depend on the choice of functional form through the use of polynomials. Thus, these estimates are dependent on the accuracy of the chosen polynomial functional form in fitting the data. An alternative in the literature is the use of nonparametric methods, such as a local linear regression in a narrow bandwidth around the cutoff (e.g. Hahn, Todd, and Van der Klaauw (2001)), which is precluded here due to the small number of dividend initiations in the optimal bandwidth. However, another alternative is the robustness test suggested by Angrist and Pischke (2008)—although the precision of estimates may go down as the bandwidth decreases, the number of polynomial terms needed to model $f\left(MPFloat_{i,t}\right)$ in (39) should also go down, while the effect of $T_{i,t}$ remains. With this in mind, (39) is re-estimated in column (5) in Panel A of *Table 4* using a smaller bandwidth of $65 million to $85 million for the running maximum public float and up to 3rd order polynomial terms.[47] The regression discontinuity estimate remains similar in magnitude and significance, even with fewer polynomial terms. This provides additional evidence on the robustness of the results.

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[45]The use of polynomials is to control for a potentially nonlinear trend relationship between the running variable and outcome variables.

[46]This expands the sample to 6,838 firm-years for 1,424 different firms. The number of dividend initiations increase from 15 to 39 when using this expanded bandwidth.

[47]The results are unchanged when using a linear or quadratic specification with this bandwidth.

5.4.4 Robustness: Falsification Test

A possible concern with the above results is that there is a trend with respect to larger public floats that is not captured by the polynomial functions, and which has nothing to do with the $75 million public float information requirement. To address this concern, I provide a falsification test, by re-estimating the results while falsely specifying the public float cutoff to be a value other than $75 million (while using similar bandwidths to the estimates before). The estimates are provided in Panel B of *Table 4*. For each cutoff value for $MPFloat_{i,t}$ and each bandwidth, the regression discontinuity estimator is insignificant. This provides additional evidence that the effect is specific to the $75 million public float information requirement introduced by Section 404 of the SOX.

5.4.5 Robustness: Threshold Manipulation

The validity of the regression discontinuity design rests on the assumption that firms cannot perfectly manipulate their public float to choose the side of the $75 million cutoff they are on. One way that firms may do so is through changes in investment or payout policy. Another way is through earnings management. It is well documented that firms in general "manage" their earnings (e.g. Dechow, Sloan, and Sweeney (1995), and Kothari, Leone, and Wasley (2005)). It is conceivable that a firm that is close to the $75 million public float threshold may manage earnings downward in order to avoid hitting the threshold and thus avoid the SOX requirements.[48]

The empirical evidence regarding active manipulation on the part of firms around this $75 million cutoff is mixed. For example, Iliev (2010) finds significant earnings management amongst firms facing large compliance costs, but focuses only on firms in 2004. In a larger sample from 2005 to 2010, Cortes (2013) finds no evidence of active manipulation by firms in general (through examining bunching around the threshold) and also specifically through changes in capital expenditures or payout policy. He does not specifically examine earnings management, however.

In order to test for whether there is significant earnings management by firms in my sample, I estimate discretionary accruals, a widely used measure for earnings management in the accounting literature, for firms close to the $75 million public float threshold. Discretionary accruals are calculated using two different measures. The first measure is referred to as Jones Model Discretionary Accruals, and follows Jones (1991). Let $(Total\, Accruals)_{i,t}$ represent total accruals for firm i as of year t, which is defined as the one-year change in current liabilities exceeding current long-term debt, minus depreciation and amortization.

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[48]I thank Antoinette Schoar for suggesting that I investigate this.

Then discretionary accruals are defined as:

$$(Discr\,Accruals)_{i,t} = (Total\,Accruals)_{i,t} - (Non\,Discr\,Accruals)_{i,t}, \qquad (40)$$

where $(Non\,Discr\,Accruals)_{i,t}$ represents non-discretionary accruals. Non-discretionary accruals are defined by the Jones Model:

$$(Non\,Discr\,Accruals)_{i,t} = \alpha_0/TA_{i,t-1} + \alpha_1\,(\triangle Sales_{i,t}/TA_{i,t-1}) + \alpha_2\,(PPE_{i,t}/TA_{i,t-1}). \quad (41)$$

The estimates for the parameters in (41) must be estimated econometrically using:

$$(Total\,Accruals)_{i,t} = \tilde{\alpha}_0/TA_{i,t-1} + \tilde{\alpha}_1\,(\triangle Sales_{i,t}/TA_{i,t-1}) + \tilde{\alpha}_2\,(PPE_{i,t}/TA_{i,t-1}) + \varepsilon_{i,t}, \quad (42)$$

where $TA_{i,t-1}$ is lagged total assets, $\triangle Sales_{i,t}$ is the change in sales, and $PPE_{i,t}$ is property, plant, and equipment. Regression (42) is estimated cross-sectionally for each year, using all firm-year observations in the same two-digit SIC industry. Using the parameter estimates obtained from (42), non-discretionary accruals are calculated for each firm-year using the Jones Model, equation (41).

The second measure, a modification of the Jones model, follows from Kothari, Leone, and Wasley (2005), includes $ROA_{i,t-1}$ as a performance measure. Thus, (41) and (42)become:

$$
\begin{aligned}
(Non\,Discr\,Accruals)_{i,t} &= \beta_0/TA_{i,t-1} + \beta_1\,(\triangle Sales_{i,t}/TA_{i,t-1}) + \beta_2\,(PPE_{i,t}/TA_{i,t-1}) \\
&\quad + \beta_3 ROA_{i,t-1}, \qquad\qquad\qquad\qquad\qquad\qquad (43)
\end{aligned}
$$

$$
\begin{aligned}
(Total\,Accruals)_{i,t} &= \tilde{\beta}_0/TA_{i,t-1} + \tilde{\beta}_1\,(\triangle Sales_{i,t}/TA_{i,t-1}) + \tilde{\beta}_2\,(PPE_{i,t}/TA_{i,t-1}) \\
&\quad + \tilde{\beta}_3 ROA_{i,t-1} + \varepsilon_{i,t}. \qquad\qquad\qquad\qquad\qquad (44)
\end{aligned}
$$

The parameters are estimated in the same way as described above, and discretionary accruals are then calculated using (40).

The regression discontinuity methodology of the previous sections is extended to see if there is any significant difference in earnings management between firms with public floats on either side of the \$75 million threshold subsequent to 2004. Thus, the following regression is estimated:

$$(Discr\,Accruals)_{i,t} = \alpha + \rho T_{i,t} + f\,(MPFloat_{i,t}) + \varepsilon_{i,t}, \qquad (45)$$

where $MPFloat_{i,t}$ is the running maximum public float that firm i has attained from 2004 until year t, $T_{i,t}$ is an indicator function which takes a value of 1 if $MPFloat_{i,t} \geq \$75$

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million, and f represents a flexible polynomial function. (45) is estimated for the same bandwidths and using the same polynomial terms as in Section 5.4.3. If firms are using earnings management to manipulate their public float around the \$75 million threshold, then the estimate for ρ in (45) should be significant—firms to the immediate left of the threshold would have a stronger incentive to use earnings management to avoid compliance than firms that are already required to comply.

The estimation results for (45) are given in *Table 5* below. Panel A of *Table 5* gives the results for discretionary accruals estimation using equations (40)–(42), while Panel B gives the results for discretionary accruals estimation using equations (43) and (44).

[Insert Table 5 Here]

As can be seen in the table, the coefficients for the regression discontinuity estimator are insignificant in all specifications, using both the Jones Model and the Modified Jones-Performance Model to calculate discretionary accruals. Thus, there seems to be no difference in earnings management between firms on either side of the \$75 million public float threshold, suggesting that earnings management is not affecting the results.

6 Conclusion

This paper develops a dynamic model of dividend initiation. The key new results of the theory are as follows. First, apart from the effects of previously-documented variables, the probability of dividend initiation is decreasing in the size of the manager's ownership, and this effect is stronger when corporate governance is weaker. Second, the probability of dividend initiation is decreasing in the potential value loss from the two-audience information disclosure costs accompanying the external financing necessitated by dividend payments. Third, there is an endogenously-arising negative price reaction to a dividend cut that is larger in absolute magnitude than the positive announcement effect of a dividend initiation; this rationalizes a reluctance to cut dividends and the consequent downward rigidity of dividends. Additionally, the model produces results consistent with previous theories, such as positive announcment effects of dividend initiations.

The two novel predictions of the theory are then confronted with the data: (i) the probability of dividend initiation is decreasing in managerial ownership, and this effect is stronger when corporate governance is weaker; and (ii) the dividend initiation probability is decreasing in the *incremental* information-disclosure costs associated with external equity financing. Empirical tests using a predictive logit model of dividend initiations provide support

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for these predictions. The second prediction is also tested by exploiting an information-disclosure-requirement discontinuity (at a public float of \$75 million) introduced by SOX. Using a regression discontinuity design, I find that, after SOX passed, firms with public floats just above \$75 million were significantly more likely to initiate dividends than firms with public floats below \$75 million. The results survive several robustness checks, including differing bandwidths in the regression discontinuity, a falsification test, checking threshold manipulation, and the impact of earnings management.

Future research could examine whether the reduction in systematic risk subsequent to a dividend increase documented by Grullon, Michaely, and Swaminathan (2002) can be explained by the information-disclosure-cost argument. Is it the case that mature firms reduce R&D, which decreases their systematic risk as well as two-audience information disclosure costs, thereby leading to the conditions that are more conducive to a dividend initiation/increase?

Appendix

Proof of Lemma 1: The proof follows directly from the fact that $1 in excess cash distributed to the shareholders via a repurchase is worth $1 to them. If kept on the balance sheet, it is worth $\delta \in (0, 1)$ at a future date. ∎

Proof of Lemma 2: For the type-N firm's manager to prefer project G over project P, a sufficient condition is that

$$[1 - \alpha_0] \left\{ [1 - \lambda]\theta^- \hat{V} - [2I - V] \right\} \geq [1 - q]B_{max}. \tag{A.1}$$

Rearranging, this means

$$q \geq 1 - [1 - \alpha_0] \left\{ [1 - \lambda]\theta^- \hat{V} + V - I - I \right\} B_{max}^{-1}. \tag{A.2}$$

Since $V - I > 0$ and $I < Ig_f^{-1}$, we see that (3) guarantees that (A.2) holds. ∎

Proof of Lemma 3: In the conjectured equilibrium, only the type-N^- firm or an observationally identical type-L firm will find itself in nodes 3-6. The only purpose of expending the personal cost K to credibly communicate to the board that the firm is type N and not type L is to get the board's approval to sell the assets in place to pay a dividend. But since the assets in place of any firm other than the type-N^+ firm have zero value, it does not pay for the manager to expend K. ∎

Proof of Lemma 4: A sufficient condition for the type-N^+ firm's manager to prefer project G over project P is (using (21) and (23)):

$$[1 - \alpha_0] \left\{ [1 - \lambda]\theta^+ \hat{V} + A - (2I - V[1 - \lambda]) \right\} \geq [1 - q] [B_{max} + A]. \tag{A.3}$$

Since $A > I$, upon rearranging it can be seen that (A.3) holds, given (4). ∎

Proof of Proposition 1: Given the conjectured investor inferences at $t = 2$ in response to a dividend cut, the manager will view his wealth as 0 if the board does not approve a sale of the assets in place in order to pay a dividend. Moreover, the board will not approve this unless the manager can convince them that the firm is type N. If the manager expends K to communicate that the firm is type N, his wealth is:

$$[1 - \alpha_0] \left\{ [1 - \lambda]\theta^+ \hat{V} + I[1 - \tau] - I \right\}, \tag{A.4}$$

where $I[1-\tau]$ is the after-tax dividend received and I is the expected payment out of second-period project cash flow to the new shareholders who provide project funding at $t = 2$. For the manager to wish to expend a personal cost of K, it must be true that

$$[1 - \alpha_0]\left\{[1 - \lambda]\theta^+\hat{V} + I[1 - \tau] - I\right\} \geq K, \tag{A.5}$$

which is guaranteed by (6). Prior to the assets being liquidated, the shareholders' posterior beliefs that the probability the firm is type N after its first-period project fails is g_2 (see (26)). Given (5), the firm clearly cannot raise enough funding externally to finance the second-period project *and* pay a second-period dividend, necessitating the asset sale. The shareholders assess their (pre-asset liquidation) expected wealth as:

$$\alpha_0 g_2 \left\{[1 - \lambda]\theta^+\hat{V} - I\tau\right\}, \tag{A.6}$$

which is (27). ∎

Proof of Lemma 5: Since the beliefs of the firm's board of directors, *after* having signaled that the firm is either $\theta = \theta^-$ or $\theta = \theta^+$, conditional on being type N, are identical to the beliefs of other investors in the market, the board views any equity issue as being correctly priced. Hence, it will invest in the project with external financing if

$$\theta^-[1 - \lambda]V > I, \tag{A.7}$$

$$\theta^+[1 - \lambda]V > I, \tag{A.8}$$

and it will invest in the project with internal financing if

$$\left[\theta^-V\right]h\left(\theta^-\right) > I, \tag{A.9}$$

$$\left[\theta^+V\right]h\left(\theta^+\right) > I. \tag{A.10}$$

Given (1), we see that (A.6)–(A.9) are satisfied. ∎

Proof of Lemma 6: If the shareholders did not initiate a dividend at $t = 0$ and the first-period project paid off, then they can finance the second-period project internally if they wish. The comparison here is between nodes 3 and 4. In node 3, external financing ensures that it is incentive compatible for the manager to choose project G, so the shareholders'

expected wealth is:

$$\alpha_0 \left\{ [1 - \lambda]\theta^- \hat{V} + V - 2I + I[1 - \tau] \right\}$$
$$= \alpha_0 \left\{ [1 - \lambda]\theta^- \hat{V} + V - I - I\tau \right\} \tag{A.11}$$

In node 4, the shareholders' expected wealth is:

$$\alpha_0 \left\{ h\left(\theta^-\right) \left[\theta^- \hat{V} \right] + V - I \right\}. \tag{A.12}$$

For the shareholders to prefer not to initiate a dividend, it must be true that (A.12) exceeds (A.11). A sufficient condition for this is that:

$$h\left(\theta^-\right) \left[\theta^- \hat{V} \right] > [1 - \lambda]\theta^- \hat{V}, \tag{A.13}$$

which holds given (30). ∎

Proof of Lemma 7: If the shareholders did not initiate a dividend at $t = 0$, then it is known that in a separating equilibrium the firm is type N^- (or type L). If the first-period project does not pay off, then the only way for the firm to both invest in the second-period project and pay a dividend is to liquidate assets in place, given that Lemma 5 asserts that the firm always chooses to invest in its second-period project. But such a firm has no assets in place of any value. Thus, it does not pay for the shareholders to initiate a dividend. ∎

Proof of Lemma 8: It will be shown that if investors know as much as the firm's board of directors about the firm's type (i.e. whether it is type N^- or type N^+), then the type-N^- firms will prefer the strategy of not paying dividends at $t = 0$ and $t = 2$ to that of paying dividends at both dates, the type-N^+ firms will prefer to pay $d = I$ at $t = 0$ and $t = 2$ rather than set $d = 0$ on both dates. Let $W_1^S(\theta)$ be the expected wealth of the shareholders at $t = 0$ if they choose not to initiate a dividend, and $W_2^S(\theta)$ the expected wealth of the shareholder if they choose to initiate a dividend at $t = 0$.

Then the type-N^- and type-N^+ firms will choose the conjectured strategies if:

$$W_2^S\left(\theta^+\right) \geq W_1^S\left(\theta^+\right), \tag{A.14}$$

and

$$W_1^S\left(\theta^-\right) \geq W_2^S\left(\theta^-\right), \tag{A.15}$$

with strict inequality for at least one of the above.

Now

$$W_1^S\left(\theta^+\right) = \alpha_0 g\left\{h\left(\theta^+\right)\theta^+\left[V - I + h\left(\theta^+\right)\left[\theta^+\hat{V}\right]\right]\right\}$$
$$+\alpha_0 g\left\{\left[h\left(\theta^+\right)\left[1 - \theta^+\right] + \left[1 - h\left(\theta^+\right)\right]\right]\left[g_f[1 - \lambda]\theta^+\hat{V} - I\right]\right\}. \quad \text{(A.16)}$$

Let us compare (A.16) to (32). Collect the following terms in (32):

$$D_1 \equiv \frac{-I\tau}{\theta^+ g} + V[1 - \lambda] - I\tau + [1 - \lambda]\theta^+\hat{V} + A - I, \quad \text{(A.17)}$$

Moreover, collect the following terms in (A.16):

$$D_2 \equiv h\left(\theta^+\right)\left[V - I + h\left(\theta^+\right)\left[\theta^+\hat{V}\right]\right]. \quad \text{(A.18)}$$

Now, given (33), we see that

$$D_1 > D_2. \quad \text{(A.19)}$$

This implies that

$$\alpha_0\left\{I[1 - \tau] - I + \theta^+ g\left[V[1 - \lambda] + I[1 - \tau] - 2I + A + [1 - \lambda]\theta^+\hat{V}\right]\right\}$$
$$> \alpha_0 g\left\{h\left(\theta^+\right)\theta^+\left[V - I + h\left(\theta^+\right)\left[\theta^+\hat{V}\right]\right]\right\}. \quad \text{(A.20)}$$

As for the remaining terms, we have $\alpha_0\left[1 - \theta^+\right]g\left[\{1 - \lambda\}\theta^+\hat{V} - I\tau\right]$ in (32) and $\alpha_0 g\left\{h\left(\theta^+\right)\left[1 - \theta^+\right] + \left[1 - h\left(\theta^+\right)\right]\right\}\left\{g_f[1 - \lambda]\theta^+\hat{V} - I\right\}$ in (A.16). Both of these terms converge to 0 as $\theta^+ \to 1$. Thus, by continuity, for θ^+ high enough, these terms can be ignored. This proves that

$$W_2^S\left(\theta^+\right) > W_1^S\left(\theta^+\right). \quad \text{(A.21)}$$

Now, $W_1^S\left(\theta^-\right)$ is given by (31), and

$$W_2^S\left(\theta^-\right) = \alpha_0\left\{I[1 - \tau] - I + \theta^- g\left[V[1 - \lambda] - I - I\tau + [1 - \lambda]\theta^-\hat{V}\right]\right\}. \quad \text{(A.22)}$$

We can write (31) as:

$$W_1^S\left(\theta^-\right) = \alpha_0 g\left\{h\left(\theta^-\right)\theta^-\left[V - I + h\left(\theta^-\right)\left[\theta^-\hat{V}\right]\right] + Q\right\}, \quad \text{(A.23)}$$

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where Q is a positive quantity. Now, comparing (A.22) and (A.23), we see that

$$
\begin{aligned}
\left[h\left(\theta^-\right)\right]^2 \left[\theta^- \hat{V}\right] &> [1 - \lambda] \left[\theta^- \hat{V}\right] \\
&> [1 - \lambda] \left[\theta^- \hat{V}\right] - I\tau,
\end{aligned}
\tag{A.24}
$$

where the first inequality follows from (34). Moreover, from (34) and (33), we have

$$
\begin{aligned}
h\left(\theta^-\right) [V - I] &> [1 - \lambda][V - I] \\
&= [1 - \lambda]V - I + I\lambda \\
&> V[1 - \lambda] - I + I[1 - \tau] \\
&> \theta^- g \{V[1 - \lambda] - I\} + I[1 - \tau].
\end{aligned}
\tag{A.25}
$$

From (A.24) and (A.25), it is clear that

$$
W_1^S\left(\theta^-\right) > W_2^S\left(\theta^-\right).
\tag{A.26}
$$

This establishes that if the investors know as much as the board, the type-N^- firm will not pay any dividend at $t = 0$ and $t = 2$, whereas the type-N^+ firm will pay $d = I$ at $t = 0$ and $t = 2$. ∎

Proof of Proposition 2: To prove that the type-N^- and type-N^+ firms will play the strategies stipulated in the proposition, it is necessary to first establish incentive compatibility (IC) along the path of play. For this, let $W^S\left(\bar{\theta} \mid \theta\right)$ be the wealth of the initial ($t = 0$) shareholders of a type-N firm with θ when it adopts the equilibrium strategy of a type-$\bar{\theta}$ firm (i.e. "reports" that it is a type-$\bar{\theta}$ firm). The IC constraints are:

$$
W^S\left(\theta^+ \mid \theta^+\right) \geq W^S\left(\theta^- \mid \theta^-\right),
\tag{A.27}
$$

$$
W^S\left(\theta^- \mid \theta^-\right) \geq W^S\left(\theta^+ \mid \theta^-\right),
\tag{A.28}
$$

with at least one strict inequality in a separating sequential equilibrium. Now, from Lemma 8, we know that $W^S\left(\theta^+ \mid \theta^+\right) \equiv W_2^S\left(\theta^+\right) > W_1^S\left(\theta^+\right)$ and since $W_1^S\left(\theta^+\right) > W^S\left(\theta^- \mid \theta^-\right)$, it is clear that (A.27) holds as a strict inequality. To prove (A.28), note that $W^S\left(\theta^- \mid \theta^-\right) \equiv W_1^S\left(\theta^-\right)$, and that the amount of ownership that the initial shareholders will have to give up to raise I at $t = 0$ if they of the type-N^- mimic the type-N^+ firm and initiate a dividend at $t = 0$ is $\alpha_n\left(\theta^+\right)$, given by:

$$
\alpha_n\left(\theta^+\right) = \frac{I}{W\left(\theta^+\right)},
\tag{A.29}
$$

where

$$W\left(\theta^+\right) \equiv \theta^+ g\left\{V[1-\lambda]+I[1-\tau]-2I+A+[1-\lambda]\theta^+\hat{V}\right\}$$
$$+\left[1-\theta^+\right]g\left\{[1-\lambda]\theta^+\hat{V}-I\tau\right\} \tag{A.30}$$

is the ex-first-period-dividend value investors assign to a firm they believe is type-N^+. Next, one can write:

$$W^S\left(\theta^+ \mid \theta^-\right)=\alpha_0 I[1-\tau]+\alpha_0\left[1-\alpha_n\right]\theta^- g\left\{I[1-\tau]+[1-\hat{\alpha}_n]\left[[1-\lambda]\theta^-\hat{V}\right]\right\}, \tag{A.31}$$

where α_n is the share of ownership the initial shareholders have to surrender to new share-holders at $t=0$ in exchange for external financing, and $\hat{\alpha}_n$ is the share of ownership that must be surrendered at $t=2$ in order to raise second-period external financing. By the competitive pricing condition,

$$\hat{\alpha}_n[1-\lambda]\theta^+\hat{V}=2I-V(1-\lambda), \tag{A.32}$$

since external financing sought in the second period, conditional on first-period project success, is $2I-V(1-\lambda)$. Substituting for $\hat{\alpha}_n$ from (A.32) into (A.31) gives:

$$W^S\left(\theta^+ \mid \theta^-\right)=\alpha_0 I[1-\tau]+\alpha_0\left[1-\alpha_n\right]\theta^- g\left\{I[1-\tau]+\left[1-\frac{[2I-V[1-\lambda]]}{[1-\lambda]\theta^+\hat{V}}\right][1-\lambda]\theta^-\hat{V}\right\}. \tag{A.33}$$

Upon simplification, we have:

$$W^S\left(\theta^+ \mid \theta^-\right) < \alpha_0 I[1-\tau]$$
$$+\alpha_0\theta^- g\left[V[1-\lambda]-I\tau-I+[1-\lambda]\theta^-\hat{V}+I-I\left\{\frac{2\theta^--\theta^+}{\theta^+}\right\}-\alpha_n\triangle\right], \tag{A.34}$$

where $\triangle \equiv I[1-\tau]+\left[1-\frac{2I-V[1-\lambda]}{[1-\lambda]\theta^+\hat{V}}\right][1-\lambda]\theta^-\hat{V}$.

Let us now compare (A.23), which gives us $W^S\left(\theta^- \mid \theta^-\right)$, and (A.34). It was shown in the proof of Lemma 8 that $[h\left(\theta^-\right)]^2\left[\theta^-\hat{V}\right] > [1-\lambda]\theta^-\hat{V} > [1-\lambda]\theta^-\hat{V}-I\tau$, and $h\left(\theta^-\right)[V-I] > \theta^- g\left[V[1-\lambda]-I\right]+I[1-\tau]$. Thus, to prove that $W^S\left(\theta^- \mid \theta^-\right) > W^S\left(\theta^+ \mid \theta^-\right)$, it is useful

to begin by noting that in (A.23),

$$
\begin{aligned}
Q &= \left\{ h\left(\theta^-\right)\left[1 - \theta^-\right] + \left[1 - h\left(\theta^-\right)\right] \right\} \left\{ g_f[1 - \lambda]\theta^- \hat{V} - I \right\} \\
&= \left\{ 1 - h\left(\theta^-\right)\theta^- \right\} \left\{ g_f[1 - \lambda]\theta^- \hat{V} - I \right\}.
\end{aligned}
\tag{A.35}
$$

Now the restriction on $g_f[1 - \lambda]\theta^- \hat{V}$ is that it belong to $(I, 2I)$. Thus, $\sup_{\hat{V}} g_f[1 - \lambda]\theta^- \hat{V} = 2I$ when $g_f[1 - \lambda]\theta^- \hat{V}$ is restricted to lie within $(I, 2I)$. Thus, $\sup_{\hat{V}} Q = \left[(1 - h\left(\theta^-\right))\theta^-\right] I$ and $\hat{V}$ can be chosen to be large enough to insure that (A.23) can be written as approximately

$$
W_1^S\left(\theta^-\right) \simeq \alpha_0 g \left\{ h\left(\theta^-\right)\theta^- \left[V - I + h\left(\theta^-\right)\left[\theta^- \hat{V}\right] - I \right] + I \right\}.
\tag{A.36}
$$

Let us now compare (A.34) and (A.36). Note first that since $\tau > 2\theta^- g\left[\theta^+ - \theta^-\right]/\theta^+$, in (A.34) the quantity

$$
I[1 - \tau] - \theta^- g - \left\{ \frac{2\theta^- - \theta^+}{\theta^+} \right\} < 0.
\tag{A.37}
$$

Next, take the quantity $V[1 - \lambda] - I\tau$ from (A.34) and note that:

$$
\begin{aligned}
V[1 - \lambda] - I\tau &< V[1 - \tau] - I[1 - \lambda] \\
&= [1 - \lambda][V - I] \\
&< h\left(\theta^-\right)[V - I],
\end{aligned}
\tag{A.38}
$$

where the first inequality follows since $1 - \lambda < \tau$, and the second inequality follows since $1 - \lambda < h\left(\theta^-\right)$. Moreover, take the quantity $[1 - \lambda]\theta^- \hat{V} - I$ from (A.34) and note that:

$$
\begin{aligned}
[1 - \lambda]\theta^- \hat{V} - I &< \left[h\left(\theta^-\right)\right]^2 \theta^- \hat{V} - I \\
&< \left[h\left(\theta^-\right)\right]^2 \theta^- \hat{V} - h\left(\theta^-\right) I,
\end{aligned}
\tag{A.39}
$$

where the first inequality follows from (34), and the second since $h\left(\theta^-\right)$ is a probability. Combining (A.37), (A.38), and (A.39), and noting that $I > \theta^- g\left[I - \alpha_n \triangle\right]$, it follows by comparing (A.34) and (A.36) that

$$
W^S\left(\theta^+ \mid \theta^-\right) < W_1^S\left(\theta^-\right).
\tag{A.40}
$$

Thus, incentive compatibility along the path of play has been established. From earlier results, the optimality of the strategies at $t = 2$ along the path of play has also been established. It is also apparent that a type-L firm that is observationally identical to a type-N firm from the board's perspective will find it privately optimal to pool with that type-N

firm.

All that remains to be proved is that no firm will wish to defect from the equilibrium path. There are no out-of-equilibrium moves at $t = 0$, so no (observable) defection from the equilibrium is possible. Defection is possible only at $t = 2$. Consider now a firm that initiated a dividend at $t = 0$, experienced project failure in the first period, and cut its dividend. In equilibrium, if, given the strategies of different types of firms, investors believe with probability 1 that it is type-L, the shareholders' wealth at $t = 2$ is zero, so it is better for the manager of the type-N firms with $\theta = \theta^+$ to invest K to convince the board the firm is type N and then sell assets to continue the dividend initiated at $t = 0$, as shown earlier. So there will be no defection by a type-N firm. However, no type-L firm that initiated a dividend at $t = 0$ will be in a position to continue the dividend payment. Given these strategies, the Bayesian posterior belief of investors about the firm's type is indeed that it is type-N if it continues its dividend and type-L if it does not, and the market's reaction of pricing firms that cut dividends as if they were type-L is a best response. Further, given the out-of-equilibrium belief that any firm that initiates a dividend at $t = 2$ after not having initiated it at $t = 0$ is either type-N^- or type-L^- (using the prior beliefs across the two types), it is clear that no firm will wish to defect from the equilibrium by doing so.

To prove that the equilibrium is sequential, it needs to be verified that the equilibrium beliefs (including out-of-equilibrium beliefs) and strategies are the limit of some sequence of Bayesian rational beliefs and strategies. Let $\sigma_i\left(\tilde{d}\right)$ be the probability with which a firm of type i chooses a dividend $\tilde{d} \in \{0, I\}$ in the second period after having set a dividend payment of $d = 0$ in the first period. Note that, conditional on having observed $d = 0$ in the first period, the market's belief is that the firm is type N^- with probability g and type L with probability $1 - g$. Define a sequence of strategies $\left\{\sigma_i^n\left(\tilde{d}\right), n = 1, 2, ..., \infty\right\}$ as follows:

$$\sigma_N^n\left(\tilde{d}\right) = \begin{cases} 1/n & \text{if } \tilde{d} = d = I \\ 1 - (1/n) & \text{if } \tilde{d} = 0 \end{cases}, \tag{A.41}$$

$$\sigma_L^n\left(\tilde{d}\right) = \begin{cases} 1/n & \text{if } \tilde{d} = d = I \\ 1 - (1/n) & \text{if } \tilde{d} = 0 \end{cases}. \tag{A.42}$$

Then, the posterior beliefs are:

$$\Pr^n\left(\text{firm is type } L \mid \tilde{d} = 0\right) = \frac{[1 - (1/n)][1 - g_p]}{[1 - (1/n)][1 - g_p] + [1 + (1/n)g_p]}, \tag{A.43}$$

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$$\mathrm{Pr}^n\left(\text{firm is type } L \mid \tilde{d} = I\right) = \frac{[1/n][1 - g_p]}{\{(1/n)[1 - g_p] + g_p(1/n)\}}, \tag{A.44}$$

$$\mathrm{Pr}^n\left(\text{firm is type } N \mid \tilde{d} = I\right) = \frac{(1/n)g_p}{\{(1/n)[1 - g_p] + g_p(1/n)\}}, \tag{A.45}$$

where g_p is the posterior belief that the firm is type N^-, conditional on the project outcome (success/failure). Now, taking limits, we see that $\forall i$:

$$\lim_{n \to \infty} \mathrm{Pr}^n\left(i \mid \tilde{d} = 0\right) = \begin{cases} 1 - g_p & \text{if } i = L \\ g_p & \text{if } i = N \end{cases}, \tag{A.46}$$

$$\lim_{n \to \infty} \mathrm{Pr}^n\left(i \mid \tilde{d} = I\right) = \begin{cases} g_p & \text{if } i = N \\ 1 - g_p & \text{if } i = L \end{cases}. \tag{A.47}$$

Thus, the sequence of Bayesian rational beliefs associated with the assumed sequence of strategies converges to the equilibrium beliefs. This completes the proof that this is a sequential equilibrium. ∎

Proof of Corollary 1: The proof of sequential equilibrium is similar to that of the proof of Proposition 2 except that a dividend cut is now also an out-of-equilibrium move. It is clear that a type-L firm gains by pooling with type-N^+ firms at $t = 2$ and continuing the dividend payment after a project failure. So no dividend cuts occur in equilibrium.

The proof that the equilibrium is sequential proceeds in exactly the same way as in the proof of Proposition 2, and so is omitted here. I now prove that the out-of-equilibrium belief on the part of investors in response to the out-of-equilibrium move of a dividend cut survives the universal divinity refinement of sequential equilibrium. Let the best reponse of the uninformed investors/market to a dividend cut be described by a probability $\mu \in [0, 1]$ with which the investors believe the firm is type N. Let μ_L be the value of this probability such that a type-L firm is indifferent between a dividend cut and paying a dividend. For any $\mu > \mu_L$, the firm strictly prefers to cut its dividend. Now, since the type L firm simply cannot liquidate its assets in place at a value high enough to pay a dividend, it follows that $\mu_L = 0$. Define

$$\Omega_L = \{\mu > \mu_L = 0 \mid \mu \in [0, 1], \text{type-}L \text{ firm cuts its dividend}\} \tag{A.48}$$

as the set of best responses for which the type-L firm strictly wishes to cut its dividend, and

$$\Omega_L^0 = \{\mu = \mu_L = 0 \mid \mu \in [0, 1], \text{type-}L \text{ firm cuts its dividend}\} \tag{A.49}$$

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as the set of best responses for which the type-L firm is indifferent between cutting its dividend and not cutting it.

Similarly, let μ_N be the value of μ such that the type-N^+ firm is indifferent between a dividend cut and paying a dividend. Now, since the board can decide whether or not to authorize the manager to pay a dividend only after it has been convinced by the manager that the firm is type N, the situation considered is one in which the manager has already done that. Thus, if the board authorizes liquidation of assets in place to pay a dividend, the expected value of the shareholders' wealth based on the stock price at $t = 2$ will be $\alpha_0 \left\{ [1 - \lambda]\theta^+ \hat{V} - I\tau \right\}$ (recalling (27)). If the board decides to not liquidate its assets and cut the dividend (to zero), then with a posterior belief of μ_N on the part of investors, the competitive pricing condition dictates that the firm will need to sell ownership $\alpha_n \in (0, 1)$ to raise I:

$$\alpha_n \mu_N \left\{ [1 - \lambda]\theta^+ \hat{V} + A \right\} = I. \tag{A.50}$$

The market value of the original shareholders' ownership claim will be

$$[1 - \alpha_n] \alpha_0 \mu_N \left\{ [1 - \lambda]\theta^+ \hat{V} + A \right\}. \tag{A.51}$$

Substituting (A.50) in (A.51) and simplifying allows (A.37) to be written as:

$$\alpha_0 \left[\mu_N \left\{ [1 - \lambda]\theta^+ \hat{V} + A \right\} - I \right]. \tag{A.52}$$

Thus, we see that μ_N is the solution to:

$$\alpha_0 \left\{ [1 - \lambda]\theta^+ \hat{V} - I\tau \right\} = \alpha_0 \left[\mu_N \left\{ [1 - \lambda]\theta^+ \hat{V} + A \right\} - I \right], \tag{A.53}$$

which yields

$$\mu_N = \frac{[1 - \lambda]\theta^+ \hat{V} + I[1 - \tau]}{[1 - \lambda]\theta^+ \hat{V} + A}. \tag{A.54}$$

Note that $A > I[1 - \tau]$, so $\mu_N \in (0, 1)$.

Define

$$\Omega_N = \{\mu > \mu_N = 0 \mid \mu \in [0, 1], \text{type-}N \text{ firm cuts its dividend}\} \tag{A.55}$$

as the set of best responses for which the type-N firm strictly wishes to cut its dividend, and

$$\Omega_N^0 = \{\mu = \mu_N = 0 \mid \mu \in [0, 1], \text{type-}N \text{ firm cuts its dividend}\} \tag{A.56}$$

be the set of best responses for which the type-N firm is indifferent between cutting its

dividend and no cutting it. From (A.48), (A.49), (A.55), and (A.56), it follows that

$$\Omega_N \cup \Omega_N^0 \subset \Omega_L. \tag{A.57}$$

From the universal divinity criterion, it follows then that investors should assign zero posterior probability to the event that the firm that has cut its dividend is type N, i.e., it assigns probability 1 that the firm is type L. In this caser, the market value of equity is zero. Thus, no type-N firm that has initiated a dividend will cut it. The proof for the case in which the first-period project was a success is similar, but simpler. ∎

Proof of Proposition 3: Consider the following exogenous parameter values: $q = 0.67$, $\lambda = 0.36$, $\alpha_0 = 0.55$, $g = 0.93$, $V = 13.8$, $\theta^+ = 0.95$, $\theta^- = 0.8$, $B_{max} = 6.9$, $A = 8$, $I = 7$, $\hat{V} = 19$, and $\tau = 0.65$. These parameter values satisfy all the restrictions on the exogenous parameters: (1)–(6), as well as (30), and (33)–(35). ∎

Proof of Lemma 9: Suppose governance is approaching to be perfect. Then $B_{max}(\xi)$ is arbitrarily close to 0. This asymptotically eliminates the private-benefit project from the manager's optimal set for any $\alpha_0 > 0$. Moreover, assume $\theta^+ - \theta^- = V^+ - V^- = \varepsilon > 0$ for ε arbitrarily small. Then the signaling benefit of dividend initiation is arbitrarily small. So suppose both type-N^+ and type-N^- firms pool and do not initiate dividends at $t = 0$. The highest value a firm that defects from this conjectured equilibrium and pays a dividend is that of a type-N^+ firm that does not pay a dividend, call it V^+, minus the disclosure cost D. For $\theta^+ - \theta^- = V^+ - V^- = \varepsilon$, the firm's value in the conjectured pooling equilibrium, call it V_p, will exceed this value, i.e., $V_p > V^+ - D$, since V_p and V^+ will be arbitrarily close to each other. Hence, no firm will defect from the pooling no-dividend equilibrium. ∎

Figure 1: Sequence of Events

$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$
▶ Shareholders own α_0 of unlevered firm. Manager owns $1 - \alpha_0$. ▶ Firm has $I + C$ in cash. ▶ Firm can pay a dividend and/or repurchase stock. Shareholders decide what to instruct the manager to do. ▶ There are two observationally indistinguishable types of firms: type L (lemons) and type N (normal). The manager privately knows the firm's type. All other believe that the prior probability the firm is type N is g. ▶ Among the type-N firms, there are those with $\theta = \theta^+$ (type-N^+) and those with $\theta = \theta^-$ (type-N^-) that are observationally identical to investors (outsiders), but whose type is known to the manager and the board.	▶ Manager has a choice between G and P projects. ▶ Manager privately observes realized value of private benefit $\tilde{B}$ associated with P. ▶ The board instructs manager to either raise external financing or use internal funds to finance project. Manager also makes unobservable project choice.	▶ Project payoff is realized. ▶ Dividend payment is either initiated, not initiated, continued, or discontinued by shareholders.	▶ Manager has the same project choice as at $t = 1$. ▶ He observes realized value of $\tilde{B}$ and chooses project. ▶ Project is financed either with internal or external financing.	▶ Second period project payoff is realized ▶ All payments are made

Figure 2: Firm's Strategies

		node 3 — externally financed →	
	dividend initiated →		
	project pays off →	no dividend → node 4 — internally financed →	Outcomes Related to No Initial Dividend Initiation
no dividend initiated → node 1 internally financed		dividend initiated → node 5 — externally financed →	
	project fails →	no dividend → node 6 — externally financed →	
		node 7 — externally financed →	
	dividend continued →		
dividend initiated → node 2 externally financed	project pays off →	dividend discontinued node 8 — internally financed →	Outcomes Related to Initial Dividend Initiation
	project fails →	dividend continued → node 9 — externally financed →	
		dividend discontinued node 10 — externally financed →	

$t = 0$ $t = 1$ ⟵ $t = 2$ ⟶ $t = 3$ $t = 4$

Figure 3: Analysis of Logit Interaction Effect

The graph gives z-statistics for the logit interaction effect, $Mgr\,Own_{i,t-1} \times Low\,Inst\,Own_{i,t-1}$, for regression (36). The z-statistics are plotted for various levels of the covariates and predicted initiation probability, following Ai and Norton (2003). The red lines indicate statistical significance at the 10% level.
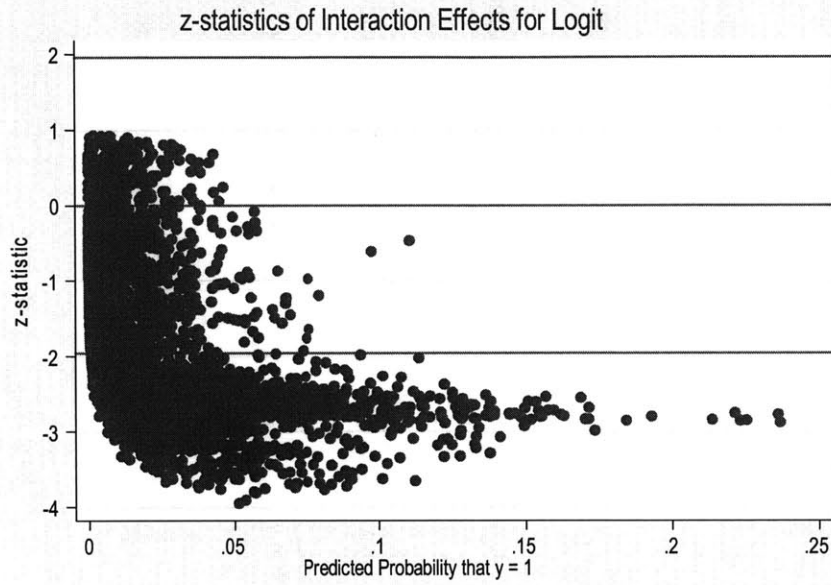
Figure 4: Dividend Initiation Rates by Public Float

The graphs give the percentage of dividend initiations per market capitalization bucket, defined as the number of dividend initiations in a market capitalization bucket divided by the total number of firms in that bucket. The period runs from 2004-2011, which is subsequent to the implementation of the Sarbanes-Oxley Act.
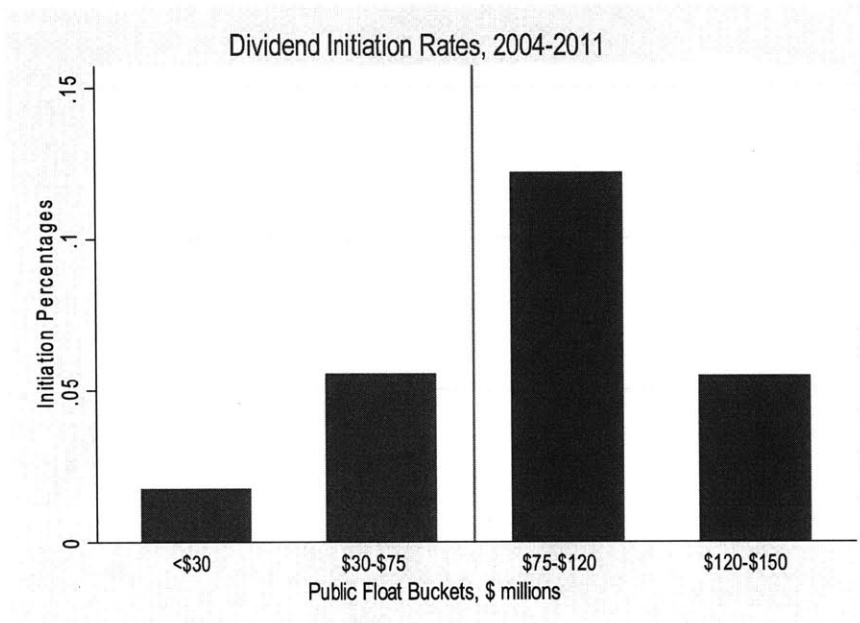
Figure 5: Probability of Dividend Initiation Around $75 million Threshold

This graph shows the probability of dividend initiation as a function of the maximum running public float, $MPFloat_{i,t}$. The estimates come from the logit regression (39), for a bandwidth of the running variable between \$50 million and \$100 million, and including up to 5th-order polynomial terms.
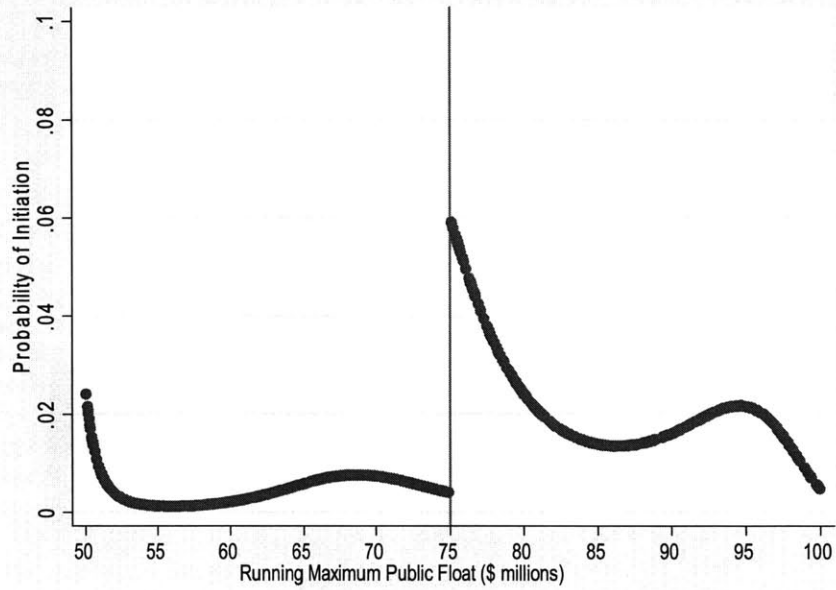
Table 1: Summary Statistics

Summary statistics of variables included in regression (36). The variable values run from 1992 to 2011. $Init_{i,t}$, is a binary variable which takes a value of 1 if a firm initiated a dividend in year t and 0 otherwise. $\ln(TA)_{t-1}$ is the natural logarithm of lagged total book assets of the company. $Div\,Tax_{t-1}$ is the personal tax rate on dividend income in year $t-1$. $Mgr\,Own_{t-1}$ is the percentage of total shares outstanding owned by top management in year $t-1$. $Inst\,Own_{t-1}$ is the percentage of total shares outstanding owned by the top 5 institutional blockholders. $(R\&D/TA)_{t-1}$ is a measure of R&D intensity in the firm. ROA_{t-1} is the lagged return on assets. $(Debt/TA)_{t-1}$ is the book value of debt scaled by total assets. $(Cash/TA)_{t-1}$ is the lagged ratio of cash to total assets. $(RE/TE)_{t-1}$ is the ratio of earned equity (retained earnings) to total assets. $Repur_{i,t-1}$ is an indicator variable that takes a value of 1 if a firm repurchases stock in the previous year. All variables except for $\ln(TA)_{i,t-1}$, $Div\,Tax_{i,t-1}$, and $Repur_{i,t-1}$ are winsorized at the 1% level.

Variable	Mean	SD	p25	Median	p75
$Init_{i,t}$	0.0263	0.151	0.000	0.000	0.000
$\ln(TA)_{i,t-1}$	6.961	1.660	5.816	6.827	8.000
$Div\,Tax_{t-1}$	0.349	0.121	0.210	0.447	0.462
$Mgr\,Own_{i,t-1}$	0.016	0.044	0.000	0.0002	0.009
$Inst\,Own_{i,t-1}$	0.260	0.098	0.192	0.256	0.322
$(Cash/TA)_{i,t-1}$	0.156	0.182	0.024	0.082	0.228
$(R\&D/TA)_{i,t-1}$	0.058	0.091	0.005	0.028	0.082
$ROA_{i,t-1}$	0.086	0.164	0.051	0.096	0.146
$(Debt/TA)_{i,t-1}$	0.219	0.209	0.044	0.197	0.330
$(M/B)_{i,t-1}$	3.222	5.013	1.509	2.356	3.798
$(RE/TE)_{i,t-1}$	0.306	4.414	0.154	0.551	0.860
$Repur_{i,t-1}$	0.516	0.500	0.000	1.000	1.000

Table 2: Predictive Logit Model of Dividend Initiations

This table presents the results of regression (36), which is a pooled predictive logit model of dividend initiations. Columns (1) and (2) run the regression for the entire sample, while columns (3)–(6) eliminate firms with high managerial ownership (>5% of shares outstanding). All variables are as described in Section 5.1. All variables except for $\ln(TA)_{i,t-1}$, $DivTax_{i,t-1}$, $LowInstOwn_{t-1}$, and $Repur_{i,t-1}$ are winsorized at the 1% level. Robust standard errors are in parentheses, and standard errors are clustered at the firm level. Industry fixed effects are included as indicated. *, **, and *** indicate signicance at the 10%, 5%, and 1% level, respectively.

Dependent Variable: $Init_{i,t}$

	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(TA)_{t-1}$	0.284***	0.331***	0.298***	0.326***	0.314***	0.360***
	(0.055)	(0.067)	(0.059)	(0.071)	(0.061)	(0.072)
$DivTax_{t-1}$	-1.492**	-1.255	-2.177***	-1.939**	-2.072**	-1.806**
	(0.751)	(0.852)	(0.819)	(0.921)	(0.817)	(0.916)
$MgrOwn_{t-1}$	-1.657	-2.040	-20.983*	-22.001*	-12.164	-9.877
	(1.931)	(2.142)	(10.979)	(12.179)	(11.945)	(12.598)
$MgrOwn_{t-1} \times LowInstOwn_{t-1}$					-47.799**	-77.579***
					(24.274)	(25.537)
$LowInstOwn_{t-1}$					0.510**	0.564***
					(0.200)	(0.217)
$InstOwn_{t-1}$	-2.354***	-2.840***	-2.904***	-3.172***		
	(0.855)	(0.983)	(0.918)	(1.050)		
$(R\&D/TA)_{t-1}$	-8.450***	-9.294***	-9.779***	-10.742***	-9.670***	-11.325***
	(1.766)	(2.698)	(1.913)	(3.029)	(1.901)	(3.087)
ROA_{t-1}	3.835***	3.067***	4.263***	3.258***	4.341***	3.441***
	(0.785)	(0.912)	(0.855)	(0.985)	(0.875)	(1.006)
$(Cash/TA)_{t-1}$		-0.018		-0.066		-0.010
		(0.580)		(0.652)		(0.653)
$(M/B)_{t-1}$		-0.008		-0.004		-0.005
		(0.021)		(0.023)		(0.023)
$(Debt/TA)_{t-1}$		-1.693***		-1.709**		-1.742***
		(0.578)		(0.632)		(0.625)
$(RE/TE)_{t-1}$		0.001		-0.000		-0.004
		(0.016)		(0.019)		(0.021)
$Repur_{t-1}$		0.569***		0.556***		0.543***
		(0.188)		(0.199)		(0.197)
Constant	-4.522***	-14.319***	-4.171***	-14.570***	-5.318***	-14.662***
	(0.632)	(1.133)	(0.680)	(1.095)	(0.576)	(1.104)
Industry Fixed Effects	No	Yes	No	Yes	No	Yes
Observations	7,270	7,015	6,483	6,267	6,483	6,267
Pseudo-R^2	0.0705	0.106	0.087	0.123	0.086	0.124

Table 3: Cox Proportional Hazard Model of Dividend Initiations

This table presents the results of regression (38), which estimates a Cox proportional hazard model for dividend initiations. Time in the model is the time since IPO for each firm. Estimates of the hazard ratio, $\exp(\beta)$, are reported for each variable. Columns (1) and (2) run the regression for the entire sample, while columns (3)–(6) eliminate firms with high managerial ownership (>5% of shares outstanding). All variables are as described in Section 5.1. All variables except for $\ln(TA)_{i,t-1}$, $DivTax_{i,t-1}$, $LowInstOwn_{t-1}$, and $Repur_{i,t-1}$ are winsorized at the 1% level. Robust standard errors are in parentheses, and standard errors are clustered at the firm level. Industry fixed effects are included as indicated. *, **, and *** indicate signicance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(TA)_{t-1}$	1.364***	1.513***	1.421***	1.559***	1.463***	1.645***
	(0.098)	(0.142)	(0.110)	(0.158)	(0.114)	(0.169)
$DivTax_{t-1}$	0.088**	0.058**	0.031***	0.030***	0.031***	0.038***
	(0.093)	(0.067)	(0.035)	(0.039)	(0.034)	(0.048)
$MgrOwn_{t-1}$	0.056	0.043	0.000**	0.000*	0.000*	0.000
	(0.143)	(0.115)	(0.000)	(0.000)	(0.000)	(0.000)
$MgrOwn_{t-1} \times LowInstOwn_{t-1}$					0.000**	0.000*
					(0.000)	(0.000)
$LowInstOwn_{t-1}$					1.421	1.546
					(0.351)	(0.427)
$InstOwn_{t-1}$	0.142*	0.029***	0.107*	0.017***		
	(0.163)	(0.037)	(0.139)	(0.025)		
$(R\&D/TA)_{t-1}$	0.0001***	0.0002**	0.00002***	0.00001**	0.00002***	0.00004**
	(0.0002)	(0.0008)	(0.0001)	(0.0002)	(0.0001)	(0.0002)
ROA_{t-1}	10.183**	8.215*	12.348**	8.610*	13.318**	10.505**
	(9.528)	(9.263)	(12.507)	(10.312)	(14.001)	(12.597)
$(Cash/TA)_{t-1}$		0.474		0.401		0.460
		(0.295)		(0.278)		(0.318)
$(M/B)_{t-1}$		0.955**		0.956*		0.962
		(0.021)		(0.024)		(0.025)
$(Debt/TA)_{t-1}$		0.087***		0.078***		0.080***
		(0.070)		(0.073)		(0.072)
$(RE/TE)_{t-1}$		0.989		0.983		0.979
		(0.021)		(0.022)		(0.021)
$Repur_{t-1}$		1.808***		1.723**		1.593*
		(0.412)		(0.436)		(0.400)
Industry Fixed Effects	No	Yes	No	Yes	No	Yes
Observations	4,992	4,936	4,405	4,354	4,405	4,354
Log-pseudolikelihood	-520.449	-452.792	-431.771	-381.103	-430.921	-382.908
Prob > chi^2	0.000	0.000	0.000	0.000	0.000	0.000

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Table 4: Effect of Information Disclosure on Dividend Initiations and Falsification Test

Panel A estimates the main regression discontinuity equation (39) for a public float threshold of \$75 million. Panel B contains estimates of the regression discontinuity equation (39) while falsely specifying the cutoff value for $MPFloat_{i,t}$. The sample is from 2004 to 2011, and consists of firms-years with running maximum public floats that fall within the indicated bandwidths (bandwidth is in \$ millions). The dependent variable is $Init_{i,t}$, which takes a value of 1 if firm i initiated a dividend in year t and 0 otherwise. $T_{i,t}$ is a dummy variable which takes a value of 1 if $MPFloat_{i,t}$ is greater than or equal to \$75 million. Specifications include 3rd- through 7th-order polynomial terms for $MPFloat_{i,t}$, as indicated (coefficient estimates are excluded). Industry and year fixed effects, as well as controls, are included where indicated. Controls variables include $ROA_{i,t}$, $(Cash/TA)_{i,t}$, $(M/B)_{i,t}$, $(Debt/TA)_{i,t}$, $(RE/TE)_{i,t}$, and $Repur_{i,t}$. All controls are winsorized at the 1% level. Robust standard errors are in parentheses, and standard errors are clustered at the firm level. *, **, and *** indicate signicance at the 10%, 5%, and 1% level, respectively.

Panel A: Effect of Information Disclosure on Dividend Initiations

Dependent Variable: $Init_{i,t}$

	(1)	(2)	(3)	(4)	(5)
$T_{i,t}$	2.793***	4.454**	2.319**	2.828**	2.778**
	(0.839)	(1.576)	(1.092)	(1.346)	(1.374)
$MPFloat_{i,t}$ Bandwidth	[50, 100]	[50, 100]	[0, 150]	[0, 150]	[65, 85]
$MPFloat_{i,t}$ Polynomial Order	5	5	7	7	3
Controls	No	Yes	No	Yes	No
Industry Fixed Effects	No	Yes	No	Yes	No
Year Fixed Effects	No	Yes	No	Yes	No
Observations	1,371	738	6,838	5,741	582
Pseudo-R^2	0.064	0.379	0.067	0.284	0.080

Panel B: Falsification Test

Dependent Variable: $Init_{i,t}$

	(1)	(2)	(3)	(4)	(5)
$T_{i,t}$	0.866	0.300	1.507	0.537	-1.277
	(2.130)	(1.909)	(1.011)	(1.073)	(1.583)
Cutoff Value	25	25	150	150	85
$MPFloat_{i,t}$ Bandwidth	[0, 50]	[0, 50]	[75, 225]	[75, 225]	[75, 95]
$MPFloat_{i,t}$ Polynomial Order	5	5	7	7	3
Controls	No	Yes	No	Yes	No
Industry Fixed Effects	No	Yes	No	Yes	No
Year Fixed Effects	No	Yes	No	Yes	No
Observations	4,487	1,160	2,573	1,987	475
Pseudo-R^2	0.062	0.295	0.015	0.312	0.036

Table 5: Earnings Management Analysis

This table estimates regression (45) to test for earnings management by firms. The dependent variable in both panels is $(Discr\,Accruals)_{i,t}$, which is described in Section 5.4.5. Panel A estimates the regression discontinuity equation (45) by calculating the dependent variable using the "Jones Model", as in Jones (1991). Panel B estimates the regression discontinuity equation (45) by calculating the dependent variable using the "Modified-Jones Performance" model, as in Kothari, Leone, and Wasley (2005). The sample is from 2004 to 2011, and consists of firms-years with running maximum public floats that fall within the indicated bandwidths (bandwidth is in $ millions). $T_{i,t}$ is a dummy variable which takes a value of 1 if $MPFloat_{i,t}$ is greater than or equal to $75 million. Specifications include 3rd- through 7th-order polynomial terms for $MPFloat_{i,t}$, as indicated (coefficient estimates are excluded). Industry and year fixed effects, as well as controls, are included where indicated. Controls variables include $ROA_{i,t}$, $(Cash/TA)_{i,t}$, $(M/B)_{i,t}$, $(Debt/TA)_{i,t}$, $(RE/TE)_{i,t}$, and $Repur_{i,t}$. All controls are winsorized at the 1% level. Robust standard errors are in parentheses, and standard errors are clustered at the firm level. *, **, and *** indicate signicance at the 10%, 5%, and 1% level, respectively.

Panel A: Estimation Using Jones Model Discretionary Accruals

Dependent Variable: $(Discr\,Accruals)_{i,t}$

	(1)	(2)	(3)	(4)	(5)
$T_{i,t}$	-1.996	-1.615	-1.782	-1.970	-5.372
	(4.805)	(5.119)	(2.399)	(2.417)	(6.212)
$MPFloat_{i,t}$ Bandwidth	[50, 100]	[50, 100]	[0, 150]	[0, 150]	[65, 85]
$MPFloat_{i,t}$ Polynomial Order	5	5	7	7	3
Controls	No	Yes	No	Yes	No
Industry Fixed Effects	No	Yes	No	Yes	No
Year Fixed Effects	No	Yes	No	Yes	No
Observations	1,832	1,822	8,386	8,322	738
R^2	0.001	0.012	0.001	0.003	0.003

Panel B: Estimation Using Modified Jones-Performance Model Discretionary Accruals

Dependent Variable: $(Discr\,Accruals)_{i,t}$

	(1)	(2)	(3)	(4)	(5)
$T_{i,t}$	-0.276	-0.008	-0.211	-0.343	-1.353
	(1.774)	(1.873)	(0.965)	(0.942)	(2.261)
$MPFloat_{i,t}$ Bandwidth	[50, 100]	[50, 100]	[0, 150]	[0, 150]	[65, 85]
$MPFloat_{i,t}$ Polynomial Order	5	5	7	7	3
Controls	No	Yes	No	Yes	No
Industry Fixed Effects	No	Yes	No	Yes	No
Year Fixed Effects	No	Yes	No	Yes	No
Observations	1,830	1,820	8,378	8,315	737
R^2	0.000	0.010	0.002	0.007	0.001

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