Stock Market Returns, Corporate Governance and Capital Market Equilibrium[*]

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Abstract

This paper analyzes why corporate governance matters for stock returns if the stock market prices the underlying managerial agency problem correctly. Our theory assumes that strict corporate governance prevents managers from diverting cash flows, but reduces incentives for managerial effort. In capital market equilibrium, this trade-off has implications for the firm's earnings, stock returns, and managerial ownership, because governance impacts the firm's risk-return structure. In particular, the strictness of corporate governance is negatively related to earnings and positively to β. Various empirical tests with U.S. data using the governance index of Gompers, Ishii, and Metrick (2003) yield results consistent with these predictions.

Keywords: Corporate governance, CAPM, stock returns, beta, cash flow, agency

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Why should corporate governance matter for stock returns? After all, if a firm is run in a way such that managers or large shareholders can use company resources at the expense of outside shareholders, the firm's share price should adjust to reflect such conflicts of interest and the firm's stock returns should be unaffected. However, empirically, stock returns do seem to be related to corporate governance.[1]

The empirical literature that was initiated by Gompers, Ishii and Metrick (2003) has studied this problem by controlling stock returns for various factors and then relating abnormal returns to measures of corporate governance. We address the problem from a new perspective, both theoretically and empirically, by relating corporate governance jointly to corporate cash flows and to stock returns, and we consider stock return volatility in the form of systematic risk (measured by β) and idiosyncratic risk.

Conceptually, we provide a simple theory relating corporate governance to firm performance and stock returns in capital market equilibrium. Empirically, we test its predictions and find strong support for them from accounting and stock market data. A key idea of our model is to differentiate between the impact of corporate governance on cash flows and on investor returns. Recently, Myers (2014) has argued that corporate governance affects not only the distribution, but also the creation of corporate value, and what matters for financial investors are governance rules that at the same time encourage the creation of value and the distribution of that value to investors. Governance rules that give investors a greater share of the value do not necessarily give them a greater return. This trade off between the size of the value produced and the share of the value distributed to outside investors is also at the heart of our theory of corporate governance.

Just like Myers (2014), we argue that there is more to corporate governance than simply restricting managerial private benefits. In fact, governance provisions affect managerial behavior along several dimensions. On the one hand, lax governance allows managers to use company resources to their own advantage. On the other hand, strict corporate governance can be counterproductive because it disenfranchises managers and thus discourages value creation. We model these efficiency considerations in a simple reduced form by assuming that lax corporate governance induces higher managerial effort. This "incentive approach" to corporate governance (Harris and Raviv, 2010) emphasizes the

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[1]See our literature discussion below.

negative incentive effects of disruptive intervention. These effects arise from restricting managerial initiative (Burkart, Gromb, Panunzi, 1997), the potential increase in corporate bureaucracy (Herzberg, 2003), and the crowding out of intrinsic motivation by extrinsic motivation (Falk and Koesfeld, 2005). As Myers (2014) has argued, managerial activity is not simply a mechanic necessity generating managerial rents that should be minimized. In fact, managerial rents are a return to human capital, which is a key asset of the modern corporation, and managers use and develop this human capital to the shareholders' and their own benefit. In a formal model in this vein, Lambrecht and Myers (2012) argue that managers capture all the firm's residual value, subject to the constraint that shareholders receive a payment stream that makes them indifferent between firing the managers or retaining them. Hence, "'perfect' investor protection gives managers no hope of future rents and no reason to invest in firm-specific human capital" (p. 1782).[2] We follow this line of thinking by assuming, in a nutshell, that strict corporate governance prevents managers from diluting the value they create, but impedes managerial value creation.[3]

Despite these conceptual considerations, the notion that lax governance induces high effort is unconventional. We therefore provide direct empirical evidence on this issue that shows that in a large cross-section of U.S. listed firms, corporate earnings measures such as EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) over total assets are positively and highly significantly correlated with the GIM Index of governance laxity (Table VII in Section VB, see our detailed discussion below). Hence, our modelling assumption is consistent with the data.

Our model starts out with corporate cash flows and embeds the single-firm problem in a capital market in which investors behave according to the one-factor CAPM and

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[2] There is a large literature on the problem of managerial effort and corporate governance. See, in particular, Bebchuk and Weisbach (2010), Harris and Raviv (2010), Hellwig (2000), Shleifer and Vishny (1997), Tirole (2001), Vives (2000), and Zingales (2008) for excellent discussions of the costs and benefits of corporate governance. Hellwig (2000), for example, has noted that giving managers residual cash flow rights and reducing external control is akin to giving them ownership status, which is known to create first-best effort incentives.

More specifically, in principal-agent theory it has long been argued that monitoring can have negative incentive effects, as too much information can hurt the principal. The classical paper by Crémer (1995), e.g., shows in an adverse selection environment that restricting the information of principals avoids costly renegotiation of long term contracts. An excellent discussion of incentives in organization theory can be found in Prendergast (1999).

[3] We deliberately abstract from managerial risk-shifting as a source of moral hazard and rather consider the dilution of cash flows. While we believe that risk-shifting is a first order problem in the financial industry, it is probably less important in non-financial firms. Our empirical analysis therefore excludes financial firms.

managers choose their ownership stake endogenously. The market prices the shares of the firm anticipating the effort that the owner-manager will exert given the governance choice and the inside equity she chooses to retain. Given these decisions, we then endogenize the firm's governance choice. As a result, corporate governance, stock returns, beta, cash flows, and managerial ownership are all endogenous, and we can predict their equilibrium correlations in response to variations of the model parameters.

We thus avoid the typical endogeneity problems of empirical finance by predicting equilibrium correlations between endogenous variables, rather than causality. To the extent that our model parameters are observable, we can also test their impact on the endogenous variables, which altogether yields a rich set of testable predictions for a number of variables of interest.

Our first result, which lies at the heart of all others, is that strict corporate governance and managerial ownership are substitutes: in equilibrium, if governance is strict, managerial ownership is low and vice versa. Hence, the governance regime can serve as a commitment mechanism for managerial ownership. Furthermore, strict governance decreases the firm's total cash flow because of lower effort: the direct effect is negative by assumption, and the indirect effect is negative because stricter governance reduces managerial equilibrium ownership (which has a positive effect on effort and on cash flow). On the other hand, strict governance increases public cash flows because it reduces cash flow diversion by the manager.

Two observations from capital asset pricing theory explain the logic of the firm's stock market β in our cash-flow-based model. First, the market prices only the firm's expected future public cash flow adjusted for the market risk factor, not total cash flows. Second, the firm's stock market β is inversely proportional to this market-adjusted future value.[4]

When determining the optimal governance level, the firm's owners trade off the impact of governance on the firm's public value (which they internalize fully because of stock market trading) and on the private cost in terms of effort provision and risk bearing. Since laxer governance has private costs brought about by more effort and higher risk from increased ownership, and since the market does not price these private costs, the

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[4]See, for example, Copeland and Weston (1988, pp. 202-03) for a derivation of the CAPM from cash flows. In such a model, β measures the sensitivity of cash flows to the market factor per unit of the market-adjusted future expected cash flows. Purely mechanically therefore, if the latter goes down, β goes up.

firm's equilibrium market value is increasing in the degree of governance laxity: at the optimum, the firm's owners choose too strict governance as a commitment device, and the market wants laxer governance. Hence, any parameter change that makes stricter governance optimal for the owners, reduces the firm's public value in equilibrium. Since β is inversely proportional to the firm's market value, the firm's stock market β therefore increases, and governance strictness and β co-move positively.[5]

Hence, governance not only affects expected cash flows but changes the risk-return tradeoff for stock market investors. In our model, managerial effort and corporate governance change the firm's cash flows additively and do not affect the firm's risk, which makes the analysis particularly simple. But our results only depend on the two basic observations from asset pricing noted before. In the appendix we show that our analysis applies equally to the case where corporate governance affects cash flows multiplicatively and thus influences risk.

Like in conventional agency theories, optimal governance in our model is determined by the wedge between public and private costs and benefits of outside control. Unlike conventional theories, however, we emphasize the costs of outside intervention for the creation of value. Since the public benefits of outside intervention (through reduced private benefits) are priced and therefore internalized by the owner/manager, the private costs are what matters in equilibrium. In a reversal of conventional wisdom, from the point of view of the owner/manager optimal governance should be stricter than what the market wants, because stricter corporate governance reduces the owner/manager's equilibrium effort costs, and it reduces her risk exposure by being able to commit to a low ownership stake.

One advantage of working in a cash-flow framework rather than with stock returns, already recognized by Lambert, Leuz, and Varrecchia (2007), is that the model yields predictions about accounting values. In particular, our model predicts that in the cross-section earnings and governance strictness co-move negatively: the stricter a firm's governance, the lower are its earnings on average. Taken together, our analysis therefore predicts that cross-sectionally β, idiosyncratic stock return volatility, and governance strictness correlate positively, and that these variables correlate negatively with earnings and managerial

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[5]This argument is a bit too simple, because it ignores the direct effect of the parameter change on the firm's public value. In Section IIIG we show that this effect has the same sign as that of governance.

ownership.

Furthermore, to the extent that we can identify the exogenous variables of our model empirically, we can use these variables to directly test the equilibrium relations discussed above. We do this with the firm's idiosyncratic cash flow risk, for which we can construct a convincing empirical proxy from accounting data. Our theoretical prediction is that an increase in idiosyncratic cash flow risk makes higher ownership less attractive, thus requires stricter governance, and at the same time increases the firm's β and reduces earnings. We can test this prediction by directly regressing our endogenous variables on idiosyncratic cash flow risk.

The model thus produces a rich set of predictions that we test on a large sample of U.S. listed firms. Measuring the quality of corporate governance poses well-known difficulties. Without any claim to originality in this issue, we use the widely used measure of corporate governance laxity by Gompers, Ishii, and Metrick (2003). This index, which emphasizes corporate provisions that protect management from outside interference, captures key elements of our model, although it certainly fails to capture some components of corporate governance.[6]

Using this measure, we conduct two sorts of tests. First, we regress our endogenous variables GIM Index, beta, and accounting earnings on idiosyncratic cash flow risk. Since our model predicts a clear causality, we can use straightforward OLS and do not have to concern ourselves with identification issues. To our knowledge we are the first to construct an empirical proxy of idiosyncratic cash flow volatility and to investigate its relationship with corporate governance, earnings, and stock return beta.[7]

Second, and even more simply, we calculate the empirical correlations between our endogenous variables. Without an exception, all these tests lend strong support to our theory.

From an empirical point of view, measurement errors are typically large for the estimation of average stock returns (and therefore of abnormal returns), while the estimation of stock return volatility needed for our theory is usually more accurate. Indeed, all our

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[6]See Kadyrzhanova and Rhodes-Kropf (2011) and Larcker, Richardson, and Tuna (2007) for detailed analysis of the impacts of different components of the GIM Index on firm value.

[7]Bates, Kahle, and Stulz (2009) have used measures of cash flow volatility from EBITDA. But our theory points to the importance of correcting such measures for systematic risk, which we do in our empirical analysis.

estimates are statistically highly significant. And interestingly, while the positive association between governance and abnormal returns identified by Gompers, Ishii and Metrick (2003) seems to disappear for the period 2000-2008 (Bebchuk, Cohen and Wang (2013)), our findings are empirically robust for the period 2000-2006.

Apart from our emphasis on corporate governance, our analysis provides an interesting insight into the link between cash flow volatility and stock return volatility. Conventional wisdom has it that stock markets diversify away idiosyncratic firm risk and only price systematic risk. Our theoretical and empirical analysis shows, however, that idiosyncratic cash flow volatility increases stock return risk, both systematic and idiosyncratic, via its influence on managerial effort, ownership, and corporate governance. This empirical observation, which is difficult to reconcile with the standard CAPM but consistent with our theory, seems to be new.

The rest of this paper is organized as follows. The following section puts our work in the context of the literature. In Section II we present our theoretical model of corporate governance choice and capital market equilibrium. Section III derives our theoretical predictions. Section IV describes the data. Section V tests our theoretical predictions in various forms, and Section VI concludes. A longer proof is given in Appendix A, a robustness check of the model in Appendix B, and a detailed description of the GIM Index is provided in Appendix C.

I   Related literature

This paper is related to different strands of literature.

On the theoretical side, the result that monitoring intensity and monetary incentives can be substitutes in a principal-agent relationship is well known, but depends very much on the model. The notion that workers don't need monetary incentives if they are well monitored and must be incentivized by money if they are not monitored, is the classic cornerstone of efficiency wage theories and theories of dual labor markets (Bulow and Summers, 1986). The Holmström-Milgrom (1994) model of the firm, on the other hand, implies that monitoring intensity and monetary incentives are complements. The reason is that in Holmström-Milgrom (1994) the principal monitors the agent's output and that more intensive monitoring increases the precision of the resulting noisy signal. Hence,

monetary rewards based on the output signal have more power if the signal becomes more reliable. In an agency model in which the principal monitors effort rather than output, Allgulin and Ellingson (2002) show that monitoring intensity and monetary incentives are substitutes if there are only two effort levels, but can be either substitutes or complements if effort is a continuous variable.

An important recent contribution to the costs and benefits of corporate governance is the work by Kadyrzhanova and Rhodes-Kropf (2011), who analyze the effects of anti-takeover provisions from the perspective of product market competition. They show that governance provisions that protect management from hostile takeovers have countervailing effects. Next to the standard agency costs of managerial entrenchment, their theory identifies a "bargaining effect" that allows protected target firms to extract a higher takeover premium in case of a successful takeover. Empirically, Kadyrzhanova and Rhodes-Kropf (2011) can then indeed identify which of the governance provisions of Gompers, Ishii, and Metrick (2003) support one or the other effect. Since our work does not consider takeovers but rather the tradeoff between the creation and distribution of corporate value, these two approaches to the costs and benefits of corporate governance are largely complementary.

On the empirical side our work is related to the studies of the relation between corporate governance and asset pricing, most notably Gompers, Ishi, and Metrick (2003) and after them, Cremers and Nair (2005), Ferreira and Laux (2007), Bebchuk, Cohen, and Ferrell, (2009), Johnson, Moorman and Sorescu (2009), and Acharya, Gottschalg, Hahn, and Kehoe (2011). Giannetti and Koskinen (2010) investigate the effect of investor protection on stock returns and portfolio allocations for cross-border portfolio investments, both theoretically and empirically. All these studies start with the observation that corporate governance is heterogenous among firms or among countries and investigate its implications for share prices or abnormal equity returns. None of these papers endogenizes corporate governance or considers β as a structural variable.

This paper is also related to the literature on opacity and governance, as lax governance is usually associated with little disclosure. In particular, our paper is related to Jin and Myers (2006) who show that lack of transparency drives the R^2 of stock return higher in a cross-country regression. In their theory, stocks are affected by one market factor observable to everyone and two idiosyncratic factors, only one of which is observable also

to outsiders. The fact that one factor is observable only to insiders (lack of transparency) allows them to extract private benefits when cash flows are high. This implies that less idiosyncratic risk is impounded into the stock price and thus that the R^2 of stock returns is larger. Jin and Myers (2006) do not consider the choice of opacity or governance, but simply set out from the observation that opacity/corporate governance is heterogenous across firms. In a microstructure context, this theme is echoed by Easley and O'Hara (2004) who show that uninformed traders require compensation to hold stocks with greater private information.

We are not the first to study the theoretical link between agency problems and the cost of capital resulting from equilibrium capital asset pricing. An important earlier paper is the work of Lambert, Leuz and Verrecchia (2007) who investigate the effects of information disclosure on equilibrium stock returns in a simple CAPM. Like us, they note that agency can best be analyzed in terms of cash flows and then transform their cash-flow based model into one of returns. They show that the quality of accounting information can influence the cost of capital through two effects. A direct effect is that better disclosure affects the firm's assessed covariances with other firms' cash flows, as in the above mentioned literature on opacity and governance. An indirect effect occurs if better disclosure affects the firm's real decisions, which likely changes the firm's ratio of expected future cash flows to the covariance of these cash flows with the sum of all the cash flows in the market. Our model can be interpreted as an extension of this line of argument to the problem of managerial effort provision, private benefits taking, and corporate governance.

The empirical paper closest to ours is Ferreira and Laux (2007), who find at the U.S. company level that lax governance is associated with low transparency, which they proxy by idiosyncratic return volatility.[8] On this front our results are qualitatively similar: a higher GIM Index (laxer governance) is associated with higher opacity of stock returns, measured as lower idiosyncratic stock return volatility over total volatility. We go beyond Ferreira and Laux (2007) by also considering systematic stock return risk and cash flow variables, and by arguing that the observed governance-risk relation is the result of an equilibrium tradeoff.

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[8] A related interpretation of idiosyncratic volatility is in terms of the availability of information: high levels of idiosyncratic volatility are associated with more efficient capital allocation (Durnev, Morck, and Yeung 2004) and with stock prices being more informative about future earnings (Durnev et al. 2003).

II   The Model: Description

In this section we present a structural model that embeds corporate governance in the basic CAPM and generates testable hypotheses about the relationships between corporate governance and cash flow and stock return variables. We do not take a stance on whether corporate governance drives cash flows or vice versa, and rather work with a model in which both are endogenous and driven by the same factors.

Consider a competitive capital market with representative firm i, run by a manager who initially owns all the shares. The model has three dates. At date 0, the owner/manager decides about the corporate governance regime of the firm. $g_i > 0$ describes the laxity of corporate governance: the larger g_i the less the owner/manager is monitored and the higher are managerial private benefits. g_i measures how well the manager is protected from interference by outside shareholders and is thus a theoretical counterpart to the GIM Index (see Appendix C for a detailed description). In corporate governance regime g_i the owner/manager can appropriate private benefits that reduce the firm's cash flows by g_i (hence, g_i is measured in cash flow units) and appropriate a monetary equivalent of $\phi_i g_i$, where $0 \leq \phi_i < 1$. The dilution parameter ϕ_i is exogenous and depends on firm characteristics such as its industry, as well as on aggregate factors such as the legal framework or the overall governance standards in the market. To simplify some expressions in the analysis we assume that $\phi_i \leq 1/2$. The theory holds more generally, as long as private benefit taking is inefficient ($\phi_i < 1$).

At date 1 the firm's shares are traded publicly at the competitive price P_{i1}. The owner-managers can trade shares at this price, provided that she discloses her final shareholding π_i.

At date 2 the owner-manager exerts a privately observed effort e_i to increase cash flows, and then cash flows C_i are realized. Managerial effort has a private cost, the monetary equivalent of which is

$$\frac{e_i^2}{2k_i g_i^r} \tag{1}$$

where $r > 0$, $k_i > 0$. Hence, effort is less costly to the manager if she enjoys more discretion. In other words, all else being equal, stricter corporate governance has a negative effect on managerial effort. This follows the "incentive approach" to corporate governance

(Harris and Raviv, 2010) that emphasizes the potential costs of strict governance. As discussed in the introduction, underlying these costs are the potentially disruptive effects of strict corporate governance, by restricting managerial initiative (Burkart, Gromb, Panunzi, 1997) or by crowding out intrinsic motivation by extrinsic motivation (Falk and Kosfeld, 2005). This is different from the traditional assumption in the agency literature, where managerial effort is a simple driver of corporate success that can be increased by outside pressure.

There is a safe asset with interest rate R_f between date 1 and date 2. For simplicity, we assume that cash flows only accrue at the final date. The date-2 cash flow of firm i is assumed to be given by the standard one-market factor model

$$C_i = A_i + \theta_i e_i + B_i R_M + \varepsilon_i \tag{2}$$

$$= F_i + \theta_i e_i + B_i(R_M - R_f) + \varepsilon_i \tag{3}$$

where R_M is the market factor with expected value $\overline{R}_M$ and variance σ_M^2, ε_i is random with mean 0 and variance σ_i^2, $cov(\varepsilon_i, R_M) = 0$, A_i, B_i and R_f are constant, and $\theta_i \geq 0$ describes the marginal impact of managerial effort on cash flow. To simplify the future analysis of market pricing, we have also expressed cash flows as a function of the market excess return and let

$$F_i = A_i + B_i R_f. \tag{4}$$

Stock market investors, who have mean-variance preferences over wealth at date 2, have homogenous expectations at date 1 and therefore invest according to two-fund separation and price the firm's shares in line with the classical CAPM. Investors take the firm's corporate governance as given and correctly anticipate the owner/manager's effort choice and public cash flows of $C_i - g_i$ at date 2. Thus corporate governance affects public cash flows at two stages: indirectly at the effort stage and directly at the stage of the extraction of managerial private benefits.

The owner/manager's final wealth consists of the public cash flows from her stake π_i in her own firm, the monetary value of her private benefits, her holding of the market portfolio, and her cash from trading at date 1. When selling the stake $1 - \pi_i$ of her firm, the owner/manager realizes cash of $(1 - \pi_i)P_{i1}$, out of which she invests $m_i \geq 0$ in the

market portfolio, whose price we normalize to 1, and keeps the rest in the risk-free asset. Her final wealth therefore is

$$W_i = \pi_i(C_i - g_i) + \phi_i g_i + m_i(1 + R_M) + ((1 - \pi_i)P_{i1} - m_i)(1 + R_f). \tag{5}$$

Like all other investors, the owner-manager is risk-averse, with mean-variance utility

$$U_i = EW_i - \frac{\lambda_i}{2}var(W_i) - \frac{e_i^2}{2k_i g_i^r} \tag{6}$$

where λ_i denotes the risk aversion of the owner-manager, and, using (2),

$$var(W_i) = \sigma_M^2 \left(\pi_i B_i + m_i\right)^2 + \pi_i^2 \sigma_i^2. \tag{7}$$

Our results are driven by cash-flow risk and managerial moral hazard. Risk and its impact are measured by the parameters λ_i, B_i, σ_M^2, and σ_i^2. Managerial moral hazard depends on $1/k_i$, the cost of providing effort, θ_i, the effect of effort on cash flow, and ϕ_i, the ease with which private benefits can be appropriated. Both k_i and θ_i measure the owner/manager's importance for the firm: the greater either of the two, the more can she contribute to the generation of cash flows. It turns out that these two parameters do not enter our results independently, but only in the form of

$$t_i = \theta_i^2 k_i \tag{8}$$

which can be interpreted as the manager's effort multiplier with respect to cash flows.

III The Model: Results and Predictions

A First Best

In a first-best world, the manager can commit to any desired level of effort, and the risk of cash flows fluctuations is insured perfectly. Since effort increases cash flows additively and the private cost of effort is additive, first-best effort simply equates the total marginal

cash flows gain from effort to the private marginal cost of effort provision:

$$\theta_i = \frac{1}{k_i g_i^r} e_i.$$

This yields

$$e_i^{FB} = \theta_i k_i g_i^r$$

for a net effort contribution to cash flows of $\theta_i e_i - \frac{e_i^2}{2k_i g_i^r} = \frac{1}{2} t_i g_i^r$.

First-best governance therefore trades off the positive direct effect of reduced cash flows diversion against the effort loss from interference through stricter governance, ignoring risk. It thus maximizes

$$U_i^{FB} = F_i + \frac{1}{2} t_i g_i^r - (1 - \phi_i) g_i + B_i (\overline{R}_M - R_f) \tag{9}$$

which yields

$$\frac{r t_i}{2} (g_i^{FB})^{r-1} = 1 - \phi_i. \tag{10}$$

The governance regime therefore matters even in a first-best world and results from a simple tradeoff between the costs and benefits of strict governance. The firm's risk plays no role in this tradeoff (including the firm's exposure to market risk). In a second-best world, the owner/manager cannot commit to effort and can only rid herself of the cash-flows risk by selling a stake of the firm. This reduces her effort incentives, which in turn reduces the positive incentive impact of g_i, as managerial ownership and strict governance are substitute instruments for effort provision.[9]

B   Effort choice

For the second best, we solve the model backwards, first determining the owner/manager's effort at date 2, then the share price at date 1 and the owner/manager's trading and port-folio decision (π_i, m_i), and then the corporate governance structure g_i at date 0. Hence,

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[9]Note that our model involves a shortcut compared to standard models of managerial moral hazard (see, e.g., Tirole (2005)), since the owner/manager's private benefit taking is mechanic (and equal to g_i). In a richer model, the owner/manager would be free to choose private benefits as a function of the corporate governance regime. In the first best, the owner/manager would then commit not to take private benefits and governance would be as lax as possible.

Enriching our model by this choice would make the second-best analysis significantly more complicated but not change the overall tradeoff and would yield results identical to those of our simplified model.

the owner/manager determines g_i knowing that she can later adjust her shareholdings, but that the stock market will price her trading decision.

Since effort is additively separable in our model, inserting (2) into (6) yields the first-order condition for effort choice as

$$
\begin{aligned}
\pi_i \theta_i - \frac{1}{k_i g_i^r} e_i &= 0 \Leftrightarrow \\
e_i &= \pi_i \theta_i k_i g_i^r.
\end{aligned} \tag{11}
$$

Thus effort is increasing in π_i and in g_i. The positive effect of inside equity on effort is standard and well understood. The positive effect of g_i on effort (i.e. the negative impact of strict corporate governance on effort) follows the incentive arguments discussed earlier, with the notion that strict managerial control stifles initiative and hence effort.

Inserting (11) into (5) and using (8) yields

$$
W_i = \pi_i(A_i + B_i R_M + \varepsilon_i) + \pi_i^2 t_i g_i^r - \pi_i g_i + \phi_i g_i + (1 - \pi_i) P_{i1}(1 + R_f) + m_i (R_M - R_f). \tag{12}
$$

This expression already exhibits the effects of corporate governance on the owner/manager's wealth quite clearly. On the one hand, higher g_i decreases wealth through the dilution of public cash flows (the term $-\pi_i g_i$), which depends on the owner/manager's final ownership π_i. On the other hand, higher g_i increases her wealth through, first, higher optimal effort (the term $+\pi_i^2 t_i g_i^r$) and second, through higher private benefits (the term $+\phi_i g_i$). Of course, W_i is also indirectly affected through P_{i1} and m_i.

C   Capital market equilibrium

Pricing at date 1 is a simple application of the CAPM. Recall that the value of the market portfolio at date 1 is normalized to 1 and the expected return on the market as of date 1 is $\overline{R}_M$. By the CAPM, P_{i1} adjusts such that the expected return of firm i is

$$
ER_i = R_f + \beta_i(\overline{R}_M - R_f) \tag{13}
$$

where $R_i = P_{i2}/P_{i1} - 1$ is the holding-period rate of return of firm i's shares, and

$$\beta_i = \frac{cov(R_i, R_M)}{var(R_M)}. \tag{14}$$

Substituting for R_i into the CAPM formula (13) yields

$$\frac{E P_{i2}}{P_{i1}} - 1 = R_f + \frac{cov(R_i, R_M)}{var(R_M)}(\overline{R}_M - R_f). \tag{15}$$

By (2),

$$P_{i2} = C_i - g_i = A_i + \theta_i e_i + B_i R_M - g_i + \varepsilon_i \tag{16}$$

which implies

$$
\begin{aligned}
cov(R_i, R_M) &= cov(\frac{P_{i2} - P_{i1}}{P_{i1}}, R_M) \\
&= \frac{B_i}{P_{i1}}\sigma_M^2.
\end{aligned}
\tag{17}
$$

From (15), the expected rate of return of stock i therefore is

$$E\frac{P_{i2}}{P_{i1}} - 1 = R_f + \frac{B_i}{P_{i1}}(\overline{R}_M - R_f). \tag{18}$$

Substituting for P_{i2} in (18) from (16) yields P_{i1}, firm's i date-1 market value:

$$A_i + B_i\overline{R}_M + \theta_i e_i - g_i = (1 + R_f)P_{i1} + B_i(\overline{R}_M - R_f)$$
$$\Rightarrow \quad P_{i1} = \frac{1}{1 + R_f}\left(A_i + R_f B_i + \theta_i e_i - g_i\right) \tag{19}$$

Combining (19) with (16) yields

$$
\begin{aligned}
R_i &= \frac{P_{i2}}{P_{i1}} - 1 \\
&= R_f + \frac{(1 + R_f)B_i}{F_i + \theta_i e_i - g_i}(R_M - R_f) + \frac{1 + R_f}{F_i + \theta_i e_i - g_i}\varepsilon_i,
\end{aligned}
\tag{20}
$$

where F_i is defined in (4). Equation (20) describes the classic linear regression of firm

returns on the market excess return. In this regression, the observed beta is given by

$$\beta_i \;=\; \frac{B_i\,(1 + R_f)}{F_i + \theta_i e_i - g_i} \tag{21}$$

$$\;=\; \frac{B_i}{P_{i1}}. \tag{22}$$

Hence, the market beta is given by the cash flow beta per unit of expected public market-adjusted cash flows.

Writing the idiosyncratic return component in (20) as

$$\eta_i = \frac{1 + R_f}{F_i + \theta_i e_i - g_i}\varepsilon_i, \tag{23}$$

one can re-write (20) in the standard form

$$R_i = R_f + \beta_i\,(R_M - R_f) + \eta_i \tag{24}$$

which is the stochastic version of the expected-return CAPM equation (13), where the standard deviation of idiosyncratic returns in (23) is

$$\sigma_{\eta i} = \frac{1 + R_f}{F_i + \theta_i e_i - g_i}\sigma_i. \tag{25}$$

Therefore, in a competitive market where stock prices are determined according to the CAPM, the amount of private benefits extracted by the insiders is fully priced. In this model, corporate governance directly affects expected returns, and it does so via the stock's systematic and idiosyncratic risk. But this is only the partial-equilibrium view. g_i also influences e_i and π_i, which in turn depends on P_{i1}, as we discuss presently.

D Ownership and portfolio choice

When the owner/manager makes her ownership and portfolio choice, the market takes the corporate governance choice g_i as given, correctly anticipates the induced value of effort, and sets the stock price consistent with managerial ownership. Hence, managerial ownership π_i, the owner/manager's market portfolio choice m_i, and the stock price P_{i1} in (19) are determined simultaneously.

Using the optimal effort (11), and inserting P_{i1} from (19) into (6) yields the owner's objective function at the stage when she determines her final ownership position π_i and her market exposure m_i at date 1:

$$
\begin{aligned}
U_i \;=\; & F_i + \pi_i t_i g_i^r - \frac{1}{2}\pi_i^2 t_i g_i^r - (1-\phi_i)g_i + (\pi_i B_i + m_i)(\overline{R}_M - R_f) \qquad (26) \\
& -\frac{\lambda_i}{2}\left[\sigma_M^2(\pi_i B_i + m_i)^2 + \pi_i^2 \sigma_i^2\right].
\end{aligned}
$$

For simplicity, we ignore the short-selling constraints $0 \le \pi_i \le 1$ and $0 \le m_i \le (1-\pi_i)P_{i1}$, which will be satisfied at the unconstrained optimum, as can be easily checked. From the perspective of the owner/manager in the objective function (26), her cash flow loss from cash flow diversion does not depend on her ownership stake π_i, although a priori she bears the dilution of cash flows only in proportion to her ownership stake (the fourth term in (12)). This is because the market prices the dilution in, which makes the owner bear the full loss from lax governance through the price P_{i1} regardless of her ownership stake. Similarly, the market prices in the full cash flow gain from managerial effort ($e_i = \pi_i \theta_i k_i g_i^r$), but not the effort cost.

Differentiating (26) with respect to m_i and π_i yields the following first-order conditions

$$
\frac{dU_i}{dm_i} \;=\; \overline{R}_M - R_f - \lambda_i \sigma_M^2(\pi_i B_i + m_i) = 0 \qquad (27)
$$
$$
\frac{dU_i}{d\pi_i} \;=\; (1-\pi_i)t_i g_i^r + B_i\left[\overline{R}_M - R_f - \lambda_i \sigma_M^2(\pi_i B_i + m_i)\right] - \lambda_i \sigma_i^2 \pi_i = 0 \qquad (28)
$$

which imply the following lemma.

Lemma 1 *For any given governance choice g_i, the optimal ownership and portfolio choices are*

$$
\pi_i^* \;=\; \frac{t_i g_i^r}{\lambda_i \sigma_i^2 + t_i g_i^r} \qquad (29)
$$
$$
m_i^* \;=\; \frac{\overline{R}_M - R_f}{\lambda_i \sigma_M^2} - \frac{B_i t_i g_i^r}{\lambda_i \sigma_i^2 + t_i g_i^r}. \qquad (30)
$$

It is straightforward to verify that the first-order conditions indeed yield an optimum. Note that the optimal investment in the market portfolio is the classical Markowitz result $(\frac{\overline{R}_M - R_f}{\lambda_i \sigma_M^2})$ corrected for the owner/manager's exposure to market risk through her holding

of stock of her own firm[10]. Hence, for any level of ownership π_i the owner/manager always holds the amount of systematic risk that is optimal in the standard Markowitz CAPM framework without managerial ownership. The risk or return of the market portfolio therefore do not matter for her choice of effort or ownership.

Thus, π_i^* depends neither on the cash flow beta B_i nor on market risk σ_M^2, but only on the firm's idiosyncratic risk, which leads to the simple firm-specific trade off of effort incentives against idiosyncratic risk sharing in Lemma 1. The direct benefit and cost of effort are given by the second and third term of (26), respectively, while terms 5 and 6 represent the traditional risk-return tradeoff. Note that if the latter concern were absent, i.e. if $\sigma_i^2 = 0$ (no idiosyncratic cash flow risk), then $\pi_i = 1$ and the owner would not sell out at all, which would yield first-best incentives. Only if idiosyncratic risk matters does ownership matter, and ownership then interacts with the incentive effects of corporate governance.

In fact, varying g_i as an exogenous parameter, Lemma 1 yields the following relation.

Lemma 2 *In equilibrium, optimal managerial ownership π_i^* and optimal managerial effort*

$$e_i^* = \frac{1}{\theta_i} \frac{t_i^2 g_i^{2r}}{\lambda_i \sigma_i^2 + t_i g_i^r} \tag{31}$$

are increasing in g_i and decreasing in σ_i^2.

Lemma 2 contains an important building block of our theory: managerial ownership should be the lower, the stricter is corporate governance. More broadly, the strictness of control and monetary incentives via managerial ownership are substitutes: if control is strict, optimal monetary incentives are small and vice versa. This is a classic theme in principal-agent theory (see, e.g., Prendergast, 1999) that has been analyzed in various contexts. In our context, its intuition can be understood from two observations on the market-based objective function (26). First, managerial utility increases linearly in ownership π_i and the disutility of ownership is only second-order. This is because the market prices managerial effort, such that the owner/manager enjoys the full marginal benefit of her effort (effort being linear in π_i). Second, the marginal effect of ownership is increasing

---

[10]This is a well known result in the literature, because if it is optimal for the manager to hold a fraction of his wealth in the firm, the portfolio choice problem becomes an optimization problem with an additional constraint (see Mayers (1973) and Anderson and Danthine (1981) for the general case where an asset is constrained).

in g_i. Therefore, we have $\partial^2 U_i \partial \pi_i \partial g_i > 0$, from which the claimed comparative statics of π_i follows.

As a consequence, stricter corporate governance makes the manager exert less effort in equilibrium. The reason is that, by (11), governance laxity and ownership both have positive direct effects on managerial effort. Hence, the direct effect of g_i on effort and the indirect effect via π_i both go in the same direction.

Lemma 1 shows that strict governance can serve as a commitment mechanism for low managerial ownership. Conversely, an owner/manager who implements weak corporate governance knows that she must hold a large ownership stake to generate the right effort incentives. But because of risk aversion the associated idiosyncratic risk is undesirable. She therefore has an incentive to make governance strict in order to have a credible reason to hold a low ownership stake.

E   Governance choice

Lemma 2 has examined exogenous changes of g_i. We now investigate the equilibrium choice of g_i. Inserting (29) and (30) in (26) yields

$$U_i^* = F_i + \frac{1}{2} t_i \pi_i^* g_i^r - (1 - \phi_i) g_i + \frac{\left(\overline{R}_M - R_f\right)^2}{2\lambda_i \sigma_M^2} \tag{32}$$

Using (29) the following derivatives are straightforward to obtain and useful to note:

$$\frac{dU_i^*}{dg_i} = \frac{rt_i^2}{2} \frac{g_i^{2r-1}}{(\lambda_i \sigma_i^2 + t_i g_i^r)^2} (2\lambda_i \sigma_i^2 + t_i g_i^r) - (1 - \phi_i) \tag{33}$$

$$\frac{d^2 U_i^*}{dg_i^2} = -\frac{rt_i^2 g_i^{2r-2}}{2(\lambda_i \sigma_i^2 + t_i g_i^r)^3} \left[2(1 - 2r)(\lambda_i \sigma_i^2)^2 + 3(1 - r)t_i \lambda_i \sigma_i^2 g_i^r + (1 - r)t_i^2 g_i^{2r}\right] \tag{34}$$

An inspection of (33) and (34) shows that U_i^* has a unique, strictly positive maximum if $r \leq 1/2$, i.e. if the positive incentive effect of weak governance is not too strong. In order to get testable predictions we therefore impose this restriction from now on.[11] With this assumption, (33) therefore implies:

---

[11] (33) and (34) show that the condition $r \leq 1/2$ is clearly not necessary. Depending on the size of the other parameters, weaker conditions on r yield the same result. But the condition is simple and suffices to make the point. If weak governance has large positive incentive effects that outweigh its costs considerably, then there is no interior maximum and governance is as lax as possible.

Proposition 3 *The optimal corporate governance decision is unique and is given by*

$$\frac{d}{dg_i}\left(\frac{1}{2}t_i\pi_i^* g_i^r\right) = 1 - \phi_i \tag{35}$$

$$\Leftrightarrow \quad rt_i^2(2\lambda_i\sigma_i^2 + t_ig_i^r) = 2(1-\phi_i)(\lambda_i\sigma_i^2 + t_ig_i^r)^2 g_i^{1-2r}. \tag{36}$$

Proposition 3 trades off the direct and the indirect costs and benefits of stricter governance that we have discussed earlier. In particular, it shows that without the positive incentive effect of lax corporate governance (i.e. for $r < 0$), corporate governance would be uniformly chosen as strictly as possible, with no cross-sectional variation. In order to get some more intuition about the tradeoffs involved, it is useful to compare the solution of Proposition 3 to the first-best, discussed earlier.

F   Comparison with first-best

For ease of comparison, the owner/manager's objective over the choice of governance g_i in (32) and the first-best objective (9) can be re-written as follows:

$$U_i^{FB} = F_i + \frac{1}{2}t_ig_i^r - (1-\phi_i)g_i + \text{const} \tag{37}$$

$$U_i^* = F_i + \frac{1}{2}\pi_i^* t_ig_i^r - (1-\phi_i)g_i + \text{const} \tag{38}$$

This comparison makes it clear that the capital market effectively eliminates risk from the agency problem, but introduces the incentive problem of partial ownership, and that this is all that matters. Comparing the corresponding first-order conditions, (10) and (35), shows that the second-best optimum g_i^* is strictly smaller than g_i^{FB} for exactly this reason: in the second-best, the owner/manager only takes the (endogenous) fraction π_i of firm value into account. She is therefore less interested in maximizing total cash flows and more interested in credibly reducing her ownership stake through stricter governance.

Furthermore, all three frictions in our model are necessary to yield the non-trivial governance decision identified in Proposition 3. First, as noted above, if the owner/manager can perfectly insure against cash flow risk or is risk neutral ($\lambda_i\sigma_i^2 = 0$), then optimally $\pi_i = 1$, and the market outcome is first-best.

Second, managerial effort is important. If the agent who makes the governance choices

contributes nothing to cash flows ($\theta_i = 0$ or $k_i \to 0$), then Lemma 1 and Proposition 3 imply that she optimally chooses the strictest possible governance rules and zero ownership of the company. Otherwise, she would pay the cost of lax governance without any benefit in terms of additional cash flows. More formally, (32) implies

Corollary 4 *If effort played no role because the effort multiplier $t_i = 0$, then $g_i^* \to 0$ and $\pi_i^* = 0$.*

And third, the inefficient diversion of cash flows is important. If there were no diversion or if diversion were efficient ($\phi_i = 1$), then the owner/managers's equilibrium utility would be increasing in g_i, and (32) implies

Corollary 5 *If cash flow diversion played no role because $\phi_i = 1$, then g_i^* is as large as possible.*

G   Testable Propositions

In our model, neither does corporate governance have a causal effect on stock prices, nor is the opposite true. Instead, governance g_i, public cash flow $C_i - g_i$, and ownership π_i on the one hand, and stock returns R_i, idiosyncratic stock risk $\sigma_{\eta i}^2$, and β_i on the other hand, are endogenous, driven by the same set of exogenous parameters. The uniqueness established in Proposition 3 implies that the equilibrium relation between the endogenous variables can be obtained by implicitly differentiating the first-order condition (35) and using the equilibrium expressions for β_i and $\sigma_{\eta i}^2$. In what follows, we present the economic logic behind this implicit differentiation.

From (19), the firm's discounted expected public market-adjusted cash flow is

$$P_{i1} = \frac{1}{1 + R_f}(F_i + t_i \pi_i g_i^r - g_i). \tag{39}$$

The owner/manager's objective (38) is therefore comprised of P_{i1} and of her private costs and benefits:

$$U_i^* = (1 + R_f)P_{i1} - \frac{1}{2}t_i \pi_i g_i^r + \phi_i g_i + \frac{\left(\overline{R}_M - R_f\right)^2}{2\lambda_i \sigma_M^2} \tag{40}$$

$$\equiv (1 + R_f)P_{i1} - M_i + \frac{\left(\overline{R}_M - R_f\right)^2}{2\lambda_i \sigma_M^2} \tag{41}$$

20

where we define the owner/manager's net private costs from the agency problem as

$$M_i = \frac{1}{2} t_i \pi_i g_i^r - \phi_i g_i. \tag{42}$$

Going back to the objective function U_i in (26) and the first-order conditions (27) and (28) shows that these costs are actually comprised of three components:

$$M_i = \frac{1}{2} t_i \pi_i^2 g_i^r + \frac{\lambda_i}{2} \sigma_i^2 \pi_i^2 - \phi_i g_i \tag{43}$$

The first term in (43) is the manager's private cost of effort, the second her disutility from the risk of holding her ownership stake π_i, and the third term is her private gain from cash flow diversion.[12]

By the first-order condition (35) and (41), $(1 + R_f)\frac{\partial P_{i1}}{\partial g_i} = \frac{\partial M_i}{\partial g_i}$. Hence, the marginal gain for public firm value from relaxing corporate governance must be equal to its private cost to the owner/manager. Differentiating (42) and using (35) yields $\frac{\partial M_i}{\partial g_i} = 1 - 2\phi_i$, which is non-negative by assumption as $\phi_i \leq 1/2$. Hence, at the owners' optimum the market prefers laxer governance ($\frac{\partial P_{i1}}{\partial g_i} \geq 0$), but this would come at the expense of higher private costs in terms of effort and risk bearing by the owner/manager.

We can now examine the impact of parameter changes on the endogenous variables. Consider first an increase in the idiosyncratic cash flow volatility σ_i, a parameter for which we can construct a good empirical proxy from public accounting information. This decreases optimal managerial ownership and thus, by the complementarity of ownership and governance laxity, the marginal value of laxer governance. Hence, with higher idiosyncratic cash flow risk, it is optimal for the owner/manager to hold a smaller equity stake and to have stricter governance: $dg_i/d\sigma_i < 0$.

The marginal impact on β_i and $\sigma_{\eta i}$ depends on the market valuation P_{i1}, the impact on which is given by

$$\frac{dP_{i1}}{d\sigma_i} = \frac{\partial P_{i1}}{\partial \sigma_i} + \frac{\partial P_{i1}}{\partial g_i} \frac{dg_i}{d\sigma_i} \tag{44}$$

We have already shown that in equilibrium $\frac{\partial P_{i1}}{\partial g_i} \geq 0$. Hence, the total impact of σ_i on P_{i1} ($dP_{i1}/d\sigma_i$) is equal to the indirect impact via g_i ($dg_i/d\sigma_i$) plus the direct impact of σ_i

---

[12]Note that the equilibrium cost of effort increases with g_i, although g_i reduces the effort cost function (1) by assumption. This is standard in models with additive effort, as the increase of effort outweighs the decrease of the cost function at the optimum.

on P_{i1} $(\partial P_{i1}/\partial \sigma_i)$.

This direct impact can be easily understood. If σ_i increases, managerial ownership π_i decreases by Lemma 1, which decreases effort and thus P_{i1}. Hence, the direct impacts of σ_i on P_{i1} and on g_i have the same sign, which by (44) implies that g_i and P_{i1} move in the same direction. Since by (22) and (25) $\beta_i = B_i/P_{i1}$ and $\sigma_{\eta i} = \sigma_i/P_{i1}$, the above analysis shows that g_i and the stock market variables β_i and $\sigma_{\eta i}$ move in opposite directions.

Finally note that changes in σ_i affect the firm's expected public cash flow, $E(C_i - g_i)$, exactly like they affect the market value P_{i1}. Since expected public cash flow is a variable for which cross-sectional accounting data is available, we also include it in the following proposition.

Proposition 6 *When the idiosyncratic cash flow volatility σ_i changes, the equilibrium values of β_i and $\sigma_{\eta i}$ move in the same direction, and opposite to that of the governance variable g_i, managerial ownership π_i, and expected public cash flow, $E(C_i - g_i)$. The dependence is as follows:*

$$
\begin{array}{cccccc}
 & g_i & \pi_i & E(C_i - g_i) & \beta_i & \sigma_{\eta i} \\
\sigma_i \nearrow & \searrow & \searrow & \searrow & \nearrow & \nearrow
\end{array}
$$
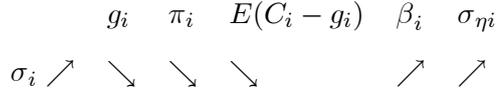
The formal proof of this proposition follows from implicitly differentiating the first-order condition (35) and (39) and is given in Appendix A. We will test the predictions of Proposition 6 in Section VA below.

The impact of changes of other parameters, such as the effort multiplier t_i or the dilution parameter ϕ_i, can be assessed in a similar way to σ_i^2. However, these parameters are more difficult to proxy for empirically. But regardless of which of the exogenous parameters moves, one can use the same reasoning as above to verify that the correlations between the endogenous variables are the same. Without resorting to causal statements as in Proposition 6, we can summarize these predictions as follows.

Proposition 7 *When any of the parameters σ_i, t_i or ϕ_i changes, the equilibrium values of β_i and $\sigma_{\eta i}$ move in the same direction, and opposite to that of the governance variable g_i, managerial ownership π_i, and expected public cash flow, $E(C_i - g_i)$. The detailed correlation is as follows:*

	g_i	$E(C_i - g_i)$	β_i	$\sigma_{\eta i}$
$E(C_i - g_i)$	+			
β_i	−	−		
$\sigma_{\eta i}$	−	−	+	
π_i	+	+	−	−

The formal proof of Proposition 7 again follows from implicit differentiation of the first-order condition (35) and (39) and is given in Appendix A. We test the correlations from Proposition 7 in Section VB below, except for those involving the inside ownership variable π_i, for which we do not have sufficiently good data.[13]

IV   Data

Not all our theoretical variables are easily observable empirically. In this section, we describe the choice and construction of our empirical variables.

A   Corporate governance

As noted in the introduction, measuring corporate governance poses serious difficulties.[14] An important practical index is the index compiled by the IRRC (Investor Responsibility Research Center) that has been used by Gompers, Ishii and Metrick (2003) in the construction of their own index. The GIM Index includes 24 anti-takeover provisions such as the existence of a staggered board, poison pills, supermajority voting requirements, etc. A full description is given in Appendix C. The GIM Index therefore describes how much management is protected from outside interference and provides a plausible proxy for our g_i variable. It is available for 2, 740 U.S. non financial firms, for the years 1990, 1993, 1995, 1998, 2000, 2002, 2004 and 2006 (in total 10,137 observations). Our sample period is therefore longer than the period in Gompers, Ishii, and Metrick (2003), which allows us to address the objection by Bebchuk, Cohen, and Wang (2013) that the observed positive

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[13]U.S. ownership data (which are still the best internationally) vary across different databases, have several biases, and are not always consistent (see Dlugosz, Fahlenbrach, Gompers, and Metrick, 2006, and von Lilienfeld-Toal and Ruenzi, 2014). The available database provided by IRRC has the drawback that for more than 70% of the companies considered in our sample ownership is not available because it is below 5%.

[14]See Bhagat, Bolton, and Romano (2008) for an excellent overview, and Larcker, Richardson, and Tuna (2007) for a detailed principal-component analysis.

correlation between the GIM Index and abnormal stock returns disappears after 2000.

As in Bates, Kahle and Stulz (2009), Ferreira and Laux (2007) and others, we exclude financial firms because their regulation, capital structure, and managerial moral hazard is more complex than the structure considered in our model. We also exclude utilities because they are subject to special regulatory supervision.

Figure 1 presents a visual summary of the frequency distribution of the GIM Index values. For expositional reasons we have re-scaled the 19 values of the GIM Index into 6 values. The mapping is as follows: values (1,2,3) of the GIM Index become 0; (4,5,6)→1; (7,8,9)→2; (10,11,12)→3; (13,14,15)→4; (16,17,18,19)→5 is the strictest governance, 5 is the least strict.[15]

INSERT Figure 1 HERE

In line with the prediction of proposition 3, the GIM Index is not zero in the large majority of cases indicating that most firms do not choose the strictest possible governance rules. Instead there is substantial heterogeneity in corporate governance levels, and the median is at the centre of the distribution, suggesting that the governance choice is the result of a trade-off.

Furthermore, we observe no major change in the GIM Index over time. Table I presents a transition matrix showing the number of changes in the GIM Index for consecutive years over the sample. When a change occurs it is most likely an increase of the GIM Index. Hence, most of the variation in the governance data is cross-sectional and not dynamic.

INSERT Table I HERE

For this reason we concentrate our analysis on the cross-section of the data (that is on 2740 observations that corresponds to the number of firms in the sample) and calculate the average GIM Index of each company in the sample (see Appendix C and Table II for the definitions and sources of variables).

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[15]Values from 20 to 24 are not considered because there are no firms having these values of the GIM Index.

INSERT Table II HERE

Table III reports the mean, standard deviation, 5th percentile, median, and 95th percentile of the GIM Index for the companies in our sample.[16]

INSERT Table III HERE

The average GIM Index on a scale from 1 to 19 is 8.53 with a standard deviation of 2.53. Thus there is concentration in the middle, but also heterogeneity in the distribution of corporate governance rules: 5% of the firms have a GIM Index below 4.5 and 5% an index above 13.

B   Cash flows and earnings

In the model, we do not distinguish between cash flows, earnings, and accounting returns, as we abstract from taxes, debt service and other expenses. Our public cash flow variable $C_i - g_i$ therefore relates to cash flows as well as performance from an accounting perspective. Empirically, it corresponds most directly to EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization).[17] After normalizing for size, we therefore proxy the model's expected public cash flows $E(C_i - g_i)$ by the average of the firms' yearly $EBITDA_{i,t}$ and we indicate this variable with $EBITDA_i$.

Table III reports the statistics of $EBITDA_i$, indicating that on average corporate earnings are 11% of the total assets with a large dispersion around the mean as indicated by the standard deviation of 15.6%.

With respect to volatility, the theoretical analysis shows that one must disentangle the component of cash flows related to market volatility ($B_i^2 \sigma_M^2$) and the cash flow risk specific to firm i, that is σ_i^2. We do this using standard regression analysis. Starting from the 2,740 firms in our sample of the GIM Index for each year, we compute the "market cash

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[16] We reports statistics for the original data because the empirical analysis is performed with the original GIM index based on the full set of provisions.

[17] The return on assets (RoA) is an alternative acounting measure of firm performance, which, however, corresponds less closely to our theory, as it depends on decisions outside our model, such as interests, taxes etc. Empirically, both variables are strongly, but not perfectly correlated (correlation of 0.78). We have conducted our analysis also with RoA instead of EBITDA and obtained similar results, which are, however, not surprisingly, statistically sometimes weaker.

flow", $EBITDA_{M,t}$, as the weighted average of the ratio between firm cash flow to assets in the sample of that year, with weights given by the firms' market value. For each firm we require at least five observations, and we regress the firms' yearly cash flows over total assets on market cash flow, that is, for each firm i, we perform the following regression:

$$EBITDA_{i,t} = \alpha_i + \gamma_i EBITDA_{M,t} + u_{i,t}, \qquad (45)$$

where $EBITDA_{i,t}$ are the public cash flows over total assets of firm i at time t (corresponding to $C_i - g_i$ in our model), α_i is the regression constant, and $u_{i,t}$ is an error term.

After estimating $\widehat{\alpha}_i$ and $\widehat{\gamma}_i$ for each firm i, we calculate the estimated residuals $\hat{u}_{i,t}$ (that is $\hat{u}_{i,t} = EBITDA_{i,t} - \widehat{\alpha}_i + \widehat{\gamma}_i EBITDA_{M,t}$). Then for each firm we calculate the volatility of the estimated residuals of each regression which we call $ICFV_i$ (Idiosyncratic cash flow volatility), and use this variable as a proxy of the idiosyncratic cash flows volatility σ_i^2 in our model.[18]

Table III reports the statistics of $ICFV_i$ for the companies in our sample. The number of firms with at least 5 observations in our sample is 1,678, still large enough to perform a proper cross-sectional analysis. Idiosyncratic cash flows volatility is relatively heterogeneous across firms, with a mean of 4.5% of total assets and a standard deviation of 3.2%. 5% of all firms have an idiosyncratic cash flow volatility of less than 1.1%, 5% more than 10.1%.

C Stock return beta and idiosyncratic risk

In order to estimate stock return beta, β_i, and idiosyncratic stock return volatility $\sigma_{\eta_i}^2$ we use the daily stock return data from the Center for Research in Security Prices (CRSP), as documented in Table II. We follow an approach similar to that of Ferreira and Laux (2007). For each stock i and each year t we consider the daily stock return and the daily market return, where the latter is defined as the market value weighted index of stock returns in our dataset. We then perform the standard regression of returns on the market, as in (24). This regression yields $Beta_{i,t}$, the beta of stock i, for the year t, and the

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[18]Our approach is similar to Bates, Kahle, and Stulz (2009) who also use EBITDA to estimate cash flow volatilities. However, they do not correct for market risk and the focus of that paper is quite different from ours, as it investigates the role of cash flow volatility for corporate cash holdings.

residuals $\eta_{i,t,d}$ for each day d of the year t considered. For each year, we can then calculate the volatility $\sigma^2_{\eta_{i,t}}$ of the daily residuals $\eta_{i,t,d}$. Since our sample period ranges from 1990 to 2006 with significant changes in market volatility, we normalize the idiosyncratic stock return volatility by the market volatility $\sigma^2_{M,t}$, calculated from daily market returns for the year t. That is we calculate $IRV_{i,t} = \sqrt{\sigma^2_{\eta_{i,t}}/\sigma^2_{M,t}}$, the normalized idiosyncratic return volatility of stock i in year t. Since in our tests, we concentrate on the cross section, we then compute the average of $Beta_{i,t}$ and $IRV_{i,t}$ for the years where we have data on the GIM-Index, to obtain the cross-section of our key stock return variables $Beta_i$ and IRV_i.

Table III shows their descriptive statistics. The average $Beta_i$ is 1.059 with a standard deviation of 0.5 indicating again a large heterogeneity of systematic risk in our sample. The average IRV_i is 3.3 with a standard deviation of 1.92, a large dispersion around the mean. Moreover, we find that idiosyncratic stock return volatility is on average three times larger than market volatility, in line with previous empirical evidence (see Ferreira and Laux 2007). In particular, idiosyncratic volatility represents the larger part of overall stock volatility.

V   Empirical Results

Our theoretical analysis has yielded two types of results. First, Proposition 6 predicts the impact of idiosyncratic cash flow volatility, which is exogenous in our model, on various endogenous variables. Second, Proposition 7 predicts the correlations between our endogenous variables for a broader set of exogenous variations, which are not necessarily observable. We now test both types of predictions in turn.

A   Regressions

In this subsection, we regress different endogenous variables on the idiosyncratic cash flow volatility variable $ICFV$ described above. We winsorize extreme observations at the bottom and top 1% levels to avoid spurious inferences.

We begin with the GIM Index and perform three different cross-sectional regressions. First, as Table IV shows, the univariate regression yields a coefficient of -10.25 significant at the 1% level. This is in line with our theoretical predictions: companies with lower idiosyncratic cash flow volatility exhibit laxer governance.

INSERT Table IV HERE

In order to verify that this result is not driven by omitted variables we use an extensive number of control variables. In the second regression, we include various balance-sheet variables to control for factors that might induce a spurious correlation. These controls are standard in the literature, including leverage (LEV), Price-to-book-value (PTBV), equity capitalization (SIZE), dividend yield (DY), and firm age (AGE). We measure variables for each firm-year and calculate the averages for our cross-section analysis.[19] Table IV displays the estimates and shows that the inclusion of control variables confirms the significant negative impact of idiosyncratic cash flow volatility on the GIM Index. The inclusion of the control variables reduces the value of the coefficient to -5.36, still significant at 1%. The inclusion of sectorial dummies, the third cross sectional regression, reported in column (3), does not change this result.

We next test the prediction of Proposition 6 that idiosyncratic cash flow risk impacts average firm cash flows negatively. We do this by regressing the cash flow variable $EBITDA_i$ described above on the idiosyncratic cash flow volatility variable $ICFV_i$. In the same way as for the GIM Index we perform three different cross-sectional regressions: a univariate regression, a multivariate regression with control variables, and a multivariate regression where we include also sector dummies. Results are reported in Table V.

INSERT Table V HERE

According to the univariate regression estimates, reported in column (1), average cash flows, $EBITDA_i$, depend negatively and significantly on idiosyncratic cash flow volatility, $ICFV_i$, as predicted by Proposition 6. The coefficient is equal to -0.44 and is significant at the 1% level. The inclusion of control and sector dummy variables in the multivariate regression confirms the negative and highly significant relation. The results are confirmed if we use ROA instead of EBITDA, but the inclusion of sector dummies lowers the significance of the coefficient. Clearly there are several other managerial decisions related to accounting returns that our model does not capture and that the empirical evidence seems to relate to industries.

Finally, we turn to the stock market risk variables β_i and $\sigma^2_{\eta_i}$. Proposition 6 predicts

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[19] A description of each control variable is in Table II, with descriptive statistics provided in Table III.

that both depend positively on idiosyncratic cash flow volatility, σ_i^2. We perform the three different cross-sectional regressions described above and report the results in Table VI.

INSERT Table VI HERE

The results from Table VI are as predicted. The univariate regression estimate shows that companies with higher idiosyncratic cash flow volatility, $ICFV_i$, have higher stock return betas, $Beta_i$, and higher idiosyncratic stock return volatility, IRV_i. Results are confirmed in the multivariate setting that includes control and sector dummies variables.

As before, the coefficient of $ICFV_i$ decreases when we include more controls, but it remains large and strongly significant. For the beta regression it decreases from 4.00 for the univariate regression (column 1) to 2.52 for the regression with all control variables (column 3), all significant at the 1% level. The impact on idiosyncratic stock return volatility IRV_i is three times as large, with coefficients ranging from 11.95 (column 1) to 7.58 (column 3), all statistically significant at the 1% level.

These regression results also provide an interesting new insight into the link between cash flow volatility and stock return volatility. Conventional wisdom has it that idiosyncratic firm risk has no impact on expected stock returns because this risk can be eliminated through portfolio diversification and only systematic risk is priced. Our theoretical and empirical analysis shows, however, that idiosyncratic cash flow volatility impacts stock return risk, both systematic and idiosyncratic, via its influence on managerial effort, ownership and corporate governance. As noted in the Introduction, this is an interesting complement to the conventional wisdom that seems to have gone unnoticed before.

B   Correlations

While idiosyncratic cash flow volatility provides an exogenous source of variation that we can identify well empirically, other exogenous variations cannot be as easily identified. However, Proposition 7 shows that several of these variations lead to the same changes of the endogenous variables and predicts the resulting equilibrium correlations. We now test these predictions of Proposition 7 empirically by looking at the correlations among the estimated endogenous variables used to proxy corporate governance (GIM Index), accounting

performance ($EBITDA_i$ and ROA_i), stock return beta ($Beta_i$), and idiosyncratic stock return volatility (IRV_i). Although covered by our theory, we do not include managerial ownership into our analysis, because we do not have good enough ownership data.

Table VII reports the correlations among the four endogenous variables.

INSERT Table VII HERE

The signs in Table VII are as predicted in the table in Proposition 7. All correlation coefficients are significant at the 1% level. The correlation analysis therefore lends support to our theoretical model on a broad basis.

As noted in the introduction, Table VII shows in particular that the GIM Index and accounting measures of corporate performance are positively correlated. In the light of standard theory, this is remarkable: the stricter is corporate governance according to the GIM Index, the lower are corporate earnings and returns on assets. The finding supports our theory that strict corporate governance reduces the diversion of corporate cash for the private benefit of managers, but decreases total cash flows. The correlation is no direct test of our assumption about managerial effort costs, because it reflects endogenous equilibrium outcomes driven by these costs.[20] But it is highly suggestive.

In summary, the correlation analysis supports our theoretical predictions. It is worth stressing that most of the literature on this topic is either only theoretical or only empirical, and the empirical analyses usually only concentrate on one single relation. Our model provides several predictions of relations among variables from very different sources: corporate governance variables, accounting variables, and stock market variables. The fact that this combination of empirical evidence is consistent with our model lends additional credibility to the model.

C   Robustness and further analysis

We have tested the robustness of our results with respect to different model specifications and different regressions methodologies. All the results reported in this subsection are available on request.

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[20]Such direct tests could be provided by laboratory experiments. The closest such study to our knowledge is Dickinson and Villeval (2008) who find that monitoring tends to crowd out work incentives when it becomes too strict. But their experimental set-up is different from our model assumptions.

First, regressions with the GIM Index re-scaled from 0 to 5 as in Figure I yield similar results. Second, we have investigated whether our empirical results disappears in the more recent part of the sample. The issue of a sample break has been raised by Bebchuk, Cohen, and Wang (2013) in the traditional framework of estimating abnormal returns. They have shown that the findings of Gompers et al. (2003) largely vanish for the period 2000-2008 and attribute this to learning by market participants. We have performed the univariate and multivariate analysis for the sample of 2000-2006 and find that our results are confirmed. Actually, the relationship between ROA and idiosyncratic cash flows volatility in the multivariate regression becomes significant at the 1% level. This shows that our findings are mainly due to a cross sectional rather than a time series effect that is persistent through time, in line with our modelling approach.

Third, we have investigated whether our results are related only to a subset of the twenty-four governance provisions of the GIM Index. This issue has been raised by Bebchuk, Cohen, and Farrell (2009), who show that only six provisions are associated with economically significant reductions of firm valuation and abnormal negative returns. Our results continue to hold when we use the Entrenchment Index based on the six provisions identified by Bebchuk, Cohen, and Ferrell (2009) instead of the GIM Index for the period 2000-2006. We have also repeated the analysis for the index based on the other eighteen provisions and the relationship are confirmed. Hence, our findings hold over subsets of the twenty-four governance provisions of the GIM Index.

In line with the work of Ferreira and Laux (2007) and the work of Cella, Ellul and Giannetti (2013) that shows that institutional investor ownership matters in amplifying the effect of shocks on stock returns, we have also considered institutional ownership as a control variable. The results are qualitatively similar.

VI Conclusion

This paper provides an answer to the question why and how corporate governance choices matter for stock returns if the stock market understands and discounts the managerial agency problem correctly. To address this question we have proposed a model that incorporates two key elements of the managerial agency problem into the CAPM, with countervailing effects of strict corporate governance. On the one hand, strict corporate

governance limits the amount of company resources a manager can extract for private benefit, on the other it increases the disutility of effort as it constrains flexibility and initiative in managerial decision making. The tradeoff between these two motives yields an optimal degree of strictness of corporate governance.

This tradeoff is quite different from that of standard agency models, in which strict governance makes the manager provide higher effort but entails resource costs of control. However, we provide direct empirical evidence that stricter corporate governance is negatively correlated with corporate earnings, which is consistent with our theory of agency.

This trade off has implications not only for the stock price but also for the firm's β, because governance alters the risk-return tradeoff of the firm's cash flow and its relation with the market factor. The reason is that effort improves firm value without affecting risk. Hence, laxer governance, by inducing effort, reduces risk (systematic and idiosyncratic) per dollar invested.

The manager's reaction in terms of effort and stock ownership is key here. In fact, in the simple CAPM, excluding the manager's effort choice and her optimal ownership adjustment on the capital market, our model yields a negative relation between governance strictness and β,[21] very much in the spirit of classic theories of levered beta (e.g., Hamada, 1972): the stricter is governance, the less the manager can divert, the larger is the pie to distribute to shareholders, and thus the smaller β (which measures risk per unit of cash flow). But in full equilibrium, taking the manager's choice of ownership stake into account, this effect is reversed: we predict the strictness of corporate governance to correlate positively both with β and with idiosyncratic risk.

These predictions are strongly confirmed in our empirical analysis. The model also makes predictions about the relationship between the variables just discussed, and accounting measures of earnings, as well as managerial ownership. While we can confirm the predictions about earnings with available data, the ownership predictions are difficult to test because we do not have sufficiently good ownership data. A comprehensive investigation would be most interesting, but is left for further research.

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[21] In the alternative model of proportional instead of additive cash flow diversion that we sketch in Appendix B, governance has no effect on β in this pure CAPM scenario.

Appendix A: Proof of Proposition 7

Suppose that one of the exogenous parameters σ_i^2, t_i, or ϕ_i varies, and call this parameter p_i.

A Impact on g_i

The impact on g_i follows from differentiating the first-order condition (36)

$$rt_i^2(2\lambda_i\sigma_i^2 + t_i g_i^r) = 2(1-\phi_i)(\lambda_i\sigma_i^2 + t_i g_i^r)^2 g_i^{1-2r}.$$

Differentiation with respect to σ_i^2 yields

$$rt_i^2(2\lambda_i + rt_i g_i^{r-1}\frac{dg_i}{d\sigma_i^2}) = 4(1-\phi_i)(\lambda_i + rt_i g_i^{r-1}\frac{dg_i}{d\sigma_i^2})(\lambda_i\sigma_i^2 + t_i g_i^r)g_i^{1-2r} + 2(1-\phi_i)(1-2r)(\lambda_i\sigma_i^2 + t_i g_i^r)^2 g_i^{-2r}\frac{dg_i}{d\sigma_i^2}$$

After multiplying by $2g_i(\lambda_i\sigma_i^2 + t_i g_i^r)$, using (36) twice, and re-arranging, this is equivalent to

$$-2g_i\lambda_i\sigma_i^2 - t_i g_i^{r+1} = \left[3t_i r g_i^r + t_i^2 r g_i^{2r} + (1-2r)(\lambda_i\sigma_i^2 + t_i g_i^r)(2\lambda_i\sigma_i^2 + t_i g_i^r)\right]\frac{dg_i}{d\sigma_i^2}$$

which implies

$$\frac{dg_i}{d\sigma_i^2} < 0 \qquad (46)$$

as claimed in Proposition 6.

Differentiation with respect to t_i yields

$$4rt_i(2\lambda_i\sigma_i^2 + t_i g_i^r) + 2rt_i^2(g_i^r + rt_i g_i^{r-1}\frac{dg_i}{dt_i}) =$$

$$(1-\phi_i)(1-2r)g_i^{-2r}(2\lambda_i\sigma_i^2 + 2t_i g_i^r)^2\frac{dg_i}{dt_i} + 4(1-\phi_i)g_i^{1-2r}(2\lambda_i\sigma_i^2 + 2t_i g_i^r)(g_i^r + rt_i g_i^{r-1}\frac{dg_i}{dt_i})$$

After multiplying by $2g_i(\lambda_i\sigma_i^2 + t_i g_i^r)$, using (36) twice, and re-arranging, this is equivalent to

$$8\lambda_i^2\sigma_i^4 + 6t_i g_i^r\lambda_i\sigma_i^2 + 2t_i^2 g_i^{2r} = \left[2t_i(1-2r)(2\lambda_i\sigma_i^2 + t_i g_i^r)(\lambda_i\sigma_i^2 + t_i g_i^r) + rt_i^2 g_i^r(6\lambda_i\sigma_i^2 + 2t_i g_i^r)\right]\frac{dg_i}{dt_i}$$

which implies

$$\frac{dg_i}{dt_i} > 0 \tag{47}$$

Finally, the differentiation with respect to ϕ_i yields

$$
\begin{aligned}
r^2 t_i^3 g_i^{r-1} \frac{dg_i}{d\phi_i} &= 4(1-\phi_i)rt_i g_i^{1-2r}(\lambda_i \sigma_i^2 + t_i g_i^r)g_i^{r-1}\frac{dg_i}{d\phi_i} \\
&\quad + 2(1-\phi_i)(1-2r)(\lambda_i \sigma_i^2 + t_i g_i^r)^2 g_i^{-2r}\frac{dg_i}{d\phi_i} - 2(\lambda_i \sigma_i^2 + t_i g_i^r)^2 g_i^{1-2r}
\end{aligned}
$$

which implies

$$\frac{dg_i}{d\phi_i} > 0 \tag{48}$$

after re-arranging as in the previous two cases.

B   Impact on V_i

As in (44), we can decompose the impact of any $p_i \in \{\sigma_i^2, t_i, \phi_i\}$ on market valuation P_{i1} in (39) as

$$\frac{dP_{i1}}{dp_i} = \frac{\partial P_{i1}}{\partial p_i} + \frac{\partial P_{i1}}{\partial g_i}\frac{dg_i}{dp_i} \tag{49}$$

In Section IIIG, we have shown that in equilibrium $\frac{\partial P_{i1}}{\partial g_i} \geq 0$. It thus remains to be shown that the direct impact of p_i on P_{i1} ($\frac{\partial P_{i1}}{\partial p_i}$) has the same sign as $\frac{dg_i}{dp_i}$ calculated above.

1. From (29), if cash flow risk σ_i^2 increases, managerial ownership π_i decreases. Hence, (39) implies $\frac{\partial P_{i1}}{\partial \sigma_i^2} < 0$.

2. Differentiating (29) shows immediately that $\frac{\partial P_{i1}}{\partial t_i} > 0$.

Hence, for both parameters, the direct impact on P_{i1} and that on g_i is the same, which by (49) implies that g_i and P_{i1} move in the same direction. Since by (21) and (25) $\beta_i = B_i/P_{i1}$ and $\sigma_{\eta i} = \sigma_i/P_{i1}$, g_i and the stock market variables β_i and $\sigma_{\eta i}$ move in opposite directions.

Since the firm's market valuation P_{i1} does not directly depend on ϕ_i, (49) implies that also $\frac{dP_{i1}}{d\phi_i} > 0$.

C Impact on π_i

The impact of our exogenous variables on managerial ownership π_i in (29) can again be decomposed into a direct and an indirect effect:

$$\frac{d\pi_i^*}{dp_i} = \frac{\partial \pi_i^*}{\partial p_i} + \frac{\partial \pi_i^*}{\partial g_i}\frac{dg_i}{dp_i} \tag{50}$$

for $p_i \in \{\sigma_i^2, t_i, \phi_i\}$. We have $\partial \pi_i^*/\partial g_i > 0$.

1. An inspection of (29) shows immediately that $\partial \pi_i^*/\partial \sigma_i^2 < 0$. By (46), $\frac{d\pi_i^*}{d\sigma_i^2} < 0$.

2. Similarly, $\partial \pi_i^*/\partial t_i > 0$. By (47), $\frac{d\pi_i^*}{dt_i} > 0$.

3. Since π_i does not directly depend on ϕ_i, (48) and (50) imply that $\frac{d\pi_i^*}{d\phi_i} > 0$.

D Impact on $E(C_i - g_i)$

From (2) and (31), the firm's expected public cash flow is

$$
\begin{aligned}
E(C_i - g_i) &= F_i + \theta_i e_i^* + B_i(\overline{R}_M - R_f) - g_i \\
&= F_i + B_i(\overline{R}_M - R_f) + \frac{t_i^2 g_i^{2r}}{\lambda_i \sigma_i^2 + t_i g_i^r} - g_i \\
&= F_i + B_i(\overline{R}_M - R_f) + t_i \pi_i g_i^r - g_i
\end{aligned}
$$

Hence, the comparative statics for $E(C_i - g_i)$ are as for P_{i1}.

The above four comparative statics sections show that whichever parameter $p_i \in \{\sigma_i^2, t_i, \phi_i\}$ changes, the endogenous variables move as predicted in the correlation table of Proposition 7.

Appendix B: The model with proportional appropriation of cash flow

In this appendix we sketch a variant of the model, in which the owner/manager appropriates a share of realized cash flows rather than a fixed dollar amount as in the main part of the paper. Hence, the owner/manager appropriates $g_i C_i$, where $g_i \in (0, 1]$ denotes corporate governance laxity. Note that here g_i is a percentage, while it measures cash flow units in the model of Section II.

The most important difference is that under proportional cash diversion, the utility from realized public cash flow, $(1 - g_i) C_i$, can be increasing in g_i for some values of C_i. The reason is that the mean-variance objective function that we assume in the paper is not derived from a von-Neumann-Morgenstern utility function. Hence, an increase in diversion reduces the mean and the variance of the investors' objective function, which can be overall beneficial if λ_i is large. This implies that the proportional case is less suited for our analysis and its comparative statics must be interpreted with caution.

All other assumptions are unchanged. It is convenient to denote

$$s_i = \phi_i g_i + \pi_i (1 - g_i) = \pi_i + (\phi_i - \pi_i) g_i, \tag{51}$$

which is the owner/manager's exposure to cash flow: $\phi_i g_i$, with $\phi_i \in [0, 1]$, is the exposure to cash flow through private benefits, and $\pi_i (1 - g_i)$ is the exposure to the public cash flow. Conceptually s_i plays a similar role as π_i in the baseline model.

The owner/manager's final wealth therefore is

$$
\begin{aligned}
W_i &= \pi_i (1 - g_i) C_i + \phi_i g_i C_i + m_i (1 + R_M) + ((1 - \pi_i) P_{i1} - m_i)(1 + R_f) \\
&= s_i C_i + (1 - \pi_i) P_{i1} (1 + R_f) + m_i (R_M - R_f)
\end{aligned}
$$

with variance

$$var(W_i) = \sigma_M^2 (s_i B_i + m_i)^2 + s_i^2 \sigma_i^2,$$

which just as its counterpart in the baseline model, (7), is independent of effort.

As in the derivation of (11) in the main model, the optimal effort as a function of π_i

and g_i is given by the FOC

$$
\begin{aligned}
s_i\theta_i - \frac{e_i}{k_i g_i^r} &= 0, \\
e_i &= s_i\theta_i k_i g_i^r,
\end{aligned}
\tag{52}
$$

with π_i replaced by s_i compared to the baseline model. Notice that if $\pi_i < \phi_i$ then the effort function is strictly increasing in g_i as in the baseline model, while if $\pi_i > \phi_i$ then effort is an inversely U-shaped function of g_i, increasing for $g_i < \frac{\pi_i r}{(1+r)(\pi_i - \phi_i)}$. It is easy to show that in this case, in equilibrium $g_i < \frac{\pi_i r}{(1+r)(\pi_i - \phi_i)}$. Therefore in either case effort increases with g_i.

The derivation of β_i from the CAPM is as in Section IIIC. However, since g_i operates multiplicatively, the equilibrium share price is

$$
P_{i1} = \frac{1 - g_i}{1 + R_f} \left(F_i + \theta_i e_i\right)
$$

different from the additive version in (19), and the factor $(1-g_i)$ cancels out in the returns:

$$
\begin{aligned}
R_i &= \frac{P_{i2}}{P_{i1}} - 1 \\
&= R_f + \frac{(1 + R_f)B_i}{F_i + \theta_i e_i}\left(R_M - R_f\right) + \frac{1 + R_f}{F_i + \theta_i e_i}\varepsilon_i,
\end{aligned}
\tag{53}
$$

The structure of (53) is the same as that of (20) in the additive case except that the expressions do not depend directly on g_i, which cancels out. In particular,

$$
\beta_i = \frac{(1 - g_i)B_i}{P_{i1}} = \frac{B_i\left(1 + R_f\right)}{F_i + \theta_i e_i},
$$

which is decreasing in g_i iff e_i is increasing in g_i. This is as in the baseline line model but stronger, because there g_i has a direct positive impact on β_i, and β_i decreases in g_i only locally at the owner's optimum (see the discussion following (43)).

As in (26) in the baseline model, one can now substitute the optimal e_i and the equilibrium P_{i1} into the owner/manager's objective function to solve for her optimal managerial

ownership, which turns out to be

$$\pi_i^* = \frac{t_i g_i^r}{\lambda_i \sigma_i^2 + t_i g_i^r} - \frac{g_i \phi_i \lambda_i \sigma_i^2}{(1 - g_i)(\lambda_i \sigma_i^2 + t_i g_i^r)} \tag{54}$$

and yields an optimal effort level of

$$e_i^* = \frac{1 - (1 - \phi_i) g_i}{\theta_i} \frac{t_i^2 g_i^{2r}}{\lambda_i \sigma_i^2 + t_i g_i^r} \tag{55}$$

The owner/manager's optimal exposure to cash flow (51) is

$$s_i^* = (1 - (1 - \phi_i) g_i) \frac{t_i g_i^r}{\lambda_i \sigma_i^2 + t_i g_i^r}$$

Both (54) and (55) are very similar to their counterparts (29) and (31) in the additive case. As (29) in the additive case, π_i in (54) can easily be shown to be increasing in g_i. e_i in (55) is increasing for small g_i and may be inversely U-shaped for some parameter values. The optimal value of g_i will then lie on the increasing part of that function.

Substituting the optimal π_i into the owner's objective function as in Section IIIE yields the owner's ultimate objective function when choosing the level of corporate governance laxity:

$$U_i^* = (1 - (1 - \phi_i) g_i) \left(F_i + \frac{1}{2} t_i s_i^* g_i^r \right) + \frac{(\overline{R}_M - R_f)^2}{2 \lambda_i \sigma_M^2} \tag{56}$$

Again, (56) has the same structure as (32) in the additive model. The difference is that the owner's cash objective before diversion,

$$F_i + \frac{1}{2} t_i s_i^* g_i^r = F_i + \frac{1}{2} \theta_i e_i^*$$

is modified additively by $-(1 - \phi_i) g_i$ in the additive case, and by the factor $(1 - (1 - \phi_i) g_i)$ in the multiplicative case.

As in Section IIIE one can now differentiate (56) with respect to g_i and show that it has a unique maximum $g_i^* \in (0, 1)$, if $r \leq 1/2$ and F_i is sufficiently large (to avoid the pathology of the mean-variance objective). Solving the FOC analytically, however, and doing the comparative statics as in Appendix A is more cumbersome than in the additive case. Under mild parameter restrictions (such as F_i being sufficiently large), however, the

mechanics are the same.

Appendix C: The GIM Index

The "Governance Index" introduced by Gompers, Ishii, and Metrick (2003) is a proxy for the level of shareholder protection in a company. It has been computed for about 1500 U.S. firms, covering more than 93% of the total capitalization of the NYSE, AMEX and NASDAQ, in 1990, 1993, 1995, 1998, 2000, 2002, 2004 and 2006.[22] This index is based on 24 corporate-governance provisions. It is computed as the number of provisions, among these 24 provisions, which reduce shareholder's rights. So, the index ranges from 0 to 24 and, the higher is the index, the weaker are shareholder rights. 22 of these provisions are provided by the Investor Responsibility Research Center (IRRC). 6 other provisions are instituted by state law, among which 4 are redundant with the IRRC provisions. However, not all the U.S. states have adopted these 6 provisions. So, in case of redundancy of two provisions, they count only for one. Thus, the index in made up of 24 provisions. The list of the provisions, along with a short description, is provided below. The provisions are clustered in five functional groups: "Delay", which contains tactics for delaying hostile bidders; "Voting", containing shareholder rights in elections or charter/bylaw amendments; "Protection", with provisions that offer protection for directors/officers against job-related liability and compensations; "Other", containing other anti-takeover provisions; and "State", which refers to protective state laws.

Some provisions may vary in amplitude: for instance, the supermajority threshold can vary from 51% to 100%; however, no distinction is made, only the presence of such provision is considered. Also notice that even though some provisions might have a positive effect for shareholders in certain circumstances,[23] as long as they increase management's power they are considered as weakening shareholder protection. The Secret ballot and the Cumulative voting provisions are the only ones increasing the shareholders' rights and their absence increases the index by one point each. It is interesting to note that the index has no obvious industry concentration.

The detailed list of provisions is as follows:

- Delay: tactics for delaying hostile bidders

    - Blank check: the issuance of preferred stocks, which give additional rights to

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[22] The GIM Index is available on Andrew Metrick's web page and in the WRDS database.

[23] See our discussion of Kadyrzhanova and Rhodes-Kropf (2011) in Section I.

its owner, to friendly investors is used as a "delay" strategy.

- Classified board: the directors are placed into different classes and serve overlapping terms.

- Special meeting: it increases the level of shareholder support required to call special meetings

- Written consent: it limits actions beyond state law requirement

- Voting: shareholder's rights in elections or charter/bylaw amendments

  - Compensation plans: it enables participants in incentive bonus plans to cash out options or accelerate the payout of bonuses in case of change in control.

  - Contracts: contracts between the company and some directors/officers indemnifying them from legal expenses and judgments resulting from lawsuits. The contracts comes in addition to indemnification.

  - Golden parachutes: severance agreements that provides a compensation to senior executives upon an event such as termination, resignation, etc.

  - Indemnification: it uses bylaws and/or charters to indemnify directors/officers from legal expenses and judgment. The contracts comes in addition.

  - Liability: it is a limitation on director personal liability to the extent allowed by state law.

- Protection: protection for director/officer against job-related liability, and compensations

  - Bylaws: it limits the shareholder's ability to amend the governing documents of a company through bylaws.

  - Charter: it limits the shareholder's ability to amend the governing documents of a company through charter.

  - Cumulative voting: it allows a shareholder to allocate his total votes in any manner desired.

  - Secret ballot: an independent third party counts votes and the management agrees not to look at individual votes

- Supermajority: it increases the level of the majority, with respect to the state law requirement, required to approve a merger

- Unequal voting: it limits the voting rights of some shareholders and expands those of others.

- Other: other anti-takeover provisions

  - Anti-greenmail: it discourages agreements between a shareholder and a company whose aim is the accumulation of large quantities of stocks.

  - Director's duties: it allows a director to consider constituencies other than shareholders, i.e. employees, suppliers, etc., when considering a merger.

  - Fair price: it limits the range of prices a bidder can pay in two-tier offers.

  - Pension parachutes: it prevents an acquirer from using surplus cash in the pension fund of the company

  - Poison pill: it provides special rights to their holders in case of specific events such as a hostile takeover. Such rights are made to render the target unattractive.

  - Silver parachutes: similar to golden parachutes except that it is extent to a large number of employees

- State: state laws

  - Anti-greenmail law (7 U.S. states)

  - Business combination law: imposes a moratorium on certain transactions between a large shareholder and a company (27 U.S. states)

  - Cash-out law: enables shareholders to sell their stake to a controlling shareholder at a certain price (3 U.S. states)

  - Directors' duties law

  - Fair price law

  - Control share acquisition law: see supermajority

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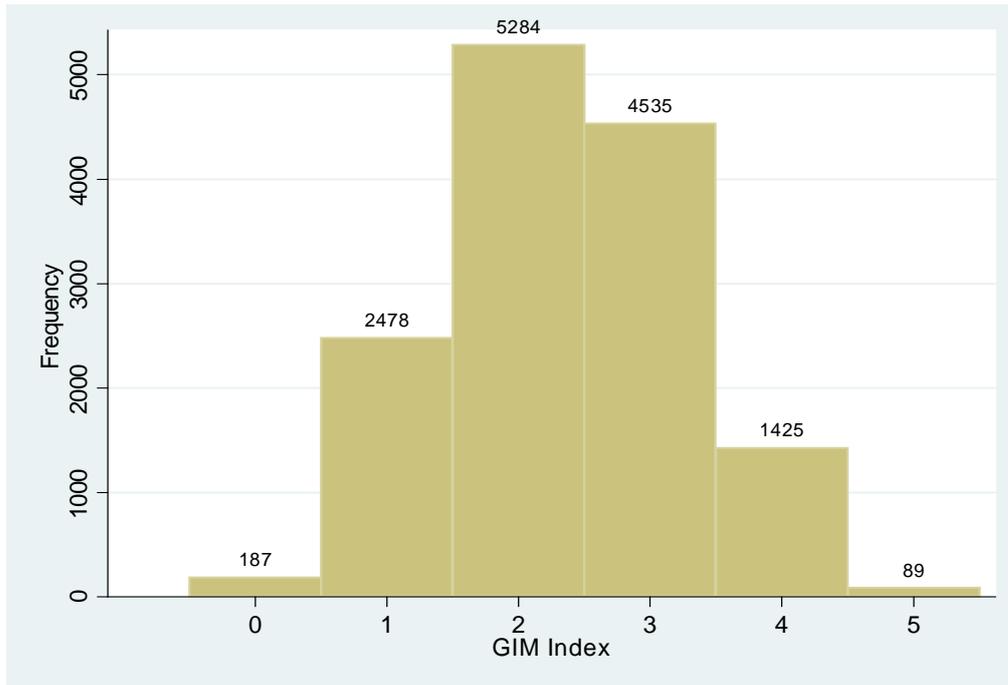
Figure 1: Distribution of the re-scaled GIM Index. Number of observations on the vertical axis. For expositional reasons we have re-scaled the 19 values of the GIM Index into 6 values. The mapping is as follows: values (1,2,3) of the GIM Index become 0; (4,5,6)→1; (7,8,9)→2; (10,11,12)→3; (13,14,15)→4; (16,17,18,19)→5. 0 is the strictest governance, 5 is the least strict.

Table I: **Transition matrix of the (re-scaled) GIM Index**

t \ t+1	0	1	2	3	4	5
0	47	36	7	0	0	0
1	7	1,004	310	16	3	0
2	0	61	2,355	334	13	0
3	1	6	135	2,150	133	0
4	0	3	8	93	731	11
5	0	0	0	0	6	35

This table describes the number of firms that reports a certain level of the GIM Index at time t (Rows) and the same or another GIM index at time t+1 (Columns). Higher GIM Index indicates less strict governance. The sample period is from 1990 to 2006. Number of observations 10,137.

Table II: Variables description

VARIABLE	DEFINITION	SOURCE
GIMIndex	Gompers, Ishii, and Metrick (2003) governance index, which is based on 24 antitakeover provisions.	IRRC
IRV	Square root of the Normalized idiosyncratic volatility given by the ratio of Idiosyncratic volatility to Market volatility	CRSP
Beta	Yearly Beta of asset i	CRSP
EBITDA	Average of the Earnings Before Interest, Taxes, Depreciation and Amortization to Assets Ratio	S&P Compustat
ICFV	Firm Standard Deviation of residuals of the EBITDA market model regression. Market value used to compute weights for market index.	S&P Compustat
ROA	Return on Asset defined as the ratio of Earnings to Total Assets	S&P Compustat
LEV	Leverage defined as the ratio of long term debt to total assets	S&P Compustat
MKTV	Market Value defined as the Annual Fiscal Price Close divided by Common Shares Outstanding	S&P Compustat
LNMV	Natural logarithm of MKTV	S&P Compustat
PTBV	Price to Book Value defined as the Annual Fiscal Price Close multiplied by the Book Value per Share	S&P Compustat
DY	Dividend Yield defined by the ratio of Total dividends to Market Value	S&P Compustat
AGE	Number of years between the year of observation and the year of stock inclusion in the CRSP database	S&P Compustat
LNAGE	Natural logarithm of AGE	S&P Compustat

This Table reports the description of the variables used in the analysis and the source of these variables.

Table III: Descriptive Statistics

	Mean	Sd	p5	p50	p95	N. Obs
GIM Index	8.583	2.530	4.667	8.515	13.000	2740
ICFV	0.045	0.032	0.011	0.036	0.108	1678
EBITDA	0.110	0.156	-0.096	0.124	0.266	2689
ROA	-0.008	0.242	-0.283	0.035	0.134	2736
Beta	1.059	0.507	0.353	0.971	1.984	2740
IRV	3.334	1.916	1.628	2.875	6.422	2740
MKTV	3631	12205	54	883	13770	2733
DY	0.022	0.175	0.000	0.003	0.047	2730
PTBV	1.854	45.494	-0.056	2.191	8.113	2726
LEV	0.214	0.205	0.000	0.182	0.570	2735
AGE	17.348	16.111	3.000	11.000	59.000	2740

This table reports the mean, the standard deviation, the 5th percentile, the median, the 95th percentile and the number of firms of the cross sectional dataset. All variables are as defined in Table II. Sample period 1990 - 2006.

Table IV: GIM Index Regression

	GIM Index		
	(1)	(2)	(3)
ICFV	-10.25***	-5.362***	-5.205***
	(-5.521)	(-2.900)	(-2.705)
LN AGE		0.596***	0.574***
		(7.005)	(6.608)
LNMV		0.0877*	0.101**
		(1.899)	(2.129)
LEV		0.753*	0.707*
		(1.901)	(1.695)
DY		26.85***	25.49***
		(5.199)	(4.583)
PTBV		-0.0205	-0.0252
		(-0.777)	(-0.954)
Constant	9.499***	6.582***	6.752***
	(88.36)	(16.65)	(15.02)
Sector Dummies	No	No	Yes
N.Obs.	1,678	1,678	1,678
R^2	0.017	0.103	0.116

This table reports estimates of coefficients of the cross-sectional firm-level regression

$$GIMIndex_i = c_0 + c_1 ICFV_i + c_2 LNAGE_i + c_3 LNMV_i + c_4 LEV_i + c_5 DY_i + c_6 PTBV_i + \varsigma_i$$

where $GIMIndex$ is the Gompers, Ishii, and Metrick (2003) governance index and $ICFV$ is the Idiosyncratic Cash Flows Volatility. The control variables include Natural Logarithm of Firm Age (LNAGE), leverage (LEV), Natural Logarithm of firm market value (LNMV), Dividend Yield (DY), Price-to-Book Value ratio (PTBV). Refer to Table II for variable definitions. Regressions include industry fixed effects (sectors dummies) where indicated. The sample period is from 1990 to 2006. Financial and utilities industries are excluded. All variables are winsorized at the bottom and top 1% levels. Robust t-statistics are in parentheses. *** Coefficients significant at the 1% level, ** Coefficients significant at the 5% level, * Coefficients significant at the 10% level.

Table V: EBITDA and ROA Regressions

	EBITDA			ROA		
ICFV	-0.439***	-0.443***	-0.350***	-0.224***	-0.218***	-0.133*
	(-7.124)	(-6.981)	(-5.547)	(-3.486)	(-3.144)	(-1.905)
LN AGE		0.00632***	0.00468**		0.00331	0.00250
		(3.192)	(2.375)		(1.539)	(1.170)
LNMV		0.0116***	0.0123***		0.0109***	0.0109***
		(7.287)	(7.538)		(7.084)	(6.759)
LEV		-0.117***	-0.143***		-0.0395***	-0.0698***
		(-9.185)	(-11.01)		(-2.789)	(-4.783)
DY		0.0915	-0.218*		0.168	-0.147
		(0.742)	(-1.852)		(1.344)	(-1.150)
PTBV		0.00468***	0.00544***		0.00793***	0.00885***
		(3.326)	(3.955)		(5.490)	(6.172)
Constant	0.0534***	-0.0362***	-0.0224*	0.147***	0.0434***	0.0567***
	(18.09)	(-3.052)	(-1.794)	(46.26)	(3.731)	(4.380)
Sectors Dummies	No	No	Yes	No	No	Yes
N.Obs.	1,678	1,678	1,678	1,678	1,678	1,678
R^2	0.041	0.241	0.297	0.01	0.174	0.23

This table reports estimates of coefficients of the cross-sectional firm-level regression

$$PERF_i = c_0 + c_1 ICFV_i + c_2 LNAGE_i + c_3 LNMV_i + c_4 LEV_i + c_5 DY_i + c_6 PTBV_i + \varsigma_i$$

where $PERF$ is alternatively, $EBITDA$ ((Earnings Before Interest, Taxes, Depreciation and Amortization) or ROA (Return on Assets) and $ICFV$ is the Idiosyncratic Cash Flows Volatility. The control variables include Natural Logarithm of Firm Age (LNAGE), leverage (LEV), Natural Logarithm of firm market value (LNMV), Dividend Yield (DY), Price-to-Book Value ratio (PTBV). Refer to Table II for variable definitions. Regressions include industry fixed effects (sectors dummies) where indicated. The sample period is from 1990 to 2006. Financial and utilities industries are excluded. All variables are winsorized at the bottom and top 1% levels. Robust t-statistics are in parentheses. *** Coefficients significant at the 1% level, ** Coefficients significant at the 5% level, * Coefficients significant at the 10% level.

	Beta			IRV		
	(1)	(2)	(3)	(4)	(5)	(6)
ICFV	3.993***	3.371***	2.522***	11.95***	9.334***	7.579***
	(11.08)	(9.994)	(8.901)	(13.94)	(12.91)	(10.50)
LN AGE		-0.0488***	-0.0332***		-0.0392	-0.00116
		(-3.692)	(-2.857)		(-1.346)	(-0.0421)
LNMV		0.0633***	0.0684***		-0.378***	-0.390***
		(9.740)	(11.26)		(-20.05)	(-21.56)
LEV		-0.172**	0.151**		0.699***	1.188***
		(-2.576)	(2.390)		(4.407)	(7.600)
DY		-9.458***	-7.149***		-8.865***	-3.388
		(-13.45)	(-11.29)		(-4.075)	(-1.538)
PTBV		-0.00520	-0.00617		0.0161	0.00634
		(-1.169)	(-1.555)		(1.256)	(0.531)
Constant	0.830***	0.718***	0.522***	2.349***	5.153***	4.815***
	(50.76)	(12.46)	(8.801)	(54.60)	(34.14)	(31.61)
Sector Dummies	No	No	Yes	No	No	Yes
N.Obs.	1,678	1,678	1,678	1,678	1,678	1,678
R^2	0.093	0.265	0.454	0.128	0.408	0.478

This table reports estimates of coefficients of the cross-sectional firm-level regression

$$RISK_i = c_0 + c_1 ICFV_i + c_2 LNAGE_i + c_3 LNMV_i + c_4 LEV_i + c_5 DY_i + c_6 PTBV_i + \varsigma_i$$

where $RISK$ is alternatively, $Beta$, stock return beta or IRV, idiosyncratic stock return volatility and $ICFV$ is the Idiosyncratic Cash Flows Volatility. The control variables include Natural Logarithm of Firm Age (LNAGE), leverage (LEV), Natural Logarithm of firm market value (LNMV), Dividend Yield (DY), Price-to-Book Value ratio (PTBV). Refer to Table II for variable definitions. Regressions include industry fixed effects (sectors dummies) where indicated. The sample period is from 1990 to 2006. Financial and utilities industries are excluded. All variables are winsorized at the bottom and top 1% levels. Robust t-statistics are in parentheses. *** Coefficients significant at the 1% level, ** Coefficients significant at the 5% level, * Coefficients significant at the 10% level.

Table VII: Correlations

	GIM Index	EBITDA	ROA	Beta
EBITDA	0.06***			
ROA	0.09***	0.78***		
Beta	-0.09***	-0.12***	-0.12***	
IRV	-0.09***	-0.31***	-0.32***	0.16***

This table presents cross-sectional correlations between the variables $GIM\,Index$ (the Gompers, Ishii, and Metrick (2003) governance index), $EBITDA$ ((Earnings Before Interest, Taxes, Depreciation and Amortization), ROA (Return on Assets), $Beta$ (stock return beta) and IRV (idiosyncratic stock return volatility) that are proxies of the endogenous variables of the theoretical model, as described in Proposition 7. Cross-sectional correlations are based on 2470 observations. The sample period is from 1990 to 2006. *** Coefficients significant at the 1% level, ** Coefficients significant at the 5% level, * Coefficients significant at the 10% level.