Agency Conflicts Around the World*

Erwan Morellec[†] Boris Nikolov[‡] Norman Schürhoff[§]

October 20, 2017

Abstract

We use a dynamic model of of financing decisions to measure agency conflicts at the firm level for a large panel of 12,652 firms from 14 countries. Our estimates show that agency conflicts are large and vary significantly across firms and countries. Differences in agency conflicts are largely due to differences in firm-level governance, ownership concentration, and other firm characteristics. The origin of law is more relevant for curtailing governance excesses than for guarding the typical firm. Agency costs split about equally between wealth transfers and value losses from policy distortions, the latter being smaller in civil law countries where ownership is more concentrated. Governance reforms in Europe during the 2000s have significantly reduced agency costs.

Keywords: Capital structure, agency conflicts, corporate governance, structural estimation

JEL Classification Numbers: G32, G34

*We thank the editor (Francesca Cornelli), two anonymous referees, our discussants Max Bruche, Murray Carlson, Dirk Hackbarth, Harald Hau, Arthur Korteweg, Lukas Roth, and conference and seminar participants at the 2014 Minnesota Mini-Finance Conference, the 2014 Tepper/LAEF Macro-Finance Conference, the 2014 EFA meetings, the 2014 Econometric Society Summer Meetings, the 2014 LBS Finance Summer Symposium, the 2014 Frontiers of Finance Conference, the 2015 AFA meetings, the 2015 Northeastern University Corporate Finance Conference, the 2015 Swiss Finance Institute research days in Gerzensee, Australian National University, Imperial College, European Central Bank, Instituto de Empresa, New Economic School, University of Zurich, and Boston University. The authors gratefully acknowledge research support from the Swiss Finance Institute and the Swiss National Science Foundation.

[†]Ecole Polytechnique Fédérale de Lausanne (EPFL), Swiss Finance Institute, and CEPR. E-mail: erwan.morellec@epfl.ch

[‡]Faculty of Business and Economics at the University of Lausanne and Swiss Finance Institute. E-mail: boris.nikolov@unil.ch

[§]Faculty of Business and Economics at the University of Lausanne, Swiss Finance Institute, and CEPR. E-mail: norman.schuerhoff@unil.ch

The scope for expropriation of minority shareholders and creditors by controlling shareholders, managers, and other corporate insiders is extensive in many countries due to the separation between ownership and control in public firms (La Porta, Lopez-de Silanes, Shleifer, and Vishny (1998, 1999, 2000, 2002)). Such conflicts of interests are severe impediments to the efficient allocation of capital. They distort financing and securities issuance decisions and depress market valuations. Despite their prevalence, the major difficulty in measuring agency conflicts and their effects on policy choices is that these conflicts are not directly observable and good empirical proxies for their severity are difficult to construct. Empirical researchers have developed a number of indexes for corporate governance and investor protection that count the number of governance provisions addressing the expropriation of outside investors.[1] Governance provisions, however, do not measure the extent of agency frictions or the distortions caused by them; they capture the response of the institutional and legal environment to their prevalence. Very few studies quantify agency conflicts directly using unique data for specific countries and in special settings (Nenova (2003) and Mironov (2013)).

In this paper, we follow a radically different approach and infer agency conflicts from the distortions they cause in corporate policy choices. We construct theory-grounded indexes of agency conflicts at the firm level for a broad set of 12,652 firms from 14 OECD countries by backing out the incentive problems within the firm from the consequences they have on observed policy choices in the data, rather than by counting governance provisions. Complementing the prior literature that focuses on corporate governance mechanisms (the cure), we quantify the severity of the underlying agency frictions (the disease). We do so by developing a dynamic model of financing choices with agency conflicts and using data on observable variables—corporate leverage decisions—to infer properties of unobserved variables—agency conflicts. Our structural estimation uses novel data on international ownership structures and a simulated maximum likelihood (SML) method that captures cross-sectional firm heterogeneity, rather than assuming a representative firm.

Our structural estimation approach requires a tractable, yet credible model to benchmark actual corporate behavior to the model-implied first-best and second-best behaviors under varying degrees

[1] Gompers, Ishii, and Metrick (2003) and Bebchuk, Cohen, and Ferrell (2009) construct indexes of shareholder protection in the U.S. by counting the provisions followed by the Investor Responsibility Research Center (IRRC). Djankov, Hart, McLeish, and Shleifer (2008) and Favara, Morellec, Schroth, and Valta (2017) construct indexes capturing creditor protection and the enforcement of debt contracts. La Porta, Lopez-de-Silanes, Shleifer, Vishny (1998, 1999, 2000, 2002), Doidge, Karolyi, Stulz (2007), Aggarwal, Erel, Stulz, Williamson (2009) and Aggarwal, Erel, Ferreira, Matos (2011) construct antidirector-rights, anti-selfdealing, creditor-rights, and other corporate governance indexes for a broad range of international firms.

of agency conflicts.[2] A large theoretical literature has shown that conflicts of interest can cause distortions in financial policies (Jensen and Meckling (1976), Jensen (1986), Stulz (1990), Hart and Moore (1995), Zwiebel (1996), Leland (1998), DeMarzo and Sannikov (2006)). For this reason, we augment a workhorse dynamic capital structure model in the spirit of Fisher, Heinkel, and Zechner (1989) and Strebulaev (2007) with agency conflicts. We then use the model to infer agency conflicts from the distortions they induce in both the levels and time series of corporate leverage. A simplified version of the model has been shown to capture the main stylized facts about U.S. corporate capital structures (Strebulaev (2007), Morellec, Nikolov, and Schürhoff (2012), or Danis, Rettl, and Whited (2014)). We broaden and advance this literature by the cross-country nature of the estimation, which is necessary for comparing legal environments, and the addition of two layers of agency conflicts, which we show is key for capturing international variation in capital structures.

In our model, financing choices reflect two types of conflicts of interest among stakeholders, on top of the standard tradeoff between the tax advantage of debt, the costs of issuing securities, and default costs. First, controlling shareholders can pursue private benefits at the expense of minority shareholders as in, e.g., Hart and Moore (1995), Zwiebel (1996), or Lambrecht and Myers (2008). Second, shareholders can extract concessions from creditors by renegotiating debt contracts in default as in, e.g., Fan and Sundaresan (2000), Garlappi, Shu, and Yan (2008), or Garlappi and Yan (2011). While the real economy is arguably more complex, we consider that each firm is run by a controlling shareholder who sets the firm's investment, financing, and default policies.[3] The controlling shareholder owns a fraction of equity and can capture part of free cash flows as private benefits. Debt constrains the controlling shareholder by reducing free cash flow available for cash diversion. The policy choices are such that firms that perform well releverage to a target to exploit the debt tax shields embedded in the controlling shareholders' equity stake. Firms that

[2]Structural estimation has recently been applied to a wide variety of topics in financial economics. See for example Hennessy and Whited (2005, 2007), Albuquerque and Schroth (2010, 2015), Taylor (2010, 2013), Morellec, Nikolov, and Schürhoff (2012), Dimopoulos and Sacchetto (2014), Nikolov and Whited (2014), Schroth, Suarez, and Taylor (2014), Glover (2016), or Li, Whited, and Wu (2016).

[3]We do not incorporate other determinants of financing decisions such as informational asymmetries, risk-shifting, and incomplete markets for a number of reasons. There is no tractable dynamic theory incorporating these elements, the theory predictions depend heavily on the modeling choices, and evidence on these frictions is mixed (see Frank and Goyal (2003), Leary and Roberts (2010), Gilje (2016)). On the other hand, debt overhang is present in the model in that, without debt, it would never be optimal to shut down the firm. Cash diversion can also be interpreted as moral hazard, similar to the classic unobservable effort problem of Holmstrom and Tirole (1997). The main difference is that we consider ex-post moral hazard, as in e.g. Biais, Hombert, and Weill (2017), where the effort takes place after the state is realized, while Holmstrom and Tirole (1997) consider ex-ante moral hazard.

perform poorly deleverage by renegotiating existing debt contracts. But since debt is not ex-ante contractible (as in Zwiebel (1996)), agency conflicts distort these financing choices.

The intuition for how our structural estimation identifies the agency conflict parameters is directly related to these policy distortions. The model implies specific leverage dynamics for a firm given the model parameters for the technological, tax, and legal environments and agency conflicts. Corporate and personal taxes, bankruptcy costs, refinancing costs, and agency conflicts prescribe not only the mean, median, and mode for leverage, but also the speed of mean reversion, variability over time, and the magnitude and frequency of capital structure readjustments. Absent agency conflicts, realistic values for taxes, bankruptcy costs, and refinancing costs predict large target leverage and infrequent and large capital restructurings. Increasing refinancing costs reduces mean leverage and the frequency of readjustments, but still produces large target leverage. The trade-off theory without agency conflicts is therefore unable to match the data for realistic parameter values.

Introducing agency conflicts allows matching both leverage levels and readjustment dynamics. Benefits of control diminish the incentives by controlling shareholders to undertake large debt issuances, which lowers the mean of leverage by both reducing target leverage and lowering the speed of mean reversion. Control benefits beyond a critical threshold generate zero leverage. Shareholder advantage in default operates differently by making debt renegotiation more likely and rendering debt more costly, thereby lowering mean and target leverage.

Building on this intuition, our identification strategy uses data on leverage dynamics to infer the unobserved control benefits and bargaining power of shareholders in default, similar to the path-breaking GMM approach in asset pricing by Hansen and Singleton (1982). In a first step, we obtain closed-form expressions for the model-implied time-series distribution of leverage ratios. In a second step, we use a simulated maximum likelihood procedure that allows for both observed and unobserved cross-sectional firm heterogeneity to estimate from panel data the firm-specific levels of agency conflicts—that is, both the control advantage of majority shareholders, CADV, and the shareholder bargaining advantage in default, SADV—that best explain observed financing behavior.

Our empirical analysis delivers several novel results. First, we find that moderate agency conflicts are sufficient to explain firms' financing behavior across a variety of institutional and legal settings. Agency theory has thus the potential to resolve several stylized capital structure puzzles. Our estimates for private control benefits CADV represent 2.6% (4.4%) of free cash flows for the median (average) firm, and shareholder advantage in default represents 45% (42%) of the renegotiation surplus. Median private benefits of control CADV are lower than the mean, suggesting that they are of moderate importance for the typical firm but large for some firms in all countries. Shareholders' renegotiation power SADV is distributed more symmetrically, but much larger than stipulated by the absolute priority rule. Shareholders can extract substantial concessions from creditors when firms approach financial distress.

Second, agency conflicts vary systematically across firms both between and within countries. The variation across countries in agency conflicts is small for the average firm, but it is large in the tails. A maximum of 2% of the variation in control benefits across firms and 1% in shareholders' renegotiation power in default can be attributed to the country of origin. The effect of legal provisions is very pronounced in the right tail. Notably, the legal environment seems less effective in civil law countries at curtailing governance excesses that in common law countries, as evidenced by the larger fraction of firms with large amounts of resources diverted. The origin of law and other country determinants are thus more relevant for curtailing governance excesses than for guarding the typical firm, consistent with limited enforcement.

Differences in agency conflicts are largely due to differences in firm-level governance, ownership concentration, and other firm characteristics. Agency costs relate to firm characteristics in the same way in all countries. Firms with more cash, higher market-to-book ratio, and more intangible assets are those with the largest agency costs. Ownership concentration by family and other individuals is, consistent with agency theory, one of the single most important determinants of control benefits. Overall, firm-specific factors explain variation in agency conflicts better than country factors.

Evidence from governance and bankruptcy code reforms in Europe during the 2000s suggests the relation between governance, institutions, and agency is causal. Specifically, estimating agency frictions before and after regulatory and bankruptcy code reforms in France and Italy, we find that these reforms had a strong impact on the magnitude of agency conflicts. Notably, the 'greater voice' to minority shareholders reforms lead to a significant reduction in the private benefits of the controlling shareholders. In parallel, the change in debt enforcement due to the easing of debt renegotiability led to a significant increase in shareholders' bargaining power in default. By contrast, our estimates show that agency frictions in Great Britain, Japan, and Poland did not exhibit any variation around these French and Italian reforms.

Third, what matters for financial policies is the mix between direct ownership and indirect compensation, or control benefits. In civil law countries, in which the legal environment is weaker, ownership concentration is much higher than in common law countries. As a result, even though control advantage is larger under civil law, shareholder incentives are better aligned in civil than common law countries, resulting in smaller financial distortions. This is consistent with firms responding to a weaker legal environment by increasing the ownership stake of controlling shareholders.

Fourth, the value losses from agency conflicts are large. The total loss to minority shareholders has two parts, a part due to rent extraction and another due to financial distortions. While rents are a transfer from one class of shareholders (minority) to another (controlling), financial distortions destroy overall value. We find agency conflicts reduce firm value by 5.4% on average, with about equal shares coming from net transfers between stakeholders (57%) and net losses due to financial distortions (43%). The composition of agency costs varies strongly across countries. In countries where incentives are less aligned due to more dispersed ownership, such as the U.S., financial distortions constitute a larger portion (63%) of agency costs, with wealth transfers (37%) making up the remainder. Counterfactual policy experiments show that agency costs mostly arise from control benefits and the financial frictions that they cause. That is, improving corporate governance to diminish private benefits of control has a larger effect than strengthening creditor rights alone.

Our paper relates to the large literature initiated by Jensen and Meckling (1976) on the relation between agency conflicts, corporate policies, and firm performance.[4] As relevant as it is for regulation and policy evaluation to quantify these conflicts, there are surprisingly few papers addressing this problem. Nenova (2003) estimates that the value of control ranges between 1 and 10% for a sample 661 dual-class firms in 18 countries in 1997, based on the value of voting rights. Dyck and Zingales (2004) use a sample of 393 control transactions across 39 countries from 1990 to 2000 and

[4]While agency conflicts potentially shape all decisions in firms, the literature has put a special emphasis on the interaction between debt financing and either manager-shareholder or shareholder-creditor conflicts. See Jensen (1986), Stulz (1990), Hart and Moore (1995), Zwiebel (1996), Morellec (2004), DeMarzo and Sannikov (2006), Lambrecht and Myers (2008), or Carlson and Lazrak (2010) for an analysis of the effects of manager-shareholder conflicts on financing decisions. See Leland (1998), Parrino and Weisbach (1999), Broadie, Chernov, and Sundaresan (2007), or Arnold, Wagner, and Westermann (2013) for an analysis of the effects of stockholder-bondholder conflicts on firms' financing decisions. This literature has so far been mostly qualitative, focusing on directional effects.

find an average control value of 14%. The methodology used in these studies implies that these estimates are based on very small country samples. Albuquerque and Schroth (2010) use a model of block trades to estimate private benefits of control of 3 to 4% of equity value in the U.S., a number close to our own estimates. Morellec, Nikolov, and Schürhoff (2012) use a capital structure model to estimate private benefits of control of 1 to 2% of equity value in the U.S.. In contrast to these last two studies, we base our analysis on a large cross-section of countries that differ in their legal tradition and enforcement environment. This allows us to disentangle the effects of country-wide factors on agency conflicts from those of firm characteristics.[5] Another difference is that these papers do not incorporate conflicts of interests between shareholders and creditors. We show that both control benefits and deviations from the absolute priority rule are important in explaining variation in capital structure. Lastly, and more importantly, a key benefit of our approach is that we can accommodate firm heterogeneity and determine how firm characteristics relate to agency conflicts. The standard approach in the structural estimation literature is instead to estimate one parameter that applies to all firms, independently of their characteristics.

While the empirical approach developed in this paper is applicable to any theory of financial policy, a prerequisite for our analysis is a model that captures the dynamics of firms' financing behavior. Among the many existing explanations of capital structure choice, only the trade-off argument has a fully worked out dynamic theory that produces quantitative predictions about leverage ratios in dynamics.[6] In addition, and as discussed above, this theory has been shown to perform well at explaining the financing patterns of U.S. firms. Also, while other factors, such as illiquid debt markets or opaque equity markets, may help explain financing behavior in some countries (see, e.g., Cornelli, Portes, and Schaeffer (1998)), we focus in our analysis on a set of developed countries in which these factors should be less important.

Lastly, we focus in our study on capital structure choices and two types of agency conflicts because a large body of theoretical work has argued that these conflicts should affect firms' financing

[5]Doidge, Karolyi, and Stulz (2007) show that countries affect the adoption of firm-level corporate governance. We complement their findings by showing that agency problems are pervasive irrespective of the country and that governance mechanisms affect firms differently depending on their characteristics.

[6]A number of recent papers have extended the pecking order theory to dynamic environments; see Morellec and Schürhoff (2011) or Strebulaev, Zhu, and Zryumov (2016). While the timing of investment is dynamic in these models, debt policy is static in that the amount of debt to be issued is chosen only once, at the time of investment. Another complication is that there usually exists multiple equilibria in these papers, leading to multiplicity in financial policies. This multiplicity makes it difficult to develop tests of the pecking order theory.

decisions and both types of conflicts have received empirical support in the reduced-form empirical literature.[7] This specific focus leads to a sharper characterization but forces us to look at a limited set of economic questions, in that we do not consider all agency conflicts or corporate policies. While it is not clear that other conflicts will bias our results in any particular way, rather than adding noise that is filtered by the firm characteristics, future research could build on our setup to incorporate explicitly other determinants of financing decisions. Similarly, while our study provides many robustness tests, incorporating additional corporate policies in the estimation could prove useful in understanding the impact of agency conflicts of corporate behavior and valuations.

The paper is organized as follows. Section 1 describes the model. Section 2 discusses the data and our empirical methodology. Section 3 provides firm-level measures of control benefits and renegotiation power in default, and it relates the agency conflict estimates to corporate governance mechanisms, ownership structure, and other determinants. Section 4 provides direct evidence from European governance reforms on the causal impact of governance on agency conflicts. Section 5 performs policy experiments and an agency cost decomposition. Section 6 documents robustness checks. Section 7 concludes.

1 Agency Conflicts and Financing Dynamics

This section develops a dynamic model of the firm based on Morellec, Nikolov, and Schürhoff (2012) in which financing and default decisions reflect personal and corporate taxes, refinancing costs, bankruptcy costs, and agency conflicts between controlling shareholders, minority shareholders, and creditors. The next sections use this model to estimate agency costs at the firm level.

[7] Considering first manager-shareholder or controlling-minority shareholders conflicts, Jung, Kim, and Stulz (1996) identify security issue decisions that seem inconsistent with shareholder value maximization. Friend and Lang (1988), Mehran (1992), Berger, Ofek, and Yermak (1997), and Kayhan (2008) find in cross-sectional studies that leverage levels are lower when CEOs do not face pressure from the market for corporate control. Berger, Ofek, and Yermak also find that leverage increases in the aftermath of shocks reducing managerial entrenchment. Considering next shareholder-debtholder conflicts in default, a series of recent papers shows that bankruptcy codes with fewer renegotiation frictions lead to larger debt reductions and reduce equity risk (Fan and Sundaresan (2000), François and Morellec (2004) or Davydenko and Strebulaev (2007)). Consistent with this view, deviations from absolute priority caused by debtor friendly bankruptcy codes have been shown to have important effects on equity returns both in the U.S. (Garlappi, Shu and Yan (2008), Garlappi and Yan (2011) and Hackbarth, Haselmann and Schoenherr (2015)) and outside the U.S. (Favara, Schroth and Valta (2012)). Favara, Morellec, Schroth, and Valta (2017) also show that debt renegotiation in default helps explain corporate investment decisions for firms close to financial distress.

1.1 Model assumptions

Throughout the model, we operate under the risk-neutral probability measure Q and assume that the risk-free rate $r > 0$ is constant. Firms $i = 1, \ldots, N$ are infinitely lived and rent capital at the rental rate R to produce output with the production function $G : \mathbb{R}_+ \to \mathbb{R}_+$, $G(k_t) = k_t^\gamma$, where $\gamma \in (0, 1)$. Capital depreciates at a constant rate $\delta > 0$ so that the rental rate is $R \equiv r + \delta$. The goods produced by the firms are not storable so that output equals demand. Output is sold at a unit price. To keep the setup tractable, there are no costs of adjusting capital so that the optimal capital stock maximizes static profits, as in Miao (2005) or Abel and Eberly (2011).[8]

Firms are heterogeneous in their productivity, ownership, taxation, and exposure to agency conflicts. While their productivity shocks are drawn from the same ex-ante distribution, they differ ex-post in the shock realizations. Specifically, we consider that the firm-specific state variable is its technology shock process, denoted by X_i and governed by:

$$dX_{it} \; = \; \mu_{Xi} \, X_{it} \, dt + \sigma_{Xi} \, X_{it} \, dZ_{it} \, , \qquad X_{i0} \; = \; x_{i0} \; > \; 0, \tag{1}$$

where $\mu_{Xi} < r$ and $\sigma_{Xi} > 0$ are constants and $(Z_{it})_{t \geq 0}$ is a standard Brownian motion under Q. Given a realization x_i of X_i and a size k_i, the operating profit of firm i is $x_i G(k_i) - \delta k_i \equiv x_i k_i^\gamma - \delta k_i$ and is taxed at the corporate tax rate τ^c. The personal tax rate on dividends τ^e and coupon payments τ^d are identical for all investors in a given country.

Because of corporate taxation and the deductibility of interest payments, firms have an incentive to issue debt. To stay in a simple time-homogeneous setting, we consider debt contracts that are characterized by a perpetual flow of coupon payments c and a principal P. Debt is callable and issued at par. The proceeds from the debt issue are distributed on a pro rata basis to shareholders at the time of flotation. Firms can adjust their capital structure upwards at any point in time by incurring a proportional refinancing cost λ, but they can only reduce their indebtedness in default.[9]

[8]This assumption is shared with most models that examine the effects of debt financing on corporate policies such as Gomes (2001), Hennessy and Whited (2005, 2007), or Gomes and Schmid (2010). One notable exception is DeAngelo, DeAngelo, and Whited (2011) in which debt takes the form of a riskless perpetual bond (i.e. there is by assumption no default risk in this model) and can be issued at no cost.

[9]While in principle management can both increase and decrease debt levels, Gilson (1997) finds that transaction costs discourage debt reductions outside of renegotiation. Hugonnier, Malamud, and Morellec (2015) show in a model similar to ours that reducing debt is never optimal for shareholders if debt holders are dispersed and have rational expectations (a result that would also obtain in our setup). That is, there is no deleveraging along the optimal path. See Admati, DeMarzo, Hellwig, and Pfleiderer (2016) for a similar result in a one-period model.

Under this assumption, any given firm's debt structure remains fixed until either the firm goes into default or the firm calls its debt and restructures with newly issued debt.

Firms that perform well may releverage to exploit the tax benefits of debt. Firms whose conditions deteriorate may default. Default can lead either to liquidation or to renegotiation. A fraction of assets are lost as a frictional cost at the time of default so that if the instant of default is T, then $X_{iT} = (1 - \alpha_i)X_{iT^-}$ in case of liquidation and $X_{iT} = (1 - \kappa_i)X_{iT^-}$ in case of reorganization, where $0 \leq \kappa_i < \alpha_i$. Because liquidation is more costly than reorganization, there exists a surplus associated with renegotiation. As in Fan and Sundaresan (2000), François and Morellec (2004), and Broadie, Chernov, and Sundaresan (2007), we consider a Nash bargaining game in default that leads to a debt-equity swap. Denoting the bargaining power of shareholders by $\eta_i \in [0, 1]$, the generalized Nash bargaining solution implies that shareholders get a fraction $\eta_i (\alpha_i - \kappa_i)$ of assets in default.[10] Greater η_i yields larger cash flows to shareholders and thus stronger incentives to default.

Private benefits of control are introduced by considering that each firm i is run by a controlling shareholder who can capture a fraction $\phi_i \in [0, 1)$ of the free cash flow to equity, as in La Porta, Lopez-de Silanes, Shleifer, and Vishny (2002), Lambrecht and Myers (2008), or Albuquerque and Wang (2008). The controlling shareholder owns a fraction φ_i of the firm's equity and has discretion over firm size, the firm's initial capital structure, as well as its restructuring and default policies. When making policy choices, the controlling shareholder maximizes the present value of the cash flows from its equity stake and private benefits. As in Leland (1998), Strebulaev (2007), and Morellec, Nikolov, and Schürhoff (2012), we focus on barrier restructuring and default policies whereby the firm's initial capital structure remains fixed until cash flows reach a low level x_D (the default barrier) and the firm goes into default or cash flows rise to a high level x_U (the restructuring barrier) and the firm calls the debt and restructures with newly issued debt.[11] We can thus view the controlling shareholder's policy choices, and hence agency conflicts, as determining firm size, the initial coupon payment, the restructuring barrier, and the default barrier.

[10] Consistent with this modeling, Favara, Schroth, and Valta (2012) show, using a large panel of firms in 41 countries with heterogeneous debt enforcement characteristics, that cross-country differences in bankruptcy procedures lead to cross-country differences in default decisions and in equity risk.

[11] Hugonnier, Malamud, and Morellec (2015) show that barrier strategies are optimal in dynamic leverage models when firm value is homogeneous of degree one in (X, c), as is the case in our model. As a result, we do not need to consider alternative strategies.

1.2 Shareholders' objective function

To solve for the controlling shareholders' optimization problem, we start by determining firm size. To save on notation, we omit the firm index i whenever possible. When choosing firm size k, the objective of controlling shareholders is to maximize:[12]

$$\pi_c(x,c) \equiv \max_{k\geq 0}\{(1-\tau^e)\left[\phi + (1-\phi)\,\varphi\right]\left[(1-\tau^c)(xk^\gamma - \delta k - c) - rk\right]\}. \tag{2}$$

The solution to this static problem is given by $k^* = \{\frac{(1-\tau)\gamma}{(1-\tau)\delta+(1-\tau^e)r}\}^\xi x^\xi$, with $\xi \equiv \frac{1}{1-\gamma} > 1$, where the effective tax rate $\tau \equiv 1-(1-\tau^c)(1-\tau^e)$ reflects corporate and personal taxes. Replacing the expression for k^* in (2) yields a cash flow to controlling shareholders over each time interval of length dt given by

$$\pi_c(x,c)dt = (1-\tau)\left[\phi + (1-\phi)\,\varphi\right](\Sigma\, x^\xi - c)dt, \tag{3}$$

where

$$\Sigma \equiv \frac{(1-\tau)\delta + (1-\tau^e)r}{\gamma(1-\gamma)^{-1}(1-\tau)}\left\{\frac{\gamma(1-\tau)^\gamma}{(1-\tau)\delta + (1-\tau^e)r}\right\}^{\frac{1}{1-\gamma}}. \tag{4}$$

In our analysis of financing and default policies, it will be more convenient to work with the capacity-adjusted technology shock $Y \equiv X^\xi$ with realizations denoted by y and dynamics given by

$$dY_t = \mu Y_t dt + \sigma Y_t dZ_t, \quad \text{with} \;\; Y_0 = \Sigma X_0^\xi > 0, \tag{5}$$

where $\mu = \xi\mu_X + \xi(\xi-1)\sigma_X^2/2$ and $\sigma = \xi\sigma_X$. Using this change of variable shows that the after-tax cash flows to minority and controlling shareholders satisfy respectively:

$$\begin{aligned} &\text{Cash flows to minority shareholders:} \quad && \pi_m(y,c) = (1-\varphi)(1-\phi)(1-\tau)(y-c), \\ &\text{Cash flows to controlling shareholders:} \quad && \pi_c(y,c) = \left[\phi + (1-\phi)\,\varphi\right](1-\tau)(y-c). \end{aligned} \tag{6}$$

The expression for $\pi_m(y,c)$ in (6) shows that minority shareholders receive a fraction $(1-\varphi)$ of the cash flows from operations y net of the coupon payment c, the fraction ϕ of cash flows captured by the controlling shareholder, and the taxes paid on corporate and personal income. The expression

[12] In most of the countries in our sample, the depreciation of capital is tax-deductible but the interest cost of capital is not. As will become clear below, this modeling assumption has no effect on our estimates of agency conflicts.

for $\pi_c(y,c)$ shows that controlling shareholders get the rents that they extract from the firm, given by $\phi(1-\tau)(y-c)$, in addition to a fraction φ of the dividend payments.[13]

Considering next financing decisions, the objective of controlling shareholders is to determine the initial coupon payment c and the default and restructuring boundaries y_D and y_U that maximize the present value of their claim to cash flows. Denote the present value of controlling shareholders' cash flows by $\mathbf{CS}(y,c)$. This value is the sum of controlling shareholders' equity stake and the value of their private benefits. The value of equity at the time of debt issuance is equal to total firm value because debt is competitively priced. Since controlling shareholders own a fraction φ of equity and can divert a fraction ϕ of net income, we can express the total value of controlling shareholders' claims as:

$$\mathbf{CS}(y_0,c) \;=\; \underbrace{\varphi\,\mathbf{V}(y_0,c)}_{\text{Equity stake}} \;+\; \underbrace{\phi\,\mathbf{N}(y_0,c)}_{\text{Cash diversion}} \tag{7}$$

where $\mathbf{N}\,(y_0,c)$ is the total value of a claim to net income absent agency conflicts (i.e. a claim to $(1-\tau)(y-c)$) given in equation (A6) and $\mathbf{V}(y_0,c)$ is the value of the firm given in equation (A11) and defined as the sum of the present value of a claim on net income plus the value of all debt issues minus the present value of issuance costs and the present value of private benefits of control.

The objective of controlling shareholders, $\sup_{c,\rho}\ \mathbf{CS}(y_0,c)$, is to maximize the ex-ante value of their claims by selecting the coupon payment c and the restructuring factor $\rho \equiv \frac{y_U}{y_0}$. Since net income decreases with c, so does $\mathbf{N}(y_0,c)$. Equation (7) therefore implies that the debt level selected by controlling shareholders is *lower* than the debt level that maximizes firm value whenever $\phi > 0$. Denote by $\mathbf{D}(y_0,c)$ the value of total debt claims, defined in (A9), and by $\mathbf{I}(y_0,c)$ the total value of issuance costs, defined in (A10). Plugging the expression for $\mathbf{V}\,(y_0,c)$ in equation (7) also shows that the objective function of controlling shareholders can be written as

$$\sup_{c,\rho}\ \mathbf{CS}(y_0,c) \;=\; [\varphi\,(1-\phi)+\phi]\ \sup_{c,\rho}\Big\{\mathbf{N}(y_0,c) + \underbrace{\frac{\varphi}{\varphi\,(1-\phi)+\phi}}_{\text{Weighting factor}}\,[\mathbf{D}(y_0,c)-\mathbf{I}(y_0,c)]\Big\}. \tag{8}$$

[13]This shows that cash flow diversion can be interpreted in terms of moral hazard. Indeed, if effort is not incurred by the controlling shareholder, the firm only delivers $(1-\phi)(1-\tau)(y-c)$ to shareholders instead of $(1-\tau)(y-c)$. This is very similar to the classic moral hazard problem of unobservable effort of Holmstom and Tirole (1997). In their analysis the moral hazard problem is formulated in terms of private benefits, instead of cost of effort. Similarly, in our analysis, ϕ is a private benefit of control. The main difference is that in our analysis (as in e.g. Biais, Hombert, and Weill (2017) whose analysis of agency conflicts is very close to ours), the effort takes place after the state is realized so we consider ex-post moral hazard, while Holmstom and Tirole (1997) consider ex-ante moral hazard.

Equation (8) demonstrates that what matters for financial policies is the mix of direct and indirect compensation, as captured by the weighting factor $\frac{\varphi}{\varphi(1-\phi)+\phi}$. Everything else equal, the bigger direct compensation, the bigger this factor, and the lower the distortions in financial policies. The larger the private benefits of control, the larger these distortions. As φ tends to one, conflicts between controlling and minority shareholders decrease and the financing policy selected by controlling shareholders converges to the financing policy that maximizes shareholder wealth, as derived for example in Leland (1998). In this case, the selected debt policy balances tax benefits of debt against default and refinancing costs. When φ tends to zero, conflicts between controlling and minority shareholders increase and the firm converges to an all-equity financed firm.

The solution to problem (8) reflects the fact that, following the issuance of corporate debt, controlling shareholders choose a default trigger that maximizes the value of their claim. As in Fan and Sundaresan (2000), the selected default threshold results from a tradeoff between the continuation value of equity, defined by $\mathbf{E}(y,c) = \mathbf{V}(y,c) - d\,(y,c)$ where $d\,(y,c)$ is the current value of corporate debt given in (A7), and the value of shareholders' claim in default. Since all claims are scaled down by the same factor in default, controlling and minority shareholders agree on the firm's default policy. Since shareholders recover a fraction η of the renegotiation surplus in default, the value of equity satisfies the value-matching condition:

$$\mathbf{E}(y_D, c) = \eta\,(\alpha - \kappa)\,\mathbf{V}(y_D, c). \tag{9}$$

The default threshold can therefore be determined using the smooth-pasting condition:

$$\left.\frac{\partial \mathbf{E}(y,c)}{\partial y}\right|_{y=y_D} = \eta\,(\alpha - \kappa)\left.\frac{\partial \mathbf{V}(y,c)}{\partial y}\right|_{y=y_D}. \tag{10}$$

Hugonnier, Malamud, and Morellec (2015) demonstrate that there exists a unique solution to this optimization problem. The full problem consists of solving (8) subject to (10).

1.3 Leverage dynamics with agency conflicts

Under policy choices that maximize the controlling shareholders' total claim to cash flows, the firm's interest coverage ratio $z_t \equiv Y_t/c_t$ follows a geometric Brownian motion with drift μ and volatility σ, that is reset to the target level $z_T \in (z_D, z_U)$ whenever it reaches either the endogenous lower default barrier $z_D \equiv \frac{y_D}{c}$ or the endogenous higher restructuring barrier $z_U \equiv \frac{y_U}{c}$.

Insert Figure 1 Here

Figure 1, Panel A shows two trajectories for the interest coverage ratio z_t that lead to a reset of capital structure, following either an improvement in the firm's fortunes or a default. Consider for example trajectory 1 that leads controlling shareholders to restructure debt upwards. In our model, debt provides a tax benefit so that firms that perform well may seek to releverage. Because changing the capital structure is costly, the optimal policy is to relever only when the interest coverage ratio exceeds the endogenously determined threshold z_U. At that point, the firm issues additional debt and increases its coupon payment to reset its interest coverage ratio to the target level z_T.

A key implication of our analysis is that the target debt level and the restructuring and default barriers reflect the interaction between market frictions and agency conflicts, so that one can write for each firm i: $z_T(\phi_i, \eta_i)$, $z_D(\phi_i, \eta_i)$, and $z_U(\phi_i, \eta_i)$. Notably, equation (6) shows that control rents decrease with debt, so that the controlling shareholder's choice of debt differs from the efficient choice of debt (optimal for shareholders when there are no controlling-minority shareholder conflicts) whenever $\phi_i > 0$. By increasing the cost of debt, deviations from the absolute priority rule in default lead to further distortions in debt policies (as in e.g. Mella Barral and Perraudin (1997), Fan and Sundaresan (2000), François and Morellec (2004), or Broadie, Chernov, and Sundaresan (2007)).

The leverage ratio ℓ_{it} being a monotonically decreasing function of the interest coverage ratio (see the top right panel of Figure 1), we can write $\ell_{it} = L(z_{it})$ with $L : \mathbb{R}^+ \to \mathbb{R}^+$ and $L' < 0$. The relation between the interest coverage ratio and financial leverage implies that the leverage ratio of each firm in the economy evolves freely between $L(z_U(\phi_i, \eta_i))$ (its lowest value at the time of a restructuring) and $L(z_D(\phi_i, \eta_i))$ (its highest value at the time of default) and is reset to its target level $L(z_T(\phi_i, \eta_i))$ at the time of a restructuring or a default (bottom left panel in Figure 1). The model-based distribution of financial leverage (bottom right panel in Figure 1) thus depends on both the policy choices of the controlling shareholder and on the distributional characteristics of the interest coverage ratio. In particular, let $f_z(z_i)$ be the density of the interest coverage ratio.

The density of the leverage ratio can then be written in terms of f_z and the Jacobian of L^{-1} as

$$f_\ell(\ell_i) = f_z\left(L^{-1}(\ell_i)\right)\left|\left(\frac{\partial \ell_i}{\partial L^{-1}(\ell_i)}\right)^{-1}\right|. \tag{11}$$

Equation (11) shows that to compute the time-series distribution of leverage implied by agency conflicts, we need to know the distribution of the interest coverage ratio f_z. Appendix B derives closed-form solutions for both the stationary and conditional distributions of the interest coverage ratio, given the target interest coverage ratio $z_T(\phi_i, \eta_i)$ and the restructuring and default policies (thresholds) $z_U(\phi_i, \eta_i)$ and $z_D(\phi_i, \eta_i)$ selected by controlling shareholders.

2 Data and Estimation Approach

Our goal in the empirical analysis is to back out from observed leverage dynamics the firm-specific levels of agency conflicts that best explain corporate financing behavior. Korteweg and Strebulaev (2015) show that leverage data can be used to determine firms' target leverage zone. We go one step further and link the policies to the underlying incentive problems. To do so, we derive the model predictions for how leverage dynamics change with the agency parameters (ϕ, η). Simulated maximum likelihood (SML) then backs out estimates for the agency parameters from panel data on leverage ratios.

2.1 Data

Our empirical analysis combines a number of data sources. We obtain financial statements from Compustat U.S. and Global, stock prices from CRSP and Datastream, and tax rates from the OECD. Ownership data is provided to us through a data feed by Thomson Reuters.[14] We collect proxies for the legal environment and other institutional determinants used in the law and finance literature from Andrei Shleifer's website.[15] We remove all regulated (SIC 4900-4999) and financial firms (SIC 6000-6999). Observations with missing total assets, market value, long-term debt, debt

[14]The Thomson-Reuters ownership data starts in 1997. All other data start earlier. We have obtained these data starting from 1991 so that we can run rolling regressions at least five years prior.

[15]`http://www.economics.harvard.edu/faculty/shleifer/dataset`.

in current liabilities, and SIC code are deleted. We obtain a panel dataset with 74,855 observations for 12,652 firms and 14 countries between 1997 and 2011. The distribution of the firms in our sample is Austria (AUT; 61 firms, 0.5% of total), Denmark (DNK; 107, 0.8%), France (FRA; 588, 4.6%), Germany (DEU; 595, 4.7%), Great Britain (GBR; 1,459, 11.5%), Ireland (IRL; 42, 0.3%), Italy (ITA; 204, 1.6%), Japan (JPN; 3,274, 25.9%), the Netherlands (NLD; 138, 1.1%), Poland (POL; 236, 1.9%), Portugal (PRT; 37, 0.3%), Spain (ESP; 102, 0.8%), Switzerland (CHE; 178, 1.4%), and the United States (USA; 5,631, 44.5%).

We split the model parameters into two groups. The non-agency parameters are standard and can be directly estimated from stock prices and other publicly available sources. The focus of our estimation is thus on the deep parameters (ϕ_i, η_i) describing the effects of agency conflicts. The basic model parameters that we can estimate directly from public data include the risk-free rate r, the corporate tax rate τ^c, the personal tax rates on interest income and dividends τ^d and τ^e, the expected profitability μ_i, volatility σ_i, the systematic exposure β_i, the controlling shareholder ownership φ_i, liquidation costs α_i, renegotiation costs κ, and debt issuance costs λ. The risk-free rate, tax rates, market risk premium, and issuance costs are country specific, with the risk-free rate r corresponding to the three-year treasury rate. The rest of the parameters are firm specific.

Table 1 reports the country means for the parameters. We specify firm-level values for the model parameters as follows. We estimate the growth rate of cash flows, μ_{it}^P, indexed by firm i and time t, as the industry average of the least-squares growth rate of EBIT where industries are defined at the SIC level 2. We estimate the risk-neutral growth rate of cash flows, μ_{it}, using the Capital Asset Pricing Model (CAPM). We have $\mu_{it} = \mu_{it}^P - \beta_{it}\psi$, where $\psi = 6\%$ is the market risk premium and β_{it} is the *leverage-adjusted* cash-flow beta. We estimate market betas based on equity returns (where we use the MSCI country index for each country in our sample) and unlever these betas based on model-implied relations. Similarly, we estimate cash-flow volatility, σ_{it}, using the standard deviation of monthly equity returns and the relation $\sigma_{it}^E = \frac{\partial \mathbf{E}(y,c)}{\partial y}\frac{y}{\mathbf{E}(y,c)}\sigma_{it}$, where σ_{it}^E is the stock return volatility and $\mathbf{E}(y,c) \equiv \mathbf{V}(y,c) - d(y,c)$ is the model-implied stock price.[16]

[16]This relation follows from an application of Itô's lemma which implies that $E_t = \mathbf{E}(Y_t, c)$ is an Itô process with:

$$dE_t = \left[\frac{1}{2}\frac{\partial^2 \mathbf{E}}{\partial y^2}(Y_t, c)\sigma^2 Y_t^2 + \frac{\partial \mathbf{E}}{\partial y}(Y_t, c)\mu Y_t\right] dt + \frac{\partial \mathbf{E}}{\partial y}(Y_t, c)\sigma Y_t dZ_t.$$

Dividing both sides of this equation by E_t yields the equation for the volatility of equity returns.

Our source for ownership data is the Thomson-Reuters Global Institution Ownership Feed. This is a commercial database compiling public records on the declarable ownership stakes in companies around the world that is updated quarterly. It allows separating between ownership by individuals, institutions, and mutual funds.[17] We use these data to construct firm-specific measures of controlling shareholders' ownership, φ_{it}. We define φ_{it} as the ownership share of the largest shareholder. In robustness tests, we define φ_{it} as the ownership share of the five largest shareholders.

Insert Table 1 Here

The literature has developed several methods to estimate liquidation costs. In this paper, we use the approach of Berger, Ofek, and Swary (1996) (also used for example in Garlappi, Shu, and Yan (2008) or Favara, Schroth, and Valta (2012)) and estimate liquidation costs as: $\alpha_{it} = 1 - (\text{Tangibility}_{it} + \text{Cash}_{it})/\text{Total Assets}_{it}$, where Tangibility_{it} equals $0.715 * \text{Receivables}_{it} + 0.547 * \text{Inventory}_{it} + 0.535 * \text{Capital}_{it}$. Gilson, John, and Lang (1990) provide evidence that renegotiation costs are negligible. We thus set the renegotiation costs parameter, κ, to zero.

The empirical literature provides estimates of debt issuance costs as a fraction of debt being issued. In the model, the cost of debt issuance, λ, is defined as a fraction of total debt outstanding. The cost of debt issuance as a fraction of the issue size is given in the model by $\frac{\rho}{\rho-1}\lambda$, where $\rho \equiv \frac{z_U}{z_0}$ is the restructuring threshold multiplier. We observe a median value of 2 for ρ in our estimations, so we set $\lambda = 1\%$. The implied cost as a fraction of debt issued of 2% corresponds to the upper range of values reported by Altinkilic and Hansen (2000).[18]

2.2 From leverage dynamics to agency cost parameters

The main objective of our empirical analysis is to estimate from panel data the parameters (ϕ_i, η_i) describing agency conflicts. The remaining non-agency parameters can be directly estimated

[17]Thomson Reuters Ownership Data Feeds report all declarable stakes (U.S. 13F, UK Share Register, among others) for all listed securities. The data is sourced from stock exchanges, regulatory bodies, institutions, financial reports and relations with publicly listed companies.

[18]There is almost no available cross-country evidence on debt issuance costs. In a recent study, Melnik and Nissim (2006) find that the total issue costs of both USD- and Euro-denominated bonds are similar. Because many firms in our sample are from the U.S. or from the Euro area (and thus face an integrated capital market), we have decided to assume that debt issue costs were constant across firms. In addition, and as shown in section 6, while debt issue costs are necessary to produce the right qualitative effects to explain the data (like inertia in leverage ratios), they have little quantitative effects on firms' financing decisions.

or calibrated. With the parameter vector split into two parts, we proceed in two steps. We first estimate the non-agency parameters $\theta_i^\star = (\mu_i, \sigma_i, \beta_i, \alpha_i, \varphi_i, \kappa, \tau^c, \tau^e, \tau^d, \lambda, r, \psi)$ using the data sources described above. Even then, estimating the agency conflict parameters (ϕ_i, η_i) for each firm using solely data on financial leverage is infeasible, or at least noisy. To reduce the dimensionality of the estimation problem further, we treat (ϕ_i, η_i) as random coefficients, instead of separately estimating a value for each firm. We specify for all firms $i = 1, \ldots, N$:

$$\phi_i = h(\alpha_\phi + X_i'\beta_\phi + \epsilon_i^\phi), \text{ and } \eta_i = h(\alpha_\eta + X_i'\beta_\eta + \epsilon_i^\eta), \tag{12}$$

with

$$\begin{pmatrix} \epsilon_i^\phi \\ \epsilon_i^\eta \end{pmatrix} \sim \mathcal{N}\left(0, \begin{bmatrix} \sigma_\phi^2 & \sigma_{\phi\eta} \\ \sigma_{\phi\eta} & \sigma_\eta^2 \end{bmatrix}\right). \tag{13}$$

This specification is sufficiently flexible to capture cross-sectional variation in the parameter values while imposing the model-implied structural restrictions on the domains. We use for $h : \mathbb{R} \to [0, 1]$ the Normal cumulative density function and, alternatively, the inverse logit transformation to guarantee that the parameters stay in their natural domain. Table 2 provides data definitions for the X_is and other variables used in the analysis. The variables X_i include the firms' market-to-book ratio and cash holdings as well as the ownership share of the largest shareholder. The market-to-book ratio captures growth opportunities and other intangibles and has been shown to be related to leverage (see e.g. Smith and Watts (1992)). Large cash holdings are a means to divert funds more easily from the firm and, hence, agency conflicts are likely to vary with the firm's cash holdings (see e.g. Nikolov and Whited (2014)). Lastly, the size of the controlling stake of the largest shareholder is likely to relate to both private benefits (see e.g. Shleifer and Vishny (1997)) and the bargaining power of shareholders in default (see e.g. Davidenko and Strebulaev (1997)). We capture unobserved heterogeneity and omitted variables among the X_is by the bivariate random variables $\epsilon_i = (\epsilon_i^\phi, \epsilon_i^\eta)$. The ϵ_i^ϕ and ϵ_i^η are normally distributed (skewed t distribution in robustness tests), correlated with each other, and independent across firms as in random effects models.

Insert Table 2 Here

To sum up, $\theta = (\alpha_\phi, \alpha_\eta, \beta_\phi, \beta_\eta, \sigma_\phi, \sigma_\eta, \sigma_{\phi\eta})$ is the parameter vector that we estimate structurally for each country. The likelihood function $\mathcal{L}$ of the parameters θ given $\theta^\star$ is based on the probability of observing the leverage ratio ℓ_{it} for firm i at date t, where we define the leverage ratio as:

$$\ell \equiv \frac{\text{Book Debt}}{\text{Book Debt} + \text{Market Value Equity}} \tag{14}$$

where Book Debt is the sum of Long-term debt (DLTT) and Debt in current liabilities (DLC). Assume that there are N firms in the sample and let n_i be the number of observations for firm i. The joint probability of observing the leverage ratios $\ell_i = (\ell_{i1}, \ldots, \ell_{in_i})'$ and the firm-specific unobserved effects $\epsilon_i = (\epsilon_i^\phi, \epsilon_i^\eta)$ for firm i is given by

$$f\left(\ell_i, \epsilon_i|\theta\right) = f\left(\ell_i|\epsilon_i;\theta\right) f\left(\epsilon_i|\theta\right) = \left(f(\ell_{i1}|\epsilon_i;\theta)\prod_{t=2}^{n_i} f(\ell_{it}|\ell_{it-1},\epsilon_i;\theta)\right) f\left(\epsilon_i|\theta\right), \tag{15}$$

where $f(\epsilon_i|\theta)$ is the bivariate normal density corresponding to (13). Explicit expressions for $f(\ell_{i1}|\epsilon_i;\theta)$ and $f(\ell_{it}|\ell_{it-1},\epsilon_i;\theta)$ are derived in Appendix B. Integrating out the random effects from the joint likelihood $f\left(\ell,\epsilon|\theta\right) = \prod_{i=1}^N f\left(\ell_i,\epsilon_i|\theta\right)$, we obtain the marginal log-likelihood function as

$$\ln \mathcal{L}\left(\theta;\ell\right) = \sum_{i=1}^N \ln \int_{\epsilon_i} f\left(\ell_i,\epsilon_i|\theta\right) d\epsilon_i. \tag{16}$$

The SML estimator is then defined as: $\widehat{\theta} = \arg\max_\theta \ln \mathcal{L}(\theta;\ell)$.[19]

At this stage, it is important to note that we are studying outcome variables in equilibrium. Agency costs and corporate governance are determined simultaneously. The better is the corporate governance, the lower are the agency costs, and thus the smaller are the leverage distortions (causal effect). But corporate governance is not determined in isolation. Corporate governance should be tighter when agency costs are larger a priori (selection effect). Depending on the ex-ante severity of

[19] We evaluate the integral in equation (16) using Monte-Carlo simulations. When implementing this procedure, we use the empirical analog to the log-likelihood function, which is given by:

$$\ln \mathbb{L}\left(\theta;\ell\right) = \sum_{i=1}^N \ln \frac{1}{U}\sum_{u_i=1}^U \left(f(\ell_{i1}|\epsilon_i^{u_i};\theta)\prod_{t=2}^{n_i} f(\ell_{it}|\ell_{it-1},\epsilon_i^{u_i};\theta)\right),$$

where U is the number of random draws per firm, and $\epsilon_i^{u_i}$ is the realization in draw u_i for firm i. In the empirical implementation of our SML estimator, the number of random draws U affects the precision and accuracy of the Monte-Carlo simulations performed as part of the estimation as well as the finite simulation sample bias in estimated coefficients. We find that 1,000 random draws are sufficient to make the simulation error negligible.

the agency conflict, the government may choose to set a more or less strict corporate governance and do so by trading off between reducing agency costs and restricting firms' flexibility. Thus different countries with different parameters on this trade-off will choose a different corporate governance and exhibit a different level of agency costs. In section 3, we go back to this issue and provide a detailed analysis of the relation between agency conflicts and various governance mechanisms at the firm or at the country level. In section 5, we develop a number of counterfactual experiments that show how financial policies change with agency conflicts across legal environments.

2.3 Identification of the agency parameters

Before proceeding with the empirical analysis, it will be useful to build intuition for how leverage choices allow identifying the agency conflict parameters. Our model builds on a large body of theoretical work that argues that manager-shareholder conflicts and debtholder-shareholder conflicts feed back into financing decisions (see footnote 2). This line of research has found support in the reduced-form empirical literature (see footnote 3). For example, Garvey and Hanka (1999) find that the adoption of the second generation of state-level antitakeover laws caused treated (i.e. protected) firms to issue less debt and substantially reduce their leverage ratios, consistent with the notion in our model that private benefits of control negatively affect leverage ratios. Becker and Stromberg (2012) show that a 1991 legal ruling limiting managers' incentives to take actions that favor equity over debt for distressed firms in Delaware led to a subsequent increase in leverage ratios in Delaware firms, consistent with the predictions of our model.

Our structural estimation approach builds on these insights. It advances the literature by quantifying the impact of agency conflicts on financial leverage, including its distribution and dynamics, and by establishing a benchmark using panel data on leverage choices for how large these conflicts would have to be to explain observed financing patterns. The model in Section 1 implies specific leverage dynamics for each firm given the model parameters for the technological, tax, and legal environment and the agency conflicts. The policy predictions include target leverage, refinancing frequency, and default probability. The firm's policies, in turn, determine average leverage, leverage variability, persistence and inertia, and other statistical moments of financial leverage. In addition, the model yields comparative statics that predict how leverage varies in the cross-section of firms with different characteristics. We exploit both types of predictions to identify the agency parameters from panel data.

The dynamic trade-off theory establishes a strong, yet unrealistic benchmark for how leverage should behave absent agency conflicts. Corporate and personal taxes, bankruptcy costs, refinancing costs, and agency conflicts prescribe not only the mean, median, and mode for leverage, but also the speed of mean reversion, variability over time, and the magnitude and frequency of large capital structure readjustments. Realistic values for taxes, bankruptcy costs, and refinancing costs predict large target leverage and infrequent large capital restructurings. Increasing refinancing costs generates lower mean leverage, less frequent readjustments, but still large target leverage.

Introducing agency conflicts can help match both leverage levels and readjustment dynamics. Figure 2 illustrates the relation between the agency parameters ϕ_i and η_i and moments used for model identification (in our SML procedure, moments are chosen optimally.) Panel A reports moments on leverage. Panel B reports the range of leverage changes, the autocorrelation of leverage changes, the probability of issuance, and the probability of default.

Insert Figure 2 Here

Control benefits diminish the incentives by controlling shareholders to undertake large debt issuances, which lowers the mean of leverage by reducing target leverage and lowering the speed of mean reversion. Figure 2 shows indeed that an increase in ϕ decreases mean leverage and increases the leverage standard deviation and the range of inertia over leverage, leading to a decline in the speed of mean reversion (or an increase in autocorrelation) and to a decrease in the probabilities of issuance and default. The intuition for these results is that debt constrains controlling shareholders by limiting free cash flows (as in Jensen (1986), Zwiebel (1996), or Morellec (2004)). Controlling shareholders respond by issuing less debt (lower target and mean leverage and lower default probability) and by restructuring less frequently (lower refinancing trigger and, hence, less mean reversion) than optimal for minority shareholders.

Shareholder advantage in default acts in different ways. Shareholder bargaining power makes debt renegotiation more likely and renders debt more costly, which lowers mean and target leverage.

Figure 2 shows indeed that deviations from the absolute priority rule lead to a decrease in mean leverage but to accelerated default and refinancing. Shareholders have an incentive to select a lower debt level as η_i increases since debt becomes costlier (as bondholders anticipate shareholders' strategic action in default and require a higher risk premium on debt). Shareholders also default earlier when η_i is larger since they capture a larger fraction of the surplus in default. As a result, the standard deviation and range of leverage decrease and the probability of default and speed of mean reversion increase with η_i.

Overall, Figure 2 reveals that the model moments exhibit significant sensitivity to the model parameters. More importantly for identification, the sensitivities differ across parameters, such that one can find moments for which the Jacobian determinant $det(\partial m/\partial \theta)$ is nonzero. While the qualitative effect on mean leverage is comparable across parameters, the measures of variation and of mean reversion depend very differently on the parameters. Bargaining power decreases the variation in leverage and autocorrelation; private benefits of control have the opposite effect. These different sensitivities imply that the structural parameters can be identified by combining time-series data on financial leverage (pinning down α_ϕ and α_η) with cross-sectional information on variation in leverage dynamics across firms (pinning down σ_ϕ, σ_η, and $\sigma_{\phi\eta}$).

3 The Size and Determinants of Agency Conflicts

3.1 Agency conflict estimates

Table 4 reports the point estimates for the agency cost parameters and their standard errors in parenthesis. We estimate the structural agency parameters $\theta = (\alpha_\phi, \alpha_\eta, \beta_\phi, \beta_\eta, \sigma_\phi, \sigma_\eta, \sigma_{\phi\eta})$ using the SML procedure discussed in Section 2 with the estimates for $\theta_i^\star = (\mu_i, \sigma_i, \beta_i, \alpha_i, \varphi_i, \kappa, \tau^c, \tau^e, \tau^d, \lambda, r, \psi)$ as inputs. We split the data into country samples and perform the SML estimation separately for each country to avoid any bias from heterogeneity at the country level in property and labor laws and in the enforceability of debt contracts. Standard errors are robust to heteroskedasticity and clustered at the 4-digit SIC industry level. Table 4 shows that the parameters representing the control benefits and the bargaining power of shareholders in default are well identified in the data.

The coefficients on most firm characteristics and the variance estimates for the random effects are economically and statistically significant. This suggests that there is sizable variation in ϕ and η across firms in each of the countries. The table also shows that our estimates of agency conflicts relate to firm characteristics in a similar, sensible way in all countries. We come back to this issue later.

Insert Table 4 Here

To see the links between agency conflicts and firm and country characteristics more explicitly and explore the magnitudes and other determinants of agency conflicts in more detail, we construct firm-level measures of the control advantage (CADV) and shareholder advantage in default (SADV) using the parameter estimates in Table 4. CADV_i is the predicted value for firm i of the parameter ϕ_i that governs the control benefits of controlling shareholders. SADV_i is the predicted value for firm i of the parameter η_i that captures shareholders' renegotiation power in default. The controlling shareholder advantage and the shareholder advantage in default for firm i are formally defined as

$$\text{CADV}_i \equiv \mathbb{E}[\phi_i|\ell_i;\widehat{\theta}] = \int\limits_{\epsilon_i^\eta}\int\limits_{\epsilon_i^\phi} h(\alpha_\phi + X_i'\beta_\phi + \epsilon_i^\phi)\frac{f(\epsilon_i^\phi,\epsilon_i^\eta,\ell_i|\widehat{\theta})}{f(\ell_i|\widehat{\theta})}d\epsilon_i^\phi d\epsilon_i^\eta, \tag{17}$$

$$\text{SADV}_i \equiv \mathbb{E}[\eta_i|\ell_i;\widehat{\theta}] = \int\limits_{\epsilon_i^\eta}\int\limits_{\epsilon_i^\phi} h(\alpha_\phi + X_i'\beta_\eta + \epsilon_i^\eta)\frac{f(\epsilon_i^\phi,\epsilon_i^\eta,\ell_i|\widehat{\theta})}{f(\ell_i|\widehat{\theta})}d\epsilon_i^\phi d\epsilon_i^\eta. \tag{18}$$

In these expressions, $f(\epsilon^\phi,\epsilon^\eta,\ell|\widehat{\theta}) = f(\ell|\epsilon^\phi,\epsilon^\eta;\widehat{\theta})f(\epsilon^\phi,\epsilon^\eta|\widehat{\theta})$ is the joint density of the normally distributed random effects $(\epsilon^\phi,\epsilon^\eta)$ with leverage ℓ, and $f(\ell|\widehat{\theta}) = \int_{\epsilon^\eta}\int_{\epsilon^\phi} f(\ell|\epsilon^\phi,\epsilon^\eta;\widehat{\theta})f(\epsilon^\phi,\epsilon^\eta|\widehat{\theta})d\epsilon^\phi d\epsilon^\eta$ is the model-implied marginal leverage distribution given the parameter estimates $\widehat{\theta}$. Plugging in the estimates from Table 4, we obtain CADV_i and SADV_i for each firm i as the predicted ϕ_i and η_i given the data on leverage $\ell_i = (\ell_{i1},...,\ell_{in_i})'$ and the parameter estimates $\widehat{\theta}$ and $\widehat{\theta}_i^\star$. With these estimates at hand, we can explore the determinants of the conflicts of interest between controlling and minority shareholders and between shareholders and debtholders.[20]

[20]Note that these conditional expectations are unbiased. We avoid a bias from country determinants by estimating the agency conflict parameters separately for each country in our sample. In addition, we augment specification (**??**) by explanatory variables X_i that capture cross-sectional variation at the firm level. Unobserved heterogeneity and omitted variables among the X_is are captured by the bivariate random variables ϵ_i. Let v_i be omitted firm-level explanatory variables from specification (13). We then have $\mathbb{E}[g_i|\ell_i,v_i;\widehat{\theta}] = \mathbb{E}[g_i|\ell_i;\widehat{\theta}] + e_i$, for $g \in \{\phi,\eta\}$, with the

Figure 3 and Table 5 provide descriptive statistics for the predicted control benefits CADV and shareholders' renegotiation power SADV, split by the country of origin. Our estimates show that private control benefits CADV representing 2.6% (4.4%) of free cash flows and a shareholder advantage in default representing 45% (42%) of the renegotiation surplus for the median (average) firm are sufficient to explain firms' financing behavior. There is sizable variation in CADV and SADV across countries and across firms in each of the countries. The largest median control benefits can be found in Poland (5.2%) and France (4.1%). The lowest are in the Netherlands (0.2%) and Denmark (0.2%). In each of the countries considered, the mean is larger than the median, indicating an asymmetric distribution with fat right tail. This is also illustrated in Figure 3, which plots the histogram of CADV (Panel A) and SADV (Panel B) across all firms. Shareholders' renegotiation power in default is distributed more symmetrically, with a standard deviation of 24%. Our estimates show that in France, Switzerland, Japan, and Poland shareholders extract the most from debtholders in renegotiations, whilst Portugal and the United States are the most debtholder friendly. Renegotiation power SADV varies more strongly within country (i.e. with firm characteristics) than across countries. Given the magnitude of bankruptcy and renegotiation costs (Table 1), 42% average bargaining power implies that shareholders capture about 20% of firm value on average by renegotiating outstanding claims in default.

Insert Figure 3 and Table 5 Here

3.2 Agency conflicts, origin of law, and firm characteristics

Many studies have identified factors that purport to explain variation in agency conflicts across and within countries. However, the extent and cost of agency conflicts between various stakeholders are hard to measure and, as a result, their determinants are difficult to study. CADV and SADV provide firm-by-firm measures for agency conflicts that we can use to explore the relation between agency costs, governance mechanisms, and firm characteristics.

following moment condition on the error e_i:

$$\mathbb{E}(e_i|\ell_i;\widehat{\theta}) = \mathbb{E}(\mathbb{E}(g_i|\ell_i,v_i;\widehat{\theta}) - \mathbb{E}(g_i|\ell_i;\widehat{\theta})|\ell_i;\widehat{\theta}) = \mathbb{E}(\mathbb{E}(g_i|\ell_i,v_i;\widehat{\theta})|\ell_i;\widehat{\theta}) - \mathbb{E}(\mathbb{E}(g_i|\ell_i;\widehat{\theta})|\ell_i;\widehat{\theta}) = 0.$$

3.2.1 How much do countries matter for agency conflicts?

Most of the legal rules covering protection of investors and governance mechanisms are set at the country level. Doidge, Karolyi, and Stulz (2007) find that country characteristics explain variation in governance ratings better than firm characteristics. We obtain a different picture when performing an analysis of variation for our direct agency proxies, CADV and SADV, in Panels A of Tables 6 and 7. A maximum of 8% of the variation in control benefits across firms in our sample and 10% in shareholders' renegotiation power can be attributed to the country of origin and the industry (4-digit SIC). Firm characteristics (M/B, cash, firm size, profitability, tangibility) and ownership structure (ownership share by individuals, institutions, and mutual funds) explain another 5 percent. These numbers are low compared to Doidge, Karolyi, and Stulz (2007). This is not surprising. Governance ratings largely depend on the legal and institutional system. Actual agency conflicts depend more on the specific type of firm.

The remaining variation is determined either by factors that are unrelated to origin, industry, firm characteristics, and ownership structure or, more likely, by the interaction of these factors. It will therefore be informative to not only measure the effect on the average firm in different countries but also explore how they affect different types of firms in each country, which is what we do next.

3.2.2 Control advantage CADV

Table 6 explores the determinants of control advantage. The law and finance literature, starting with the seminal study by La Porta, Lopez de Silanes, Shleifer, and Vishny (1998), argues that legal tradition and enforcement influence financial structure and economic development. The origin of law and legal principles and mechanics of debt enforcement influence the design of investor protection (Djankov, Hart, McLiesh, and Shleifer, 2008). To date, however, the empirical evidence on the relation between governance indices and corporate policies is mixed (see e.g. Bebchuk, Cohen, and Ferrell (2009) or Spamann (2010)). We assess the importance of legal origin by linking CADV to the origin of law for each country. The four origins are English common law and French, German, and Scandinavian civil law. Common law countries tend to score higher than civil law countries on the scale of shareholder protection and enforcement of minority rights. We thus expect CADV to be higher in civil than common law countries.

Insert Table 6 Here

The sorts in Table 6, Panel B show that civil law countries have indeed higher control advantage than common law countries, though the difference is small for the average firm. The observed difference corresponds to an additional 160 dollars out of a 1,000 dollar profit diverted into the pockets of the controlling shareholders at the expense of minority interests, with a corresponding drop in the market value of equity.

Enforcement of statutory governance provisions is crucial to ensure the efficacy of provisions and determines the magnitude of agency conflicts (see also Favara, Morellec, Schroth, and Valta (2017)). Enforcement costs preclude the efficient resolution of conflicts of interest when agency conflicts are small. One would thus expect that the contracting environment has asymmetric impact on the distribution of agency costs. Small control advantages likely remain unresolved when enforcement is costly. In such instances, governance provisions should have little effect on CADV. By contrast, governance provisions should have larger impact on CADV when agency costs are sizable. Simply speaking, good governance should preclude massive control failures and agency excesses in the country. The comparison across columns in Table 6 of firms in different quantiles of the control advantage distribution shows that this is indeed the case.

Even though the origin of law has little impact on average CADV, the effect of legal provisions is very pronounced in the tails. The civil law status affects the right tail of CADV more than the median and left tail. Firms at the 95% threshold extract 6 percentage points more out of cash flows in civil law countries than under common law. The difference corresponds to an additional 420 dollars out of a 1,000 dollar profit diverted. This means that, consistent with costly enforcement, common law countries are better at curtailing excesses that are characterized by large amounts of resources diverted from the firm.

In addition to the origin of law, we include sorts on firm attributes. We split the sample into quintiles and report the bottom (LO) and top (HI). We include both the X_i variables from the specification (13) for ϵ_i to quantify their impact and, in addition, other standard control variables in order to see how much variables omitted from (13) matter. The market-to-book ratio (M/B) captures growth opportunities and other intangibles. Large cash holdings are a means to divert funds more easily from the firm and, hence, agency conflicts are likely to vary with the firm's cash holdings. We control for scale effects by including firm size, measured as the natural log of sales. To control for company profitability, we use the return on assets (ROA), defined as EBITDA divided by total assets at the start of the year. Two variables are included to measure the uniqueness of assets: M/B and tangibility (PP&E net divided by total assets).

The differences in CADV across firms depending on their characteristics are large and the signs are as expected. CADV is larger the higher M/B and cash, and the smaller firm size and tangibility. The only exception is ROA in that the differences are small. Cash rich, large intangibles, high market-to-book firms in the top quintiles allow controlling shareholders to divert more than double the amount than the bottom quintiles. Cash, intangibles, and other growth opportunities facilitate resource diversion, especially in poorly governed firms.

The ownership structure of a firm is an important aspect of governance and gives an indication for how a publicly traded company copes with agency conflicts between different stakeholders. Ownership structure relates to agency conflicts for at least two reasons. Higher concentration in the hands of individuals and families in civil law countries gives scope for more rent extraction at the expense of minority shareholders. At the same time, ownership concentration may be the (optimal) response in a weak institutional setting to an otherwise even larger agency problem. The first hypothesis predicts a positive relation between ownership concentration and CADV. The second hypothesis may generate a positive relation between concentration and CADV if the concentration targets the worst CADV cases.

We find that ownership concentration is responsible for large variation in agency costs. While we measure controlling shareholder ownership in the estimation by the stake of the largest shareholder (alternatively the five largest shareholders), expressed as a fraction of market capitalization, here we split ownership into the total share of different types of investors: individuals, institutions, and mutual funds. The bottom panel in Table 6 shows that ownership concentration by family and other individuals is, consistent with agency theory, one of the single most important determinants of control benefits. Higher individual ownership is associated with a significant rise in rent extraction and, hence, a decline of similar magnitude in the firm's market value. Individual owners in the top quintile extract double the cash flows from the firm than controlling shareholders in the bottom quintile. Ownership by institutions and mutual funds, in contrast, does not systematically affect CADV in the cross section of firms. We return to this issue in Section 3.4.

3.2.3 Shareholder advantage SADV

Table 7 focuses on the determinants of the shareholder advantage. Panel A shows origin, industry, firm characteristics, and ownership alone explain little of the overall variation in SADV, like for CADV. It is the interaction of firm characteristics with the legal environment that is important.

Panel B in Table 7 shows the average bargaining power of shareholders in default is 42%, close to the Nash solution. This constitutes a significant deviation from the absolute priority rule. If the rule of law in most countries was costlessly enforceable, we would expect shareholders as residual claimants to end up losing most of their stake in default. This does not seem to be the case, consistent with Favara, Morellec, Schroth, and Valta (2017). Across firms, the standard deviation in SADV (28%) is large. In some firms, shareholders extract no concessions from debtholders while in others they seem to have a very strong bargaining position.

Insert Table 7 Here

SADV exhibits similar levels and variation in civil and common law countries. The difference between civil and common law countries is positive and 4% on average, which is surprising at first given the stronger legal status in debtholder friendly countries with tighter bankruptcy laws. Debt enforcement in most countries is far from perfect, however, due to material enforcement costs and weaker courts, especially in civil law countries.

Panel B also shows in univariate sorts that both firm characteristics and ownership are strong determinants of shareholder advantage in default, under both civil and common law. SADV rises strongly with M/B and cash holdings and drops with size, profitability, and tangibility.

Ownership structure should, of course, also affect shareholder bargaining power. Ownership concentrated in the hands of a few naturally strengthens equityholders' power in a renegotiation situation. We find strong evidence for this conjecture. The individual ownership share correlates strongly with SADV, as for CADV, while institutional and mutual fund ownership affect SADV only weakly. The difference in shareholder bargaining power between firms with disperse and highly concentrated ownership is 10%, ranging from about 40% for the bottom to 50% for the top quintile.

3.3 Origins of variation in control and shareholder advantage

Ownership structures and other firm characteristics vary across countries such that the real sector has different composition in each country.[21] We may thus observe differences in C(S)ADV because ownership concentration and other characteristics are different. Alternatively, the governance setting in a country shapes the scope for shareholder and control advantage, but differently so depending on the institutional, legal, and economic environment. This systemic effect is reflected in the different effects of firm characteristics on C(S)ADV in civil compared to common law countries. To better understand why there exist systematic differences in CADV and SADV between firms in civil and common law countries, we decompose the observed differences $\text{CADV}_{CIV} - \text{CADV}_{COM}$ and $\text{SADV}_{CIV} - \text{SADV}_{COM}$ into the two 'composition' and 'systemic' components.

Let X_l be the average firm characteristics in legal environment $l = CIV, COM$. The firm composition effect is $\beta_{CIV}(X_{CIV} - X_{COM})$, which is simply the regression coefficient β_{CIV} on observable characteristics of the firms in civil law countries times the difference in average characteristics. The remainder captures the impact of the institutional setting resulting in different exposures to the covariates since we can write

$$\begin{aligned} \text{C(S)ADV}_{CIV} - \text{C(S)ADV}_{COM} &= \beta_{CIV} X_{CIV} - \beta_{COM} X_{COM} \\ &= \underbrace{\beta_{CIV}(X_{CIV} - X_{COM})}_{\text{Firm composition effect}} + \underbrace{(\beta_{CIV} - \beta_{COM}) X_{COM}}_{\text{Systemic effect}}. \end{aligned} \tag{19}$$

Table 8 summarizes decompositions of C(S)ADV in which the covariates X include the firms' size, market-to-book ratio, ROA, cash, tangibility, ownership by individuals, institutions, and mu-

[21] We thank a referee and the editor for suggesting an analysis along these lines.

tual funds, and industry fixed effects.[22] The gap of 0.7% in control advantage between $\text{CADV}_{CIV} = 4.8\%$ and $\text{CADV}_{COM} = 4.1\%$ (see Table 6) can be decomposed as follows: $\beta_{CIV}(X_{CIV} - X_{COM}) = -1.1\%$ and $(\beta_{CIV} - \beta_{COM})X_{COM} = 1.8\%$. Table 8 also summarizes the components for each characteristic. Firms in civil law countries are, based on their characteristics, less prone to control advantage. The composition effect is with -1.1% negative and sizable. The largest contribution comes from differences in ownership structure. Firms in civil law countries have more concentrated individual and less concentrated institutional ownership. Concentrated individual and institutional ownership lead to larger control advantage ($\beta > 0$). CADV is 2.0% larger and 2.2% smaller in civil law countries because individual (institutional) ownership is more (less) concentrated, largely offsetting each other. The impact of the institutional setting is such that control advantage is by 1.8% substantially larger in civil than common law countries due to sensitivities being different. This is consistent with the notion that civil law countries have weaker institutions.

Insert Table 8 Here

It also becomes clearer why we observe higher SADV in civil law than common law countries, with an average difference of 3.1%. Plugging in the coefficient estimates and evaluating the X covariates at their mean, we obtain $\beta_{CIV}(X_{CIV} - X_{COM}) = -2.4\%$ and $(\beta_{CIV} - \beta_{COM})X_{COM} = 5.5\%$. Civil law firms naturally have lower SADV, since the effect of different firm characteristics in the population of firms is negative (-2.4%) and sizable. We can see in Table 8 that we observe larger SADV on average in civil law countries for a number of reasons. Most notably, firms in civil law countries have more concentrated individual and less concentrated institutional ownership. Concentrated individual (institutional) ownership leads to larger (smaller) shareholder advantage, which pushes the average in the data up by 4.6% (0.9%). With same ownership structure as in common law countries, SADV would be $4.6 + 0.9 - 1.0 = 4.5\%$ lower in civil law countries. The positive gap also comes from different sensitivities β to the characteristics, and this slope effect is presumably due to differences in the institutional, legal, and economic setting. Line (2) in Table 8 reveals the slope effect alone explains a 5.5% difference in average SADV. Overall, the observed

[22] For the estimation, we pool all firms i from civil (common) law countries to obtain estimates for β_{CIV} and β_{COM}. Let $\text{C(S)ADV}_i = \beta_l X_i + \epsilon_i$ be the C(S)ADV measure for firm i in legal environment $l = CIV, COM$. We then compute $\text{CADV}_l = \beta_l E_l[X_i]$ as the expected value of $CADV_i$ across firms in legal environment l, which we obtain by plugging in the estimated coefficients and evaluating the X covariates at their respective means.

difference in SADV can only partially be explained by different firm compositions. The majority comes from different ownership structures and sensitivities. The two predominant forces are that SADV is by almost 4.5% larger in civil law countries because of concentrated individual ownership and by 5.5% because of weaker institutions, even though bankruptcy rules are tougher.

These results tell us that the observed differences in both CADV and SADV between civil and common law firms are largely due to differences in ownership structure and in the institutional setting, and to some degree confounded by firm characteristics. Comparing averages therefore leads to a misestimation of the true differences coming from the environment.

3.4 Incentive alignment and financial distortions

Incentive alignment, as captured by the weighting factor $\frac{\varphi}{\varphi(1-\phi)+\phi}$ (see expression (8)), varies strongly across countries and legal origins. Section 1.2 has shown that with agency conflicts, what matters for financial policies is the mix of direct ownership and indirect compensation, or control advantage as captured by the weighting factor. Everything else equal, the larger the direct compensation, the smaller the distortions in financial policies. The larger the private benefits of control, the larger these distortions. How direct ownership and control advantage relate to each other in different firms and legal environment is thus important for incentive alignment and financial distortions.

Table 9 sorts firms into quintiles according to direct ownership share φ (rows) and CADV/ϕ (columns). We use independent sorts. Panel A reports the average incentive alignment factor, $\varphi/(\varphi(1-\text{CADV})+\text{CADV})$, in each of the 25 bins. The factor naturally rises with φ across rows and falls with CADV across columns. Financial distortions are the largest when the incentive alignment factor is the lowest. This is the case for CADV in the HI bin and φ in the LO bin. In this extreme case, the factor equals 25%, which means only 25% of the total compensation comes from direct ownership while the remainder, 75% of the total, are control benefits. For low CADV, the weighting factor is about 95% across almost all rows and thus close to 100%, implying a small control advantage and, hence, limited financial distortions.

Insert Table 9 Here

Panels B and C report the fraction of firms in each of the bins. Panel B shows that in civil law countries the fraction of firms with high ownership concentration exceeds the fraction of low concentration firms for all but the lowest quintile in indirect ownership CADV. This is not the case in common law countries (Panel C). In common law countries, firms with high ownership concentration are under-represented (7%). Indirect ownership, or control advantage is more equally distributed across civil and common law countries, as shown in the first row of Panel A and Panel B. The right tail of CADV is slightly fatter in civil and common law countries, consistent with Table 6. Large CADV is thus more likely in civil than common law country firms, but the main difference is the predominance of large shareholders in civil law countries.

The double sorts reveal an important interaction. In civil law countries, high levels of CADV are concentrated in firms with large direct ownership share of the controlling shareholder. Ownership is most dispersed in firms with low CADV (that is, the fraction of firms with dispersed owners drops monotonically with CADV for low levels of direct ownership), and it is the most concentrated in firms with largest rent extraction. The most striking feature is how the ownership structure looks like in firms with the highest rent extraction (CADV HI). For high CADV, firms have predominantly a very concentrated ownership. A total of 11.4% of all firms, or 50% (=11.4%/22.9%) of all firms with the highest CADV, are in the most concentrated ownership bucket. At the same time, not all firms with very concentrated ownership also face high rent extraction. Only 32% (=11.4%/35.7%) of all concentrated firms are in the top CADV bin. This is consistent with the hypothesis that ownership concentration is a mechanism to limit incentive problems at the corporate level. In civil law countries, in which the legal and institutional system is weaker than in common law countries, ownership structure is an important governance mechanism. There is some evidence that concentration in the hands of individuals and families gives scope for rent extraction at the expense of minority shareholders. But the predominant force is that ownership concentration is a response in a weak institutional setting to an otherwise even larger agency problem.

The link between ownership concentration and CADV is, by contrast, weak in common law countries. The correlation between ownership concentration and CADV is close to zero. Small control benefits occur mostly in firms with dispersed owners, like in civil law countries. But large CADV can occur in any firm, with dispersed or concentrated owners. Mostly firms with medium ownership concentration exhibit the highest levels of CADV. Ownership structure does not seem to be a relevant mechanism to curtail corporate excesses in a common law environment. The opposite is true in civil law with generally weaker institutions.

Insert Figure 4 Here

Figure 4 plots the resulting distribution in the incentive alignment ratio across firms in common and, respectively, civil law countries. For all values up to 80%, the fraction of firms with large incentive problems in common law countries exceeds the fraction in civil law countries. In turn, incentive alignment above 80% is significantly more likely in civil law countries.

3.5 Recap and discussion

Overall, four facts emerge from the analysis so far. First, our agency conflict estimates are large, vary significantly across firms, and relate to firm characteristics in the same way in all countries. Firms with more cash, more intangible assets, and higher market-to-book ratio, are those with the largest agency costs. Ownership concentration by family and other individuals is, consistent with agency theory, one of the single most important determinants of control benefits. Second, a maximum of 2% of the variation in control benefits across firms and 1% in shareholders' renegotiation power in default can be attributed to the country of origin. Even though the origin of law has little impact on average agency costs, the effect of legal provisions is very pronounced in the tails. Notably, consistent with costly enforcement, common law countries are better than civil law countries at curtailing excesses that are characterized by large amounts of resources diverted from the firm. Third, the observed differences in agency conflicts between civil and common law firms are largely due to differences in ownership structure and in the institutional setting, and to some degree confounded by firm characteristics. Comparing averages therefore leads to a misestimation of the true differences coming from the environment. Fourth, because what matters for financial policies is the mix of direct (ownership) and indirect (rents) compensation, the response of firms to a weaker legal environment is to increase the ownership stake of controlling shareholders. In civil law countries, high levels of agency conflicts are thus concentrated in firms with a large direct ownership share of the controlling shareholder.

4 Direct Evidence from Governance Reforms

What remains missing from the analysis is an explicit consideration for the fact that institutions, governance, and agency conflicts are equilibrium outcomes. Basically, what we are studying is an equilibrium where agency costs, corporate governance, and the firms' legal framework are determined simultaneously. The better are the institutions and the corporate governance, the lower are the agency costs and thus the leverage distortions. But the worse the conflicts of interests within firms and the larger the resulting financial and potentially real distortions in a country, the stronger is the need for the government to step in and strengthen minority shareholder and creditor rights. One could imagine, for instance, that the government chooses to set a more or less strict corporate governance in a trade-off between reducing agency costs and restricting too much firms' flexibility. Thus, different countries with different exposure to these problems, due to, e.g., industry structure, capital market development, and legal heritage, will choose a different corporate governance and effectively a different level of agency costs. But this choice will depend on some parameters about the country environment that may affect also other choices of the firms, such as leverage.

A natural way to address the joint endogeneity of governance, institutions, and agency is to study time variation in shareholder protection and in creditors' enforcement rights due to reforms.[23] Without such an analysis, it is not clear how one can attribute the effect of leverage distortions to agency conflicts rather than other mechanisms that correlate with corporate governance or the mechanics of debt enforcement. In the following, we study major changes in shareholder protection across Europe where many listed companies have a dominant shareholder, usually an individual or a family, who controls the majority of the votes, so that the interests of controlling and minority shareholders are not well aligned. Both France and Italy implemented major governance reforms during the 2000s in order to curb agency excesses. Enriques and Volpin (2007) discuss the European corporate governance reforms in much detail. They lay out four reform elements that improved internal governance mechanisms, empowered minority shareholders, enhanced disclosure, and strengthened public enforcement. We also examine the effects of two major bankruptcy reforms in France and Italy that affected debt enforcement (see Favara, Morellec, Schroth, and Valta (2017)). Notably, France added to its bankruptcy law a reorganization procedure inspired by the U.S.'s Chapter 11 in

[23]We thank the referee and the editor to push us to consider this analysis.

2005 ("Sauvegarde de l'entreprise"). The main change was to allow management to retain control of the distressed company and the goal was to facilitate debt renegotiations (see Weber (2005)). As in France, the reform in Italy in 2005 aimed at facilitating debt renegotiations while protecting debtors (see Rodano, Serrano-Velarde, and Tarantino (2016)).

In order to gauge the causal effect of governance and debt enforcement on our agency estimates, we augment the list of firm characteristics X_i and re-estimate the model with time series dummies for the post-reform period in our specification (12) for both agency parameters, instead of only cross-sectional determinants. The post-reform dummies $\mathbf{D}_{\phi/\eta}$ capture the systematic causal effects that the governance and bankruptcy code reforms had on control benefits ϕ and shareholder power η. We specify for all firms $i = 1, \ldots, N$:

$$\phi_i = h(\alpha_\phi + \delta_\phi \mathbf{D}_\phi + X_i' \beta_\phi + \epsilon_i^\phi), \tag{20}$$

$$\eta_i = h(\alpha_\eta + \delta_\eta \mathbf{D}_\eta + X_i' \beta_\eta + \epsilon_i^\eta), \tag{21}$$

To implement the test, we consider two major corporate governance reforms in Europe that occurred in a staggered fashion. Tables 4–7 in Enriques and Volpin (2007) list each governance provision with corresponding year. During our sample period, 2001 (France), 2003 (France and Italy) and 2005 (France and Italy) stand out as the years with the major reform elements targeting 'greater voice' for minority shareholders. The staggered nature of the reforms helps us detect persistent shifts in agency conflicts by increasing statistical power. Accordingly, we define the post-reform dummy for the staggered reforms as follows:

- France: $\mathbf{D}_\phi = 1$ if year is 2001; $= 2$ for 2002–2004; $= 3$ for 2005 and later; $= 0$ otherwise.
- Italy: $\mathbf{D}_\phi = 1$ if year is 2003–2004; $= 2$ for 2005 and later; $= 0$ otherwise.

We also explore the effects of two major bankruptcy reforms in France and Italy in 2005 that facilitated debt renegotiations (see Favara, Morellec, Schroth, and Valta (2017)) and define the post-reform dummy in the specification for shareholder power η as:

- France and Italy: $\mathbf{D}_\eta = 1$ if year is 2005 or later; $= 0$ otherwise.

There exists no ideal control country for France and Italy. We are therefore mostly interested in whether CADV and SADV changed significantly in the reform countries. As control firms and countries, we consider several groups based on alternate considerations. France and Italy are both highly industrialized OECD countries with civil law heritage and they are members of the European Union. Great Britain shares many features but has a common law origin. Japan shares the civil law heritage and is highly industrialized, but it is not a member of the EU. Finally, Poland is a civil law country in the EU but with a different firm composition. We estimate the coefficients δ_ϕ and δ_η on the event dummies also for GBR, JPN, and POL. Our intent here is not to argue that these countries are all-else-equal to FRA and ITA, but that if these countries also experienced changes in CADV and SADV during the reform periods, then the impact we identify is likely spurious.

Table 10 shows how the governance and bankruptcy code reforms in France and Italy affected our estimates for agency conflicts, as measured by the coefficients δ_ϕ and δ_η. The coefficient on the post-reform dummy in the specification for ϕ is significantly negative at -0.094 (-0.073) for France (Italy), suggesting the 'greater voice' reforms achieved the goal of taking power away from majority shareholders and reducing their control advantage. Our control countries show no corresponding shift in CADV around the same time. The table also shows that the bankruptcy code reforms had a positive impact on shareholders' bargaining power in default, consistent with the evidence on policy choices in Favara, Morellec, Schroth, and Valta (2017). The coefficient on the post-reform dummy in the specification for η is significantly positive at 0.314 (0.224) for France (Italy).

Insert Table 10 Here

To gauge the magnitude of the reforms' impact on agency conflicts, Panel B in Table 10 reports the average predicted control advantage, defined as $\mathbb{E}[\phi|\ell;\widehat{\theta}]$, and average predicted shareholder advantage, defined as $\mathbb{E}[\eta|\ell;\widehat{\theta}]$, before and after the governance reforms. The difference reported in the third column comes from the estimates for the coefficients δ_ϕ and δ_η. First of all, Panel B shows that none of the alternative countries, GBR, JPN, or POL, is an ideal control country, as the baseline CADV and SADV values before the reforms differ across the countries. The numbers for the difference in CADV and SADV after compared to before the reforms should be interpreted with caution as an indicator for the causal impact of the reforms. It is remarkable, nonetheless, that the reform dummies in the specifications for GBR, JPN, and POL generate almost no explanatory power. For France and Italy, on the other hand, the drop in CADV is 0.8 (1.1) percentage points on average, from a high pre-reform level of 7.1% (5.3%) to a more moderate 6.3% (4.2%). The European governance reforms of the 2000s thus seem to have led to significant reductions in majority shareholders' control advantage. Similarly, the increase in SADV for France and Italy is 6.8 (4.4) percentage points on average, demonstrating the effects of the 2005 bankruptcy code reforms on debt enforcement.

5 Policy Experiments and Agency Cost Decomposition

The previous sections have shown that agency conflicts matter for corporate policies. In this section, we first develop a number of counterfactual experiments that show how agency conflicts affect financial policy. We then show that the value loss from agency conflicts and the composition of the loss vary significantly across countries. Agency costs have two components, the part due to rent extraction and the part due to financial distortions. While rents are a transfer from one class of agents (e.g., minority shareholders) to another one (e.g., controlling shareholders), financial distortions destroy overall value.

Table 11 shows how financial policies change with agency conflicts across legal environments. The table reports a number of key characteristics of leverage decisions and their implications for credit spreads. If agency could be eliminated (that is, $\phi = \eta = 0$), average firm leverage would rise to 40% from an observed 29%, and default and issuance probabilities would almost double while the size of debt issues would decline. As a result, the speed of adjustment would rise from 12% to 18% and credit spreads would increase from 2.71% to 4.44%. Improving overall corporate governance by shutting off control benefits has a larger effect than improving creditor rights alone, as revealed by comparing the counterfactual values in the last two columns. The table also shows that, compared to firms in common law countries, firms in civil law countries exhibit higher leverage, probability of default, and credit spread and lower probability of issuance, issue size, and speed of adjustment. Eliminating agency conflicts has a larger effect on outcome variables in common law countries than in civil law countries.

Insert Table 11 Here

Table 12 quantifies total agency costs for the average firm in each country (first column). It also shows the split between transfers due to rents (second column) and value loss due to distortions in financial policies (third column). Total agency costs are measured as the difference between firm value with agency and firm value without agency (where we set $\phi = \eta = 0$) and are expressed in percent of the firm value without agency conflicts. The total loss in firm value amounts to 5.4% on average, with 3.1% of net transfers and 2.3% of net losses due to financial distortions. Total agency costs range from 3.8% in Austria to 8.6% in Poland, while the U.S. (5%) is close to the median.

Insert Table 12 Here

Table 12 also shows that, consistent with Table 11, the mix between net transfers and value losses due to financial distortions varies significantly among countries. To understand this variation, it is important to recall that what matters for financial policies is the mix of direct (ownership) and indirect (rents) compensation. Our estimates in the previous section show that controlling shareholders' total stake in the firm exceed their direct ownership due to private benefits:

$$\text{Total ownership} = \text{Direct ownership} + \text{Rents} = \varphi * (1 - \text{CADV}) + \text{CADV}. \tag{22}$$

Panel B of Figure 4 shows the compensation mix for the 14 countries in our sample. While controlling shareholders in Italy extract 5.4% of cash flow on average in control benefits (compared to 4.1% in the United States in Table 5), this number constitutes less than 20% of their total ownership. By contrast, public ownership is more dispersed in U.S. corporations, so that 30% of total compensation comes from control benefits. Table 12 shows that in common law countries where the total compensation of controlling shareholders is more tilted toward indirect compensation, for example the United States and Great Britain, financial distortions constitute a larger portion of the total agency costs. By contrast, the portion of agency costs due to wealth transfers is larger in civil law countries with concentrated ownership structure, for example France, Italy, or Poland.

The last two columns of Table 12 report the value loss due to imperfect creditor rights and, respectively, imperfect monitoring. We compute these numbers by counterfactually setting η or, respectively, ϕ to zero and recomputing the firms' optimal policies and valuations. Assuming that creditor rights could be redesigned to allocate all bargaining power to debtholders, so that there are no deviations from the absolute priority rule (APR) and $\eta = 0$, agency costs due to control benefits would still be 4.2%, or 79% of the total. Most agency costs arise from control benefits and the financial frictions that they cause. With perfect monitoring of controlling shareholders (i.e. with $\phi = 0$), agency costs would be reduced to 1.3%.

6 Robustness Checks

We have made a number of assumptions when implementing the empirical estimation of the parameters governing agency conflicts. One may be concerned about the robustness of our estimates given these modeling and data choices. To address this issue, we have performed a number of robustness checks in which we vary the specifications for cost functions and other parametrizations. First, we set issuance costs, λ, to 0.5% (vs. 1% in the main specification). Second, we set renegotiation costs, κ, to 15% (vs. 0%). Third, we allow the non-agency parameters, $\theta_i^\star$, to vary period-by-period (vs. time-invariant) assuming controlling shareholders are myopic about this time variation. Forth, we set controlling shareholder ownership, φ_i, to the ownership of the 5 (vs. 1) largest shareholders. Fifth, we use a broader definition of leverage. Sixth, we set the function h to the inverse logit transformation (vs. the Normal cumulative density function). Seventh, we draw the random variables capturing the firm-specific unobserved heterogeneity, $\epsilon_i = (\epsilon_i^\phi, \epsilon_i^\eta)$, from the skewed t distribution (vs. the Normal distribution) to permit for skewness and kurtosis.

Insert Table 13 Here

Table 13 shows how the results change when we use different specifications. We report average predicted control advantage, CADV, and predicted shareholder advantage, SADV, for each firm in our sample and split by country for each robustness check. The Internet Appendix reports the details for the structural parameter estimates. In short, our estimates are stable across the different specifications. For some countries and parameterizations, the agency cost estimates rise while for others they remain unchanged or fall. There is no systematic bias compared to the main specification. Lower issuance costs and higher renegotiation costs (i.e., lower renegotiation surplus) raise the estimates for CADV from 4.4% to 4.7% and, respectively, 5.1%. Average SADV is barely affected by the different cost specifications. Higher ownership share of the controlling shareholders requires 5.3% CADV on average to explain the leverage dynamics, while SADV is almost unchanged. A radically different leverage definition has the biggest impact, rendering both CADV and SADV smaller. The reason is that the financial distortions that are implied by the alternative definition are smaller compared to the base case. Finally, the alternative h transformation mostly lowers the SADV estimates, while allowing for fat-tailed errors has little impact. Overall, the main conclusions seem resilient to the specific parametric assumptions, and any deviation has an intuitive justification.

We also explore in the Internet Appendix the effect of time variation in the model parameters on optimal financing choices and firm value. Because asset volatility (via its effects on the trade-off between tax benefits and default and refinancing costs) and ownership (via its effects on the trade-off between rents and equity stake) are two first order determinants of financing policies, we introduce variation in both σ and φ. The analysis demonstrates that, even for the parameters with the largest comparative static effect on financial policies (σ and φ), the effect of time variation in the parameters over and above the myopic policy is modest. The effect on valuations is less than 1% on average and does not exceed 13%.

7 Conclusion

This paper offers a novel approach to quantifying agency conflicts. We construct theory-grounded indexes of agency conflicts based on revealed managerial preferences at the firm level across 14 countries. For this purpose, we develop and estimate a dynamic capital structure model augmented by agency. We focus on two types of agency conflicts: controlling–minority shareholders conflicts and shareholder–bondholder conflicts. The level, variability, persistence, and other (un)conditional moments of firms' financial leverage allow us to infer the magnitude of these agency conflicts from observed corporate financial policies, as opposed to counting governance provisions like much of the prior studies in the literature.

Our agency indexes for the private benefits of controlling shareholders and shareholders' advantage in default show that conflicts of interest are large and vary significantly across firms and countries. Control advantage and shareholder advantage are higher in civil than in common law countries, but the origin of law is more relevant for curtailing governance excesses than for guarding the typical firm. Agency issues relate to firm characteristics in the same way in all countries. Firms with more cash, higher market-to-book ratio, and more intangible assets exhibit the largest agency costs. Ownership concentration by family and other individuals is, consistent with agency theory, the single most important determinant of agency costs.

Agency conflicts lead to a 5.3% reduction in firm value on average, with about equal shares coming from net transfers between stakeholders (2.9%) and net losses due to financial distortions (2.4%). The composition of agency costs also varies strongly across countries. In countries where incentives are less aligned, such as the U.S. and UK, financial distortions constitute a larger portion (60%) of total agency costs than in countries like Italy, with wealth transfers (40%) making up the remainder. Counterfactual policy experiments show that agency costs mostly arise from control benefits and the financial frictions that they cause. As a result, improving corporate governance to diminish private benefits of control has a larger effect than strengthening creditor rights alone.

Comparing agency frictions before and after regulatory reforms shows that the corporate governance and bankruptcy code reforms of the 2000s in France and Italy had a strong impact on the control advantage of majority shareholders and shareholder advantage in default. In line with the stated intent of 'greater voice' to minority shareholders, we find a significant reduction in the private benefits of the controlling shareholders. Similarly, in line with the stated intent of facilitating debt renegotiations while protecting debtors, we find a significant increase in shareholders' bargaining power in default. More research on the optimal combination of various governance mechanisms across different legal, institutional, and cultural settings is needed.

References

Abel, A. and J. Eberly, 2011, "How Q and Cash Flow Affect Investment without Frictions: An Analytic Explanation," *Review Economic Studies* 78, 1179-1200.

Admati, A., P. DeMarzo, M. Hellwig, and P. Pfleiderer, 2016, "The Leverage Ratchet Effect," Working paper, Stanford University.

Aggarwal, R., I. Erel, R. Stulz, R. Williamson, 2009, "Differences in Governance Practices between U.S. and Foreign Firms: Measurement, Causes, and Consequences," *Review of Financial Studies* 22, 3131-3169.

Aggarwal, R., I. Erel, M. Ferreira, P. Matos, 2011, "Does governance travel around the world? Evidence from institutional investors," *Journal of Financial Economics* 100, 154181.

Albuquerque, R., and E. Schroth, 2010, "Quantifying Private Benefits of Control from a Model of Block Trades," *Journal of Financial Economics* 96, 33-55.

Albuquerque, R., and E. Schroth, 2015, "The Value of Control and the Costs of Illiquidity," *Journal of Finance* 70, 1405-1455.

Albuquerque, R., and N. Wang, 2008, "Agency Conflicts, Investment, and Asset Pricing," *Journal of Finance* 63, 1-40.

Altinkilic, O., and R. Hansen, 2000, "Are There Economies of Scale in Underwriting Fees: Evidence of Rising External Financing Costs," *Review of Financial Studies* 13, 191-218.

Arnold, M., A. Wagner, and R. Westermann, 2013, "Growth Options, Macroeconomic Conditions, and the Cross Section of Credit Risk," *Journal of Financial Economics* 107, 350-385.

Bebchuk, L., A. Cohen, and A. Ferrell, 2009, "What Matters in Corporate Governance?" *Review of Financial Studies* 22, 783-827.

Becker, B., and P. Stromberg, 2012, "Fiduciary Duties and Equity-debtholder Conflicts," *Review of Financial Studies* 25, 1931-1969.

Berger, P., E. Ofek, and I. Swary, 1996, "Investor Valuation and the Abandonment Option," *Journal of Financial Economics* 42, 257-287.

Berger, P., E. Ofek, and D. Yermak, 1997, "Managerial Entrenchment and Capital Structure Decisions," *Journal of Finance* 52, 1411-1438.

Bhamra, H., L.-A. Kuehn, and I. Strebulaev, 2010, "The Aggregate Dynamics of Capital Structure and Macroeconomic Risk," *Review of Financial Studies* 23, 4187-4241.

Biais, B., J. Hombert, and P.-O. Weill, 2017, "Incentive Constrained Risk-Sharing, Segmentation, and Asset Pricing," Working Paper, Toulouse School of Economics.

Broadie, M., M. Chernov, and S. Sundaresan, 2007, "Optimal Debt and Equity Values in the Presence of Chapter 7 and Chapter 11," *Journal of Finance* 62, 1341-1377.

Carlson, M., and A. Lazrak, 2010, "Leverage Choice and Credit Spreads when Managers Shift Risk," *Journal of Finance* 65, 2323-2362.

Cornelli, F., R. Portes, and M. Schaeffer, 1998, "The Capital Structure of Firms in Central and Eastern Europe," in *Different Paths to a Market Economy: China and European Economies in Transition*, O. Bouin, F. Coricelli and F. Lemoine (eds.).

Danis, A., D. Rettl, and T. Whited, 2014, "Refinancing, Profitability, and Capital Structure," *Journal of Financial Economics* 114, 424-443.

Davydenko, S., and I. Strebulaev, 2007, "Strategic Actions and Credit Spreads: An Empirical Investigation," *Journal of Finance* 62, 2633-2671.

DeAngelo, H., L. DeAngelo, and T. Whited, 2011, "Capital Structure Dynamics and Transitory Debt," *Journal of Financial Economics* 99, 235-261.

DeMarzo, P., and Y. Sannikov, 2006, "A Continuous Time Agency Model of Optimal Contracting and Dynamic Capital Structure," *Journal of Finance* 61, 2681-2724.

Dimopoulos, T., and S. Sacchetto, 2014, "Preemptive Bidding, Target Resistance, and Takeover Premiums," *Journal of Financial Economics* 114, 444-470.

Djankov, S., O. Hart, C. McLiesh, and A. Shleifer, 2008, "Debt Enforcement Around the World," *Journal of Political Economy* 116, 1105-1150.

Doidge, C., A. Karolyi, and R. Stulz, 2007, "Why do countries matter so much for corporate governance?" *Journal of Financial Economics* 86, 139.

Dyck, A., and L. Zingales, 2004, "Private benefits of control: An international comparison," *Journal of Finance* 59, 537-600.

Enriques, L., and P. Volpin, 2007. "Corporate Governance Reforms in Continental Europe," *Journal of Economic Perspectives* 21, 117-140.

Fan, H., and S. Sundaresan, 2000, "Debt Valuation, Renegotiation, and Optimal Dividend Policy," *Review of Financial Studies* 13, 1057-1099.

Favara, G., E. Morellec, E. Schroth, and P. Valta, 2017, "Debt Enforcement, Investment, and Risk Taking Across Countries," *Journal of Financial Economics* 123, 22-41.

Favara, G., E. Schroth, and P. Valta, 2012, "Strategic Default and Equity Risk Across Countries," *Journal of Finance* 67, 2051-2095.

Fischer, E., R. Heinkel, and J. Zechner, 1989, "Dynamic Capital Structure Choice: Theory and Tests," *Journal of Finance* 43, 19-40.

François, P., and E. Morellec, 2004, "Capital Structure and Asset Prices: Some Effects of Bankruptcy Procedures," *Journal of Business* 77, 387-411.

Frank, M., and V. Goyal, 2003, "Testing the Pecking Order Theory of Capital Structure," *Journal of Financial Economics* 67, 217-248.

Franks, J., and W. Torous, 1989, "An Empirical Investigation of Firms in Reorganization," *Journal of Finance* 44, 747-769.

Friend, I., and L. Lang, 1988, "An Empirical Test of the Impact of Managerial Self-Interest on Corporate Capital Structure," *Journal of Finance* 43, 271-281.

Garlappi, L., Shu, T., and Yan, H., 2008, "Default Risk, Shareholder Advantage, and Stock Returns," *Review of Financial Studies* 21, 2743-2778.

Garlappi, L. and Yan, H., 2011, "Financial Distress and the Cross-Section of Equity Returns," *Journal of Finance* 66, 789-822.

Garvey, G., and G. Hanka, 1999, "Capital Structure and Corporate Control: The Effect of Anti-takeover Statutes on Firm Leverage," *Journal of Finance* 54, 547-580.

Gilje, E., 2016, "Do Firms Engage in Risk-Shifting? Empirical Evidence," *Review of Financial Studies* 29, 2925-2954.

Gilson, S., 1997, "Transactions Costs and Capital Structure Choice: Evidence from Financially Distressed Firms," *Journal of Finance* 52, 161-196.

Gilson, S., K. John, and L. Lang, 1990, "Troubled Debt Restructurings: An Empirical Study of Private Reorganization of Firms in Default," *Journal of Financial Economics* 27, 315-353.

Glover, B., 2016, "The Expected Cost of Default," *Journal of Financial Economics* 119, 284-299.

Goldstein, R., N. Ju, and H. Leland, 2001, "An EBIT-Based Model of Dynamic Capital Structure," *Journal of Business* 74, 483-512.

Gomes, J., 2001, "Financing Investment," *American Economic Review* 91, 1263-1285.

Gomes, J., and L. Schmid, 2010, "Levered Returns," *Journal of Finance* 65, 467-494.

Gompers, P., L. Ishii, and A. Metrick, 2003, "Corporate Governance and Equity Prices," *Quarterly Journal of Economics* 118, 107-155.

Hackbarth, D., R. Haselman, and D. Schoenherr, 2015, "Financial Distress, Stock Returns, and the 1978 Bankruptcy Reform Act," *Review of Financial Studies* 28, 1810-1847.

Hansen, L. and K. Singleton, 1982, "Generalized Instrumental Variable Estimation of Nonlinear Rational Expectations Models," *Econometrica* 50, 1269-1286.

Hart, O., and J. Moore, 1995, "Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management," *American Economic Review* 85, 567-585.

Hennessy, C., and T. Whited, 2005, "Debt Dynamics," *Journal of Finance* 60, 1129-1165.

Hennessy, C., and T. Whited, 2007, "How Costly is External Financing? Evidence from a Structural Estimation," *Journal of Finance* 62, 1705-1743.

Homlstrom, B., and J. Tirole, 1997, "Financial Intermediation, Loanoable Funds, and the Real Sector," *Quarterly Journal of Economics* 112, 663-691.

Hugonnier, J., S. Malamud, and E. Morellec, 2015, "Credit Market Frictions and Capital Structure Dynamics," *Journal of Economic Theory* 157, 1130-1158.

Jensen, M., 1986, "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers," *American Economic Review* 76, 323-329.

Jensen, M., and W. Meckling, 1976, "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure," *Journal of Financial Economics* 3, 305-360.

Jung, K., Y. Kim, and R. Stulz, 1996, "Timing, Investment Opportunities, Managerial Discretion, and the Security Issue Decision," *Journal of Financial Economics* 42, 159-185.

Korteweg, A., 2010, "The Net Benefits to Leverage," *Journal of Finance* 65, 2137-2170.

Lambrecht, B., and S. Myers, 2008, "Debt and Managerial Rents in a Real-Options Model of the Firm," *Journal of Financial Economics* 89, 209-231.

La Porta, R., F. Lopez-de Silanes, A. Shleifer, and R. Vishny, 1998, "Law and Finance," *Journal of Political Economy* 106, 1113-1155.

La Porta, R., F. Lopez-de Silanes, A. Shleifer, and R. Vishny, 1999, "Corporate Ownership Around the World," *Journal of Finance* 54, 471-517.

La Porta, R., F. Lopez-de Silanes, A. Shleifer, and R. Vishny, 2000, "Investor Protection and Corporate Governance," *Journal of Financial Economics* 58, 3-27.

Leary, M., and M. Roberts, M., 2010, "The Pecking Order, Debt Capacity, and Information Asymmetry," *Journal of Financial Economics* 95, 332-355.

Leland H., 1998, "Agency Costs, Risk Management, and Capital Structure," *Journal of Finance* 53, 1213-1243.

Leland, H., 1994, "Corporate Debt Value, Bond Covenants, and Optimal Capital Structure," *Journal of Finance* 49, 1213-1252.

Li, S., T. Whited, and Y. Wu, 2016, "Collateral, Taxes, and Leverage," *Review of Financial Studies* Forthcoming.

Melnik, A. and D. Nissim, 2006, "Issue Costs in the Eurobond Market: The Effects of Market Integration," *Journal of Banking and Finance* 30, 157-177.

Mehran, H., 1992, "Executive Incentive Plans, Corporate Control, and Capital Structure," *Journal of Financial and Quantitative Analysis* 27, 539-560.

Mella-Barral, P., and W. Perraudin, "Strategic Debt Service," *Journal of Finance* 52, 531-556.

Miao, J., 2005, "Optimal Capital Structure and Industry Dynamics," *Journal of Finance* 60, 2621-2660.

Mironov, M., 2013, "Taxes, Theft, and Firm Performance," *Journal of Finance* 68, 1441-1472.

Modigliani, F., and M. Miller, 1958, "The Cost of Capital, Corporation Finance, and the Theory of Investment," *American Economic Review* 48, 261-297.

Morellec, E., 2004, "Can Managerial Discretion Explain Observed Leverage Ratios?" *Review of Financial Studies* 17, 257-294.

Morellec, E., B. Nikolov, and N. Schürhoff, 2012, "Corporate Governance and Capital Structure Dynamics," *Journal of Finance* 67, 803-848.

Morellec, E., and N. Schürhoff, 2011, "Corporate Investment and Financing under Asymmetric Information," *Journal of Financial Economics* 99, 262-288.

Nenova, T., 2003, "The Value of Corporate Voting Rights and Control: A Cross-Country Analysis," *Journal of Financial Economics* 68, 325-351.

Nikolov, B., and T. Whited, 2014, "Agency Conflicts and Cash: Estimates from a Dynamic Model," *Journal of Finance* 69, 1881-1923.

Rodano, G., N. Serrano Velarde, E. Tarantino, 2016, "Bankruptcy Law and Bank Financing," *Journal of Financial Economics* 120, 363-382.

Schroth, E., G. Suarez, and L. Taylor, 2014, "Dynamic Debt Runs and Financial Fragility: Evidence from the 2007 ABCP Crisis," *Journal of Financial Economics* 112, 164-189.

Shleifer, A., and R. Vishny, 1997, "A Survey of Corporate Governance," *Journal of Finance* 52, 737-783.

Smith, C., and R. Watts, 1992, "The Investment Opportunity Set, and Corporate Financing, Dividend, and Compensation Policies," *Journal of Financial Economics* 32, 262-292.

Spamann, H., 2010, "The Antidirector Rights Index Revisited," *Review of Financial Studies* 23, 467-486.

Stokey, N., 2009, *The Economics of Inaction*, Princeton University Press.

Strebulaev, I., 2007, "Do Tests of Capital Structure Mean What They Say?" *Journal of Finance* 62, 1747-1787.

Strebulaev, I., and B. Yang, 2013, "The Mystery of Zero-Leverage Firms," *Journal of Financial Economics* 109, 1-23.

Strebulaev, I., H, Zhu, and P. Zryumov, 2016, "Optimal Issuance under Information Asymmetry and Accumulation of Cash Flows," Working Paper, Stanford University.

Stulz, R., 1990, "Managerial Discretion and Optimal Financial Policies," *Journal of Financial Economics* 26, 3-27.

Taylor, L., 2010, "Why are CEOs Rarely Fired? Evidence from Structural Estimation," *Journal of Finance* 65, 2051-2087.

Taylor, L., 2013, "CEO Wage Dynamics: Estimates from a Learning Model," *Journal of Financial Economics* 108, 79-98.

Weber, R., 2005, "Can the Sauvegarde Reform Save French Bankruptcy Law?: A Comparative Look at Chapter 11 and French Bankruptcy Law from an Agency Cost Perspective," *Michigan Journal of International Law* 27, 257-301.

Zwiebel, J., 1996, "Dynamic Capital Structure under Managerial Entrenchment," *American Economic Review* 86, 1197-1215.

Appendix

A. Agency conflicts and the values of corporate securities

As shown by (6), controlling and minority shareholders are entitled to a cash flow stream that is proportional to the firm's net income $(1-\tau)(y-c)$. To determine the value of the controlling shareholders' claim, we thus start by deriving the value of a claim on net income, denoted by $\mathbf{N}(y,c)$. Let $n(y,c)$ denote the present value of the firm's net income over one financing cycle, i.e., for the period over which neither the default threshold y_D nor the restructuring threshold y_U are hit and the firm does not change its debt policy. This value is given by

$$n(y,c) = \mathbb{E}^{\mathcal{Q}}\left[\int_t^T e^{-r(s-t)}\,(1-\tau)\,(Y_s - c)ds|Y_t = y\right], \tag{A1}$$

where $T = \inf\{T_U, T_D\}$ with $T_s = \inf\{t \geq 0 : Y_t = y_s\}$ for $s = U, D$, and is the unique solution to the ordinary differential equation

$$rn(y,c) = \frac{1}{2}\sigma^2 y^2 \frac{\partial^2 n(y,c)}{\partial y^2} + \mu y \frac{\partial n(y,c)}{\partial y} + (1-\tau)(y-c), \tag{A2}$$

on the interval (y_D, y_U) subject to the boundary conditions

$$n(y_D,c) = n(y_U,c) = 0. \tag{A3}$$

Denote by $p_U(y)$ the present value of \$1 to be received at the time of refinancing, contingent on refinancing occurring before default, and by $p_D(y)$ the present value of \$1 to be received at the time of default, contingent on default occurring before refinancing. Using this notation, standard calculations (see e.g. Leland (1998)) show that we can write the solution to equation (A2) subject to (A3) as:

$$n(y,c) \;=\; (1-\tau)\left[\frac{y}{r-\mu} - \frac{c}{r} - p_U(y)\left(\frac{y_U}{r-\mu} - \frac{c}{r}\right) - p_D(y)\left(\frac{y_D}{r-\mu} - \frac{c}{r}\right)\right], \tag{A4}$$

where

$$p_D(y) \;=\; \frac{y^\omega - y^\nu y_U^{\omega-\nu}}{y_D^\omega - y_D^\nu y_U^{\omega-\nu}} \quad \text{and} \quad p_U(y) \;=\; \frac{y^\omega - y^\nu y_D^{\omega-\nu}}{y_U^\omega - y_U^\nu y_D^{\omega-\nu}}$$

and ω and ν are the positive and negative roots of the equation $\frac{1}{2}\sigma^2\beta(\beta-1) + \mu\beta - r = 0$.

Consider next the total value $\mathbf{N}(y,c)$ of a claim to the firm's net income. In the static model in which the firm cannot restructure, the default threshold y_D is linear in c (see e.g. Leland, 1994, equation (14)). In addition, the selected coupon rate c is linear in y (see Leland, 1994, equation (21)). Thus, if two firms i and j are identical except that $y_{i0} = \Lambda y_{j0}$, then the selected coupon rate and default threshold satisfy $c_i = \Lambda c_j$ and $y_{iD} = \Lambda y_{jD}$ and every claim will be scaled by the same factor Λ. For our dynamic model, this scaling feature implies that at the first restructuring point, all claims are scaled up by the same proportion

$\rho \equiv y_U/y_0$ that asset value has increased. That is, it is optimal for controlling shareholders to choose $c_1 = \rho c_0$, $y_{1D} = \rho y_{0D}$, and $y_{1U} = \rho y_{0U}$. Subsequent restructurings scale up these variables again by the same ratio ρ. Similarly, if default occurs prior to restructuring, asset value is reduced by a constant factor $\eta\left(\alpha-\kappa\right)\gamma$ with $\gamma \equiv y_D/y_0$. At that time new debt is issued and all claims are scaled down by the same proportion $\eta(\alpha-\kappa)\gamma$ that asset value has decreased. As a result, the total value $\mathbf{N}\left(y,c\right)$ of a claim to the firm's net income over all financing cycles satisfies for $y_D \leq y \leq y_U$:

$$\underbrace{\mathbf{N}\left(y,c\right)}_{\text{Total value of the claim}} = \underbrace{n\left(y,c\right)}_{\text{Value over one cycle}} + \underbrace{p_U\left(y\right)\rho\mathbf{N}\left(y_0,c\right)}_{\text{PV of claim on net income at a restructuring}} + \underbrace{p_D\left(y\right)\eta\left(\alpha-\kappa\right)\gamma\mathbf{N}\left(y_0,c\right)}_{\text{PV of claim on net income in default}}. \tag{A5}$$

Using this expression, we can rewrite the total value of a claim to the firm's net income at the initial date as:

$$\mathbf{N}\left(y_0,c\right) = \frac{n\left(y_0,c\right)}{1-p_U\left(y_0\right)\rho-p_D\left(y_0\right)\eta\left(\alpha-\kappa\right)\gamma} \equiv n\left(y_0,c\right)\;\mathbf{S}(y_0,\rho,\gamma), \tag{A6}$$

where the function $\mathbf{S}(y_0,\rho,\gamma)$ scales the value of a claim to cash flows over one financing cycle at a restructuring point into the value of this claim over all financing cycles.

The same arguments apply to the valuation of corporate debt. Consider first the value $d\left(y,c\right)$ of the debt issued at time $t=0$. Since the issue is called at par if cash flows reach y_U before y_D, the current value of corporate debt satisfies at any time $t \geq 0$:

$$d\left(y,c\right) = \underbrace{b\left(y,c\right)}_{\text{Value of debt over one cycle}} + \underbrace{p_U\left(y\right)\;d\left(y_0,c\right)}_{\text{PV of cash flow at a restructuring}}. \tag{A7}$$

where $b(y,c)$ represents the value of corporate debt over one refinancing cycle, i.e., ignoring the value of the debt issued after a restructuring or after default, and is given by

$$b\left(y,c\right) = \frac{\left(1-\tau^d\right)c}{r}\left[1-p_U\left(y\right)-p_D\left(y\right)\right] + p_D\left(y\right)\left[1-\left(\kappa+\eta\left(\alpha-\kappa\right)\right)\right]\left(\frac{1-\tau}{r-\mu}\right)y_D. \tag{A8}$$

The first term on the right-hand side of equation (A8) represents the present value of the coupon payments until the firm defaults or restructures. The second term represents the present value of the cash flow to *initial* debtholders in default.

As in the case of the claim to net income, the total value of corporate debt includes not only the cash flows accruing to debtholders over one refinancing cycle, $b(y,c)$, but also the new debt that will be issued in default or at the time of a restructuring. As a result, the value of the total debt claims over all the financing cycles is given by

$$\mathbf{D}\left(y_0,c\right) \equiv b(y_0,c)\,\mathbf{S}(y_0,\rho,\gamma), \tag{A9}$$

where $\mathbf{S}(y_0,\rho,\gamma)$ is defined in (A6). Because issuance costs represent a constant fraction λ of debt value and are incurred each time the firm adjusts its capital structure, the total value of issuance costs at time

$t = 0$ is in turn given by

$$\mathbf{I}\,(y_0, c) \equiv \lambda\, d\,(y_0, c)\ \mathbf{S}(y_0, \rho, \gamma). \tag{A10}$$

We can then write the value of the firm at the restructuring date as the sum of the present value of a claim on net income plus the value of all debt issues minus the present value of issuance costs and the present value of private benefits of control, or

$$\mathbf{V}\,(y_0, c) \;=\; \mathbf{S}(y_0, \rho, \gamma)\ \{\, n\,(y_0, c) \,+\, b\,(y_0, c) \,-\, \lambda\, d\,(y_0, c) \,-\, \phi\, n\,(y_0, c)\,\}\,. \tag{A11}$$

B. Leverage distributions with agency conflicts

Equation (11) shows that to compute the time-series distribution of leverage implied by agency conflicts, we need to know the density of the interest coverage ratio f_z. Denote by $\iota = \inf\{t \geq 0 : z_t \notin (z_D, z_U)\}$, where $z_i \equiv y_i/c$, the first time that the firm changes its capital structure or defaults and define

$$\mathcal{I}\,(z; z_D, s) \equiv \mathbb{E}\left[\int_0^{\iota} 1_{[z_D, s]}(z_t)dt \,\middle|\, z_0 = z\right]. \tag{B1}$$

$\mathcal{I}\,(z; z_D, s)$ measures the (expected) time spent by the interest coverage ratio in the closed interval $[z_D, s]$ between now and the first time that the firm changes its capital structure or defaults, given $z_0 = z$. The Feynman-Kac formula shows that $\mathcal{I}\,(z; z_D, s)$ is the unique solution to the second order differential equation

$$\frac{1}{2}\sigma^2 z^2 \frac{\partial^2}{\partial z^2}\mathcal{I}\,(z; z_D, s) + \mu_z z \frac{\partial}{\partial z}\mathcal{I}\,(z; z_D, s) + 1_{\{z \leq s\}} = 0 \tag{B2}$$

on the interval (z_D, z_U) subject to the boundary condition $\mathcal{I}\,(z_D; z_D, s) = \mathcal{I}\,(z_U; z_D, s) = 0$, where μ_z is the physical drift of the interest coverage ratio z. Using basic properties of diffusion processes as found for example in Stokey (2009), it is then possible to derive the following closed-form expression for the stationary density of the interest coverage ratio:

Proposition 1 *The stationary density function of the interest coverage ratio is given by*

$$f_z(s) = \frac{\frac{\partial}{\partial s}\mathcal{I}\,(z; z_D, s)}{\mathcal{I}\,(z; z_D, z_U)}, \tag{B3}$$

where the function $\mathcal{I}\,(z; z_D, s)$ *satisfies*

$$\mathcal{I}\,(z; z_D, s) = \begin{cases} \frac{e^{\vartheta \ln(z/s)} - e^{\vartheta \ln(z/z_D)}}{2b^2} - \frac{p_B}{b\sigma}\ln\left(\frac{s}{z_D}\right) - \frac{p_U}{2b^2}\left[e^{\vartheta \ln(z_U/s)} - e^{\vartheta \ln(z_U/z_D)}\right], & s \leq z, \\ \frac{1 - e^{\vartheta \ln(z/z_D)}}{2b^2} + \frac{1}{b\sigma}\ln\left(\frac{s}{z}\right) - \frac{p_B}{b\sigma}\ln\left(\frac{s}{z_D}\right) - \frac{p_U}{2b^2}\left[e^{\vartheta \ln(z_U/s)} - e^{\vartheta \ln(z_U/z_D)}\right], & s > z, \end{cases} \tag{B4}$$

with $b = \frac{1}{\sigma}(\mu_z - \frac{\sigma^2}{2})$, $\vartheta = -2b/\sigma$, $p_B = (z^\vartheta - z_U^\vartheta)(z_D^\vartheta - z_U^\vartheta)^{-1}$, *and* $p_U = (z^\vartheta - z_D^\vartheta)(z_U^\vartheta - z_D^\vartheta)^{-1}$.

To implement our empirical procedure, we also need the conditional distribution of leverage at time t given its value at time 0. To determine this conditional density, we first compute the conditional density of the interest coverage ratio at time t given its value z_0 at time 0 and then apply (11). For ease of exposition, we introduce the regulated log interest coverage ratio $W_t = \frac{1}{\sigma}\ln(z_t)$ with initial value $w = \frac{1}{\sigma}\ln(z_0)$, drift rate $b = \frac{1}{\sigma}(\mu_z - \frac{\sigma^2}{2})$ and unit variance, and define the upper and lower boundaries as $H = \frac{1}{\sigma}\ln(z_U)$ and $L = \frac{1}{\sigma}\ln(z_D)$. Given that the interest coverage ratio is reset to the level z_T whenever it reaches z_D or z_U, W is regulated at L and H, with reset level at $T = \frac{1}{\sigma}\ln(z_T)$, and we can write its dynamics as

$$dW_t = bdt + dZ_t + 1_{\{W_{t-}=L\}}(T-L) + 1_{\{W_{t-}=H\}}(T-H). \tag{B5}$$

The conditional distribution F_z of the interest coverage ratio z is then related to that of W by the following relation:

$$F_z(z|z_0) = \mathbb{P}(W_t \leq \frac{1}{\sigma}\ln(z)|W_0 = w). \tag{B6}$$

We are interested in computing the conditional density function

$$g(w,x,t) = \frac{\partial}{\partial x}\mathbb{P}(W_t \leq x|w) = \frac{\partial}{\partial x}\mathbb{E}_w[1_{\{W_t\leq x\}}], \quad (w,x,t) \in [L,H]^2 \times (0,\infty), \tag{B7}$$

of the regulated log interest coverage ratio W at some horizon t. Rather than computing this conditional density function directly, we will consider its Laplace transform in time:

$$\mathcal{J}(w,x,\rho) = \int_0^\infty e^{-\rho t} g(w,x,t)dt. \tag{B8}$$

The last step will then involve the inversion of the Laplace transform (B8) for $g(w,x,t)$.

To compute $\mathcal{J}(w,x,\rho)$, define $G(w,x,t) = \mathbb{P}(W_t \leq x|w) = \mathbb{E}_w[1_{\{W_t\leq x\}}]$ and

$$\mathcal{K}(w,x,\rho) = \int_0^\infty e^{-\rho t} G(w,x,t)dt = \mathbb{E}_w\left[\int_0^\infty e^{-\rho t} 1_{\{W_t\leq x\}}dt\right]. \tag{B9}$$

Since W is instantly set back at T when it reaches either of the restructuring barriers L or H, we must have $\mathcal{K}(H,x,\rho) = \mathcal{K}(L,x,\rho) = \mathcal{K}(T,x,\rho)$ for all x. Let $W_t^0 = w + bt + Z_t$ denote the unregulated log interest coverage ratio (that is, ignoring the (S,s) adjustments). Using the Markov property of W and the fact that W and W^0 coincide up to the first exit time of W^0 from the interval $[L,H]$, we have that $\mathcal{K}(w,x,\rho)$ satisfies

$$\mathcal{K}(w,x,\rho) = \Psi(w,x,\rho) + \mathcal{K}(T,x,\rho)\Phi(w,\rho), \tag{B10}$$

where

$$\Psi(w,x,\rho) = \mathbb{E}_w\left[\int_0^\zeta e^{-\rho t} 1_{\{W_t^0\leq x\}}dt\right] \text{ and } \Phi(w,\rho) = \mathbb{E}_w[e^{-\rho\zeta}],$$

with $\zeta = \inf\{t \geq 0 : W_t \notin (L,H)\}$. Using the Feynman-Kac formula and basic properties of diffusion processes, it is possible to derive closed form expressions for $\Psi(w, x, \rho)$ and $\Phi(w, \rho)$. We can then use the relation

$$\frac{\partial}{\partial x}\mathcal{K}(w, x, \rho) = \mathcal{J}(w, x, \rho), \tag{B11}$$

to get the following result:

Proposition 2 *The Laplace transform in time $\mathcal{J}(w, x, \rho)$ of the conditional density function $g(w, x, t)$ of the log interest coverage ratio $W_t = \frac{1}{\sigma}\ln(z_t)$ satisfies*

$$\mathcal{J}(w, x, \rho) = \Theta(w, x, \rho) + \frac{\Phi(w, \rho)}{1 - \Phi(T, \rho)}\Theta(T, x, \rho), \tag{B12}$$

where

$$\Theta(w, x, \rho) = \begin{cases} \left(\frac{A_H(x,\rho)\Delta''_H(x,\rho) - A_L(x,\rho)\Delta''_L(x,\rho) - \Lambda''(x,\rho)}{\Delta_H(x,\rho)\Delta'_L(x,\rho) - \Delta_L(x,\rho)\Delta'_H(x,\rho)}\right)\Delta_H(x,\rho)\Delta_L(w,\rho), & \text{if } w \in [L, x], \\ \left(\frac{A_H(x,\rho)\Delta''_H(x,\rho) - A_L(x,\rho)\Delta''_L(x,\rho) - \Lambda''(x,\rho)}{\Delta_H(x,\rho)\Delta'_L(x,\rho) - \Delta_L(x,\rho)\Delta'_H(x,\rho)}\right)\Delta_L(x,\rho)\Delta_H(w,\rho), & \text{if } w \in [x, H], \end{cases} \tag{B13}$$

and

$$\Phi(w, \rho) = \frac{e^{(b+\upsilon(\rho))L}}{e^{2\upsilon(\rho)L} - e^{2\upsilon(\rho)H}}\Delta_H(w, \rho) - \frac{e^{(b+\upsilon(\rho))H}}{e^{2\upsilon(\rho)L} - e^{2\upsilon(\rho)H}}\Delta_L(w, \rho), \tag{B14}$$

with

$$\begin{aligned} A_L(x, \rho) &= \frac{\Lambda(x, \rho)\Delta'_H(x, \rho) - \Lambda'(x, \rho)\Delta_H(x, \rho)}{\Delta_H(x, \rho)\Delta'_L(x, \rho) - \Delta_L(x, \rho)\Delta'_H(x, \rho)}, \\ A_H(x, \rho) &= \frac{\Lambda(x, \rho)\Delta'_L(x, \rho) - \Lambda'(x, \rho)\Delta_L(x, \rho)}{\Delta_H(x, \rho)\Delta'_L(x, \rho) - \Delta_L(x, \rho)\Delta'_H(x, \rho)}, \\ \Lambda(x, \rho) &= \frac{1}{\rho}[1 - e^{(b+\upsilon(\rho))(L-x)}], \\ \Delta_{L,H}(w, \rho) &= e^{(\upsilon(\rho)-b)w}[1 - e^{2((L,H)-w)\upsilon(\rho)}], \end{aligned}$$

and $b = \frac{1}{\sigma}(\mu_z - \frac{\sigma^2}{2})$, $T = \frac{1}{\sigma}\ln(z_T)$, $H = \frac{1}{\sigma}\ln(z_U)$, $L = \frac{1}{\sigma}\ln(z_D)$ *and* $\upsilon(\rho) = \sqrt{b^2 + 2\rho}$.

Table 1
Model parameters

The table reports model parameters used for the estimation. r is the risk-free rate. τ^c is the corporate tax rate. τ^d is the personal tax rate on coupons. τ^e is the personal tax rate on dividends. τ is the effective tax rate. μ_z and σ_Y are the the drift and standard deviation of the cash flow process. β_Y is beta of cash flows. φ is the controlling shareholder ownership. α is the liquidation cost. Panel A reports country-level parameters and Panel B reports firm-level parameters. In Panel B, numbers represent the average per country with the standard deviation in parenthesis.

Panel A: Country-level model parameters

Country	r	τ^c	τ^d	τ^e	τ
AUT	0.031	0.298	0.429	0.250	0.045
CHE	0.016	0.235	0.376	0.360	0.134
DEU	0.030	0.407	0.482	0.272	0.086
DNK	0.033	0.289	0.536	0.423	0.053
ESP	0.035	0.335	0.452	0.246	0.047
FRA	0.031	0.364	0.378	0.369	0.221
GBR	0.041	0.295	0.417	0.270	0.069
IRL	0.041	0.179	0.430	0.410	0.086
ITL	0.037	0.341	0.423	0.150	0.018
JPN	0.005	0.411	0.468	0.212	0.069
NLD	0.030	0.311	0.521	0.341	0.026
POL	0.057	0.249	0.280	0.181	0.105
PRT	0.045	0.310	0.374	0.218	0.087
USA	0.033	0.393	0.426	0.310	0.155

Panel B: Firm-level model parameters

Country	Firms	μ_z	(S.D.)	σ_Y	(S.D.)	β_Y	(S.D.)	φ	(S.D.)	α	(S.D.)
AUT	61	0.015	(0.121)	0.308	(0.111)	0.373	(0.242)	0.196	(0.223)	0.495	(0.101)
CHE	178	0.083	(0.046)	0.283	(0.111)	0.607	(0.354)	0.166	(0.203)	0.489	(0.108)
DEU	595	0.089	(0.064)	0.389	(0.175)	0.407	(0.294)	0.207	(0.250)	0.525	(0.127)
DNK	107	0.085	(0.062)	0.316	(0.195)	0.464	(0.343)	0.185	(0.195)	0.492	(0.113)
ESP	102	-0.099	(0.103)	0.271	(0.126)	0.403	(0.291)	0.204	(0.223)	0.540	(0.118)
FRA	588	-0.011	(0.059)	0.348	(0.205)	0.510	(0.372)	0.263	(0.267)	0.531	(0.127)
GBR	1,459	0.137	(0.058)	0.398	(0.180)	0.618	(0.352)	0.132	(0.128)	0.509	(0.157)
IRL	42	0.135	(0.072)	0.353	(0.163)	0.532	(0.462)	0.101	(0.110)	0.494	(0.147)
ITL	204	-0.145	(0.135)	0.281	(0.085)	0.387	(0.284)	0.277	(0.262)	0.550	(0.120)
JPN	3,274	0.035	(0.024)	0.330	(0.137)	0.447	(0.308)	0.188	(0.161)	0.468	(0.087)
NLD	138	0.039	(0.050)	0.323	(0.153)	0.490	(0.322)	0.159	(0.175)	0.500	(0.135)
POL	236	0.171	(0.108)	0.460	(0.186)	0.594	(0.281)	0.317	(0.220)	0.481	(0.099)
PRT	37	-0.132	(0.122)	0.256	(0.119)	0.272	(0.250)	0.345	(0.257)	0.596	(0.117)
USA	5,631	0.152	(0.040)	0.473	(0.216)	0.731	(0.567)	0.101	(0.100)	0.522	(0.147)

Table 2
Variable definitions

Variable	Description
Financial indicators (Source: Compustat Global)	
Book Debt	Long-term debt (DLTT) + Debt in current liabilities (DLC)
Book Debt (alternate)	Liabilities total (LT) + Preferred stock (PSTK) – Deferred taxes (TXDITC)
Book Equity	Assets total (AT) – Book debt
Book Equity (alternate)	Assets total – Book debt (alternate)
Leverage	Book debt/(Assets total – Book equity + Market value (CSHOC*abs(PRCCD)))
Leverage (alternate)	Book debt (alternate) / (Assets total – Book equity (alternate) + Market value))
EBIT growth rate	Five-year least squares annual growth rate of EBIT
Market-to-Book M/B	(Market value + Book debt) / Assets total
Cash	Cash and Short-Term Investments (CHE) / Assets total
Size	log(Sales net (SALE))
Return on assets ROA	(EBIT (EBIT) + Depreciation (DP)) / Assets total
Tangibility	Property, plant, and equipment total net (PPENT) / Assets total
Volatility and systematic risk (Source: Datastream and CRSP)	
Equity volatility	Standard deviation of monthly equity returns, rolling over past five years
Market model beta	CAPM beta based on monthly equity returns, rolling over past five years
Ownership structure (Source: Thomson-Reuters Global Institution Ownership Feed)	
Controlling shareholders	Ownership of the 1 (5) largest shareholders, measured as a fraction of market capitalization.
Ownership individuals	Ownership of all reported individual shareholders, measured as a fraction of market capitalization.
Ownership institutions	Ownership of all reported institutional shareholders, measured as a fraction of market capitalization.
Ownership mutual funds	Ownership of all reported mutual fund shareholders, measured as a fraction of market capitalization.
Origin of law (Source: Djankov et al., 2008a)	
Legal origin	Dummy variable that identifies the legal origin of the bankruptcy law of each country. The four origins are English common law and French, German, and Scandinavian civil law.

Table 3
Firm characteristics

The table reports descriptive statistics of firm characteristics. Numbers represent country level averages with standard deviations in parenthesis. Variable definitions are provided in Table 2.

Country	Leverage	Leverage alternate	M/B	Cash	Size	ROA	Tangibility	Ownership individuals	Ownership institutions	Ownership mutual funds
All firms	0.271	0.454	1.466	0.131	7.209	0.070	0.275	0.260	0.142	0.060
	(0.247)	(0.233)	(0.902)	(0.131)	(1.974)	(0.126)	(0.198)	(0.197)	(0.121)	(0.062)
Civil law	0.324	0.529	1.189	0.130	9.258	0.082	0.289	0.370	0.043	0.038
	(0.262)	(0.232)	(0.606)	(0.110)	(1.768)	(0.075)	(0.176)	(0.234)	(0.055)	(0.046)
Common law	0.203	0.362	1.803	0.136	4.705	0.053	0.264	0.117	0.264	0.087
	(0.229)	(0.236)	(1.271)	(0.162)	(2.218)	(0.193)	(0.227)	(0.149)	(0.203)	(0.083)
AUT	0.336	0.535	1.227	0.100	6.249	0.104	0.327	0.230	0.075	0.067
	(0.259)	(0.228)	(0.478)	(0.115)	(1.899)	(0.070)	(0.175)	(0.277)	(0.084)	(0.077)
CHE	0.246	0.409	1.575	0.124	6.323	0.107	0.308	0.201	0.095	0.096
	(0.214)	(0.215)	(1.020)	(0.120)	(1.753)	(0.097)	(0.195)	(0.257)	(0.092)	(0.090)
DEU	0.285	0.504	1.364	0.119	5.623	0.086	0.231	0.245	0.080	0.072
	(0.258)	(0.239)	(0.790)	(0.131)	(2.201)	(0.129)	(0.177)	(0.303)	(0.089)	(0.085)
DNK	0.298	0.443	1.576	0.089	7.097	0.091	0.334	0.285	0.045	0.052
	(0.236)	(0.235)	(1.144)	(0.123)	(1.765)	(0.120)	(0.213)	(0.284)	(0.057)	(0.063)
ESP	0.331	0.492	1.542	0.053	7.211	0.115	0.315	0.301	0.090	0.087
	(0.279)	(0.255)	(0.983)	(0.073)	(2.504)	(0.083)	(0.197)	(0.298)	(0.075)	(0.070)
FRA	0.312	0.523	1.377	0.087	5.849	0.102	0.188	0.328	0.068	0.066
	(0.247)	(0.232)	(0.733)	(0.086)	(2.249)	(0.089)	(0.155)	(0.324)	(0.078)	(0.072)
GBR	0.201	0.403	1.596	0.126	4.269	0.077	0.272	0.323	0.090	0.083
	(0.205)	(0.218)	(1.048)	(0.154)	(2.252)	(0.163)	(0.237)	(0.221)	(0.104)	(0.078)
IRL	0.232	0.406	1.501	0.173	5.519	0.090	0.292	0.161	0.063	0.073
	(0.213)	(0.213)	(0.927)	(0.166)	(2.325)	(0.117)	(0.229)	(0.183)	(0.084)	(0.080)
ITL	0.399	0.573	1.208	0.050	6.768	0.083	0.242	0.354	0.052	0.057
	(0.285)	(0.243)	(0.519)	(0.073)	(3.112)	(0.081)	(0.183)	(0.321)	(0.059)	(0.059)
JPN	0.338	0.547	1.087	0.142	10.771	0.077	0.301	0.417	0.026	0.020
	(0.267)	(0.231)	(0.506)	(0.107)	(1.570)	(0.057)	(0.172)	(0.206)	(0.041)	(0.030)
NLD	0.251	0.446	1.552	0.101	6.352	0.117	0.251	0.216	0.101	0.127
	(0.213)	(0.210)	(0.878)	(0.124)	(2.084)	(0.104)	(0.186)	(0.263)	(0.101)	(0.103)
POL	0.223	0.397	1.502	0.074	5.771	0.094	0.341	0.467	0.084	0.078
	(0.216)	(0.224)	(0.965)	(0.083)	(1.635)	(0.092)	(0.196)	(0.268)	(0.085)	(0.079)
PRT	0.516	0.641	1.188	0.028	6.866	0.098	0.358	0.506	0.074	0.056
	(0.270)	(0.223)	(0.493)	(0.047)	(2.358)	(0.056)	(0.190)	(0.313)	(0.078)	(0.053)
USA	0.204	0.348	1.874	0.139	4.837	0.045	0.261	0.049	0.323	0.089
	(0.237)	(0.242)	(1.347)	(0.165)	(2.206)	(0.204)	(0.224)	(0.125)	(0.236)	(0.084)

Table 4
Structural parameter estimates

The table reports the structural parameter estimates by country. The parameters are estimated via the SML procedure discussed in Section 2. For this, we split the data into country samples and perform the SML estimation separately for each country. For each country, we obtain a set of estimates for the parameters $\theta = (\alpha_\phi, \beta_\phi^\varphi, \beta_\phi^{M/B}, \beta_\phi^{Cash}, \sigma_\phi, \alpha_\eta, \beta_\eta^\varphi, \beta_\eta^{M/B}, \beta_\eta^{Cash}, \sigma_\eta, \sigma_{\phi\eta})$. The table reports the point estimates and standard errors in parenthesis for each country. Standard errors are robust to heteroskedasticity and clustered at the industry level (4-digit SIC).

Country	α_ϕ	β_ϕ^φ	$\beta_\phi^{M/B}$	β_ϕ^{Cash}	σ_ϕ	α_η	β_η^φ	$\alpha_\eta^{M/B}$	β_η^{Cash}	σ_η	$\sigma_{\phi\eta}$	*Logl*
AUT	-2.507	0.165	0.010	0.133	0.595	-0.813	0.643	0.092	0.598	0.651	-0.061	-2,669
	(0.005)	(0.023)	(0.001)	(0.040)	(0.016)	(0.092)	(0.051)	(0.004)	(0.066)	(0.037)	(0.012)	
CHE	-1.911	0.132	0.017	0.138	0.631	-0.893	1.121	0.098	2.108	1.119	-0.102	-13,835
	(0.013)	(0.042)	(0.006)	(0.020)	(0.003)	(0.028)	(0.274)	(0.047)	(0.447)	(0.246)	(0.055)	
DEU	-2.204	0.188	0.017	0.227	1.472	-0.962	0.933	0.157	1.183	2.325	-0.413	-42,694
	(0.055)	(0.021)	(0.006)	(0.068)	(0.004)	(0.064)	(0.258)	(0.040)	(0.346)	(0.304)	(0.057)	
DNK	-2.570	0.175	0.018	0.173	0.873	-0.501	1.020	0.128	0.809	2.519	-0.331	-4,685
	(0.080)	(0.159)	(0.015)	(0.161)	(0.034)	(0.033)	(0.386)	(0.086)	(0.548)	(0.408)	(0.156)	
ESP	-2.215	0.135	0.025	0.138	0.597	-1.084	1.798	0.024	0.968	1.288	-0.112	-5,408
	(0.006)	(0.004)	(0.000)	(0.005)	(0.001)	(0.017)	(0.027)	(0.000)	(0.012)	(0.010)	(0.006)	
FRA	-1.743	0.346	0.022	0.200	0.893	-0.185	0.652	0.233	0.034	1.687	-0.277	-48,747
	(0.017)	(0.001)	(0.000)	(0.032)	(0.004)	(0.028)	(0.018)	(0.001)	(0.006)	(0.086)	(0.040)	
GBR	-1.923	0.234	0.014	0.176	0.851	-1.360	1.501	0.148	1.045	2.094	-0.093	-138,725
	(0.006)	(0.040)	(0.003)	(0.014)	(0.004)	(0.045)	(0.406)	(0.037)	(0.376)	(0.287)	(0.051)	
IRL	-2.337	0.164	0.018	0.160	0.995	-1.447	2.088	0.074	0.600	0.982	-0.048	-3,906
	(0.209)	(2.893)	(0.050)	(0.269)	(0.167)	(0.172)	(0.391)	(0.126)	(0.962)	(0.333)	(0.078)	
ITL	-2.723	0.146	0.015	0.141	0.669	-3.085	0.984	0.110	1.078	2.414	-0.326	-3,901
	(0.010)	(0.003)	(0.001)	(0.005)	(0.000)	(0.016)	(0.013)	(0.003)	(0.034)	(0.046)	(0.011)	
JPN	-2.183	0.231	0.037	0.090	1.047	-1.165	1.702	0.111	1.828	2.173	-0.016	-264,397
	(0.051)	(0.055)	(0.004)	(0.038)	(0.019)	(0.154)	(0.439)	(0.049)	(0.869)	(1.210)	(0.003)	
NLD	-2.562	0.142	0.013	0.125	0.685	-0.813	0.914	0.089	1.287	0.689	-0.084	-11,960
	(0.023)	(0.041)	(0.004)	(0.032)	(0.003)	(0.014)	(0.102)	(0.012)	(0.297)	(0.014)	(0.052)	
POL	-1.922	0.290	0.019	0.173	2.258	-0.808	1.737	0.193	0.311	3.587	-0.305	-7,260
	(0.045)	(0.220)	(0.017)	(0.268)	(0.054)	(0.038)	(0.123)	(0.015)	(0.483)	(0.489)	(0.478)	
PRT	-1.897	0.135	0.015	0.074	0.686	-1.901	1.336	0.082	1.899	2.481	-0.032	-891
	(0.036)	(0.054)	(0.005)	(0.029)	(0.013)	(0.020)	(0.058)	(0.013)	(0.910)	(0.121)	(0.016)	
USA	-2.071	0.154	0.008	0.125	0.753	-1.189	0.879	0.123	1.069	2.936	-0.391	-468,560
	(0.016)	(0.030)	(0.001)	(0.006)	(0.014)	(0.168)	(0.357)	(0.020)	(0.432)	(0.521)	(0.118)	

Table 5
Descriptive statistics for control advantage and shareholder advantage

The table reports descriptive statistics for predicted control advantage CADV, defined as $\mathbb{E}[\phi|\ell;\widehat{\theta}]$, and predicted shareholder advantage SADV, defined as $\mathbb{E}[\eta|\ell;\widehat{\theta}]$, for each firm in our sample and split by country. Panel A (B) documents the distribution of CADV (SADV). All variables are measured in fractions.

Country	Mean	Std	25%	Median	75%
Panel A: Control advantage CADV (%)					
All firms	4.4	6.1	0.7	2.6	4.8
AUT	1.9	2.4	0.3	1.1	2.5
CHE	4.5	6.0	0.6	2.3	5.9
DEU	2.9	4.5	0.4	1.6	3.2
DNK	4.8	7.5	0.2	1.4	5.9
ESP	4.5	7.0	0.3	1.5	5.7
FRA	6.6	6.5	2.4	4.1	8.8
GBR	3.7	5.1	0.8	2.3	4.0
IRL	6.5	9.2	0.6	2.1	8.1
ITL	5.4	8.8	0.3	1.4	5.7
JPN	4.8	7.3	0.7	2.0	5.2
NLD	2.2	4.0	0.2	0.6	2.9
POL	6.9	7.5	1.9	5.2	7.5
PRT	6.2	7.9	1.2	3.3	8.2
USA	4.1	5.4	0.7	3.1	4.7
Panel B: Shareholder advantage SADV (%)					
All firms	42.3	28.7	16.2	44.2	60.7
AUT	39.0	16.6	29.6	39.6	48.0
CHE	45.1	25.4	25.5	45.0	63.2
DEU	44.9	24.0	27.5	45.5	59.8
DNK	42.8	28.7	18.3	37.3	64.4
ESP	41.9	35.5	3.7	40.5	69.3
FRA	49.1	28.5	27.2	49.4	69.8
GBR	44.9	24.3	24.6	48.3	61.5
IRL	41.9	29.6	13.5	46.3	65.0
ITL	40.3	31.6	3.0	43.9	65.1
JPN	43.4	28.6	16.7	44.1	64.9
NLD	45.1	23.3	22.9	47.4	63.7
POL	46.4	29.3	17.7	50.1	63.2
PRT	34.3	32.6	4.0	29.6	56.1
USA	39.9	30.0	9.7	43.0	53.8

Table 6
The cross section of control advantage

The table reports statistics for the cross-section distribution of control advantage CADV in different sample splits. We split firms according to various characteristics and report statistics for the bottom and, respectively, top quintile.

Panel A: Analysis of variation in CADV

R^2 explained by	origin	industry	origin+ind.	+ firm chars.	+ ownership
CADV	1.6	5.9	8.0	11.4	12.6

Panel B: Sorts on origin of law, firm characteristics, and ownership

		All firms						
Determinant		Mean	S.D.	5%	50%	95%	Civil	Common
All firms		4.4	6.6	0.1	2.6	18.1	4.8	4.1
Civil law		4.8	7.4	0.1	2.2	21.3		
Common law		4.1	5.9	0.2	2.9	15.0		
Firm characteristics:								
M/B	LO	3.9	6.0	0.1	2.2	14.5	4.2	3.2
	HI	6.2	7.9	0.2	3.9	24.1	8.7	5.6
Cash	LO	2.9	4.4	0.1	1.4	9.9	3.8	2.5
	HI	6.7	7.8	0.4	4.4	24.7	7.7	6.2
Size	LO	5.1	6.4	0.2	3.5	18.7	5.7	5.0
	HI	4.2	7.3	0.1	1.5	20.9	4.3	1.4
ROA	LO	5.4	6.6	0.3	3.8	19.1	5.4	5.4
	HI	4.6	7.1	0.1	2.7	20.5	6.7	3.8
Tangibility	LO	6.1	7.4	0.3	3.9	22.8	7.0	5.6
	HI	3.2	5.7	0.1	1.4	12.4	3.6	2.9
Ownership structure:								
Ownership individuals	LO	3.7	4.6	0.2	3.3	9.9	3.4	3.7
	HI	6.4	8.4	0.3	3.6	26.6	6.5	5.3
Ownership institutions	LO	4.4	6.3	0.1	2.8	16.8	4.5	4.2
	HI	4.1	6.3	0.2	2.7	14.7	3.5	4.1
Ownership mutual funds	LO	4.4	6.2	0.2	3.1	16.7	4.6	4.2
	HI	4.1	6.5	0.2	2.3	15.7	4.4	4.0

Table 7
The cross section of shareholder advantage

The table reports statistics for the cross-section distribution of shareholder advantage SADV in different sample splits. We split firms according to various characteristics and report statistics for the bottom and, respectively, top quintile.

Panel A: Analysis of variation in SADV

R^2 explained by	origin	industry	origin+ind.	+ firm chars.	+ ownership
SADV	0.8	8.7	9.9	14.1	14.9

Panel B: Sorts on origin of law, firm characteristics, and ownership

		All firms						
Determinant		Mean	S.D.	5%	50%	95%	Civil	Common
All firms		42.3	28.7	0.8	44.1	95.9	44.0	41.0
Civil law		44.0	28.2	3.3	44.8	95.0		
Common law		41.0	29.0	0.5	43.9	96.6		
Firm characteristics:								
M/B	LO	39.5	26.8	1.5	40.6	90.6	41.3	35.6
	HI	52.1	29.2	0.5	52.0	99.1	62.9	49.6
Cash	LO	33.0	26.8	0.5	35.0	86.7	35.8	31.8
	HI	53.8	26.8	1.4	54.3	98.7	60.8	49.8
Size	LO	48.2	26.6	1.3	49.0	96.7	54.8	47.2
	HI	40.2	29.0	2.9	35.8	95.2	40.4	35.5
ROA	LO	48.5	27.3	0.9	49.2	97.5	53.3	47.6
	HI	45.9	28.9	0.9	46.7	98.1	52.1	43.2
Tangibility	LO	49.8	26.1	1.4	50.4	97.0	55.8	46.5
	HI	34.7	27.7	0.8	33.6	90.8	34.5	34.2
Ownership structure:								
Ownership individuals	LO	41.0	24.7	0.7	44.3	90.6	44.6	40.6
	HI	48.5	28.1	4.2	52.8	97.0	47.8	50.6
Ownership institutions	LO	43.2	26.5	3.2	45.7	91.9	42.6	44.3
	HI	39.6	30.8	0.3	42.5	98.4	38.8	39.7
Ownership mutual funds	LO	42.8	26.4	2.2	45.4	92.5	43.1	42.4
	HI	41.8	29.7	0.5	43.8	98.1	47.4	40.7

Table 8
Origins of variation in shareholder and control advantage

The table documents the origins of the difference between civil and common law countries in control advantage, $\Delta\text{CADV} = \text{CADV}_{CIV} - \text{CADV}_{COM}$, decomposed as

$$\Delta CADV = \underbrace{\beta_{CIV}(X_{CIV} - X_{COM})}_{\text{(1) Firm composition effect}} + \underbrace{(\beta_{CIV} - \beta_{COM})X_{COM}}_{\text{(2) Systemic effect}},$$

and the corresponding difference in shareholder advantage, $\Delta\text{SADV} = \text{SADV}_{CIV} - \text{SADV}_{COM}$.

	ΔCADV (%)	ΔSADV (%)
(1) Total contribution from characteristics $\beta_{CIV}(X_{CIV} - X_{COM})$	−1.1	−2.4
Contribution from differences in firm characteristics		
Market-to-book	−0.8	−3.6
Cash	−0.1	−0.4
Size	−0.3	−3.5
ROA	0.3	1.2
Tangibility	0.0	−0.2
Contribution from differences in ownership structure		
Ownership individuals	2.0	4.6
Ownership institutions	−2.2	0.9
Ownership mutual funds	0.2	−1.0
Contribution from differences in industry composition	−0.1	−0.3
(2) Total contribution from sensitivities $(\beta_{CIV} - \beta_{COM})X_{COM}$	1.8	5.5
Contribution from different sensitivity to firm characteristics		
Market-to-book	4.4	1.2
Cash	5.8	0.5
Size	1.3	1.0
ROA	0.5	0.1
Tangibility	−4.7	−0.7
Contribution from different sensitivity to ownership structure		
Ownership individuals	0.1	0.6
Ownership institutions	−2.3	2.1
Ownership mutual funds	0.8	−0.2
Contribution from different sensitivity to industry	−4.0	0.9

Table 9
Distribution of direct and indirect ownership in civil vs. common law countries

The table reports the fraction of firms in each quintile of direct ownership φ across rows and indirect ownership, or control advantage CADV/ϕ. We perform independent sorts. Panel A reports the fraction of direct ownership to total ownership, $\varphi/(\varphi(1-\phi)+\phi)$, of the controlling shareholder in each bin, which we call incentive alignment factor. Panel B (C) reports the fraction of firms in each bin for civil (common) law countries.

		Control advantage CADV				
Direct ownership φ	All firms	LO	2	3	4	HI
Panel A: Incentive alignment factor $\varphi/(\varphi(1-\text{CADV})+\text{CADV})$						
All firms	0.74	0.93	0.87	0.74	0.67	0.50
LO	0.53	0.88	0.73	0.46	0.35	0.25
2	0.71	0.94	0.87	0.72	0.63	0.41
3	0.77	0.95	0.91	0.78	0.71	0.49
4	0.81	0.95	0.92	0.83	0.78	0.58
HI	0.88	0.94	0.92	0.90	0.89	0.77
Panel B: Firm composition in civil law countries (% of firms)						
All firms	100.0	22.0	20.8	19.9	14.3	22.9
LO	13.6	5.3	2.4	3.1	1.5	1.2
2	13.2	4.4	3.7	2.0	1.4	1.7
3	13.0	3.1	3.4	2.2	1.6	2.7
4	24.5	4.5	6.4	4.7	3.0	5.9
HI	35.7	4.7	5.0	7.9	6.7	11.4
Panel C: Firm composition in common law countries (% of firms)						
All firms	100.0	18.8	19.7	20.3	24.1	17.1
LO	25.4	6.5	2.9	5.2	7.6	3.2
2	25.6	6.1	5.3	4.6	5.2	4.2
3	25.5	3.8	6.6	4.7	5.6	4.8
4	16.5	1.7	4.2	3.4	3.5	3.7
HI	7.0	0.6	0.7	2.4	2.2	1.1

Table 10
Impact on agency conflicts of governance reforms in France and Italy

The table documents the impact on agency conflicts of governance reforms in France and Italy. Panel A reports structural parameter estimates by country for specifications (20) and (21). The parameters are estimated via the SML procedure discussed in Section 2. For each country, we obtain a set of estimates for the parameters $\theta = (\alpha_\phi, \delta_\phi, \beta_\phi^\varphi, \beta_\phi^{M/B}, \beta_\phi^{Cash}, \sigma_\phi, \alpha_\eta, \delta_\eta, \beta_\eta^\varphi, \beta_\eta^{M/B}, \beta_\eta^{Cash}, \sigma_\eta, \sigma_{\phi\eta})$. The table reports the point estimates and standard errors in parenthesis for each country. Standard errors are robust to heteroskedasticity and clustered at the industry level (4-digit SIC). Panel B reports the average predicted control advantage CADV, defined as $\mathbb{E}[\phi|\ell;\widehat{\theta}]$, and average predicted shareholder advantage SADV, defined as $\mathbb{E}[\eta|\ell;\widehat{\theta}]$, before and after the governance reforms.

Panel A: Model estimates

Country	α_ϕ	δ_ϕ	β_ϕ^φ	$\beta_\phi^{M/B}$	β_ϕ^{Cash}	σ_ϕ	α_η	δ_η	β_η^φ	$\alpha_\eta^{M/B}$	β_η^{Cash}	σ_η	$\sigma_{\phi\eta}$	*Logl*
Governance reform countries:														
FRA	-1.871	-0.094	0.384	0.017	0.011	0.778	-0.086	0.314	0.469	0.156	0.025	0.586	-0.151	-32,143
	(0.028)	(0.007)	(0.020)	(0.002)	(0.002)	(0.002)	(0.012)	(0.028)	(0.035)	(0.009)	(0.001)	(0.022)	(0.008)	
ITL	-2.831	-0.073	0.270	0.011	0.009	0.827	-2.366	0.224	0.649	0.086	0.805	1.015	-0.138	-2,756
	(0.023)	(0.032)	(0.050)	(0.001)	(0.001)	(0.000)	(0.024)	(0.030)	(0.089)	(0.010)	(0.121)	(0.038)	(0.029)	
Alternate control countries:														
GBR	-1.807	0.008	0.194	0.054	0.126	0.791	-1.185	0.002	1.801	0.098	0.895	1.729	-0.123	-128,721
	(0.006)	(0.009)	(0.028)	(0.002)	(0.038)	(0.008)	(0.057)	(0.007)	(0.638)	(0.014)	(0.264)	(0.581)	(0.070)	
JPN	-2.118	-0.007	0.195	0.048	0.064	1.121	-1.027	0.081	1.202	0.311	2.080	1.933	-0.034	-251,844
	(0.062)	(0.282)	(0.061)	(0.015)	(0.024)	(0.047)	(0.172)	(0.178)	(0.102)	(0.087)	(0.974)	(0.924)	(0.005)	
POL	-1.725	-0.012	0.2218	0.028	0.143	2.027	-0.927	0.002	1.276	0.147	0.221	3.294	-0.241	-6,413
	(0.045)	(0.385)	(0.318)	(0.018)	(0.220)	(0.018)	(0.016)	(0.005)	(0.381)	(0.023)	(0.617)	(0.647)	(0.798)	

Panel B: Comparison of CADV and SADV before and after the reforms

Country	Before reforms	After reforms	Difference
Average control advantage CADV (%):			
FRA	7.1	6.3	-0.8***
ITL	5.3	4.2	-1.1***
GBR	3.6	3.6	0.0
JPN	5.0	5.0	0.0
POL	7.2	7.2	0.0
Average shareholder advantage SADV (%):			
FRA	49.2	56.0	6.8***
ITL	46.8	51.2	4.4***
GBR	45.6	45.6	0.0
JPN	44.3	44.3	0.0
POL	45.8	45.8	0.0

Table 11
Counterfactual corporate policies

The table reports the effect of agency frictions on corporate policies when agency frictions can be eliminated entirely ($\phi = \eta = 0$), deviations from the absolute priority rule (APR) can be ruled out ($\eta = 0$) and, respectively, private benefits of control can be eliminated ($\phi = 0$).

		Counterfactuals		
Data moment	Agency	No agency	No APR deviation	No benefits of control
Leverage (%)				
All firms	28.63	40.20	33.68	34.61
Civil law	33.78	49.11	39.93	41.46
Common law	22.33	29.29	26.03	26.20
Pr(Default) (%)				
All firms	1.60	2.66	1.78	2.90
Civil law	2.03	4.15	2.02	4.34
Common law	1.08	1.14	0.83	1.49
Credit spread (%)				
All firms	2.71	4.44	2.87	3.45
Civil law	3.52	6.52	3.79	3.40
Common law	1.71	1.90	1.74	3.51
Pr(Issuance) (%)				
All firms	5.48	9.05	5.25	10.52
Civil law	3.01	3.31	2.48	4.06
Common law	8.49	16.09	8.63	18.44
Issue size (%)				
All firms	29.45	26.90	36.97	23.51
Civil law	28.45	27.11	36.38	28.06
Common law	30.66	15.28	49.04	17.93
Speed of adjustment				
All firms	0.12	0.18	0.12	0.15
Civil law	0.10	0.17	0.05	0.17
Common law	0.14	0.20	0.13	0.21
Autocorrelation 1yr				
All firms	0.75	0.59	0.79	0.57
Civil law	0.73	0.69	0.78	0.66
Common law	0.77	0.46	0.81	0.46

Table 12
Agency cost decomposition

The table quantifies the loss in firm value due to agency frictions. Agency costs are the fraction of firm value lost due to transfers to majority shareholders when $\phi > 0$ and the financial distortions induced by these conflicts.

$$\text{Agency costs} = 1 - \text{Firm value/Firm value if } \phi = \eta = 0 \text{ and no financial distortion.}$$

We split the total agency costs into the value transfer from control benefits and renegotiation power and, respectively, the value loss from financial frictions. All value losses are expressed in percent of the firm value under no agency conflicts.

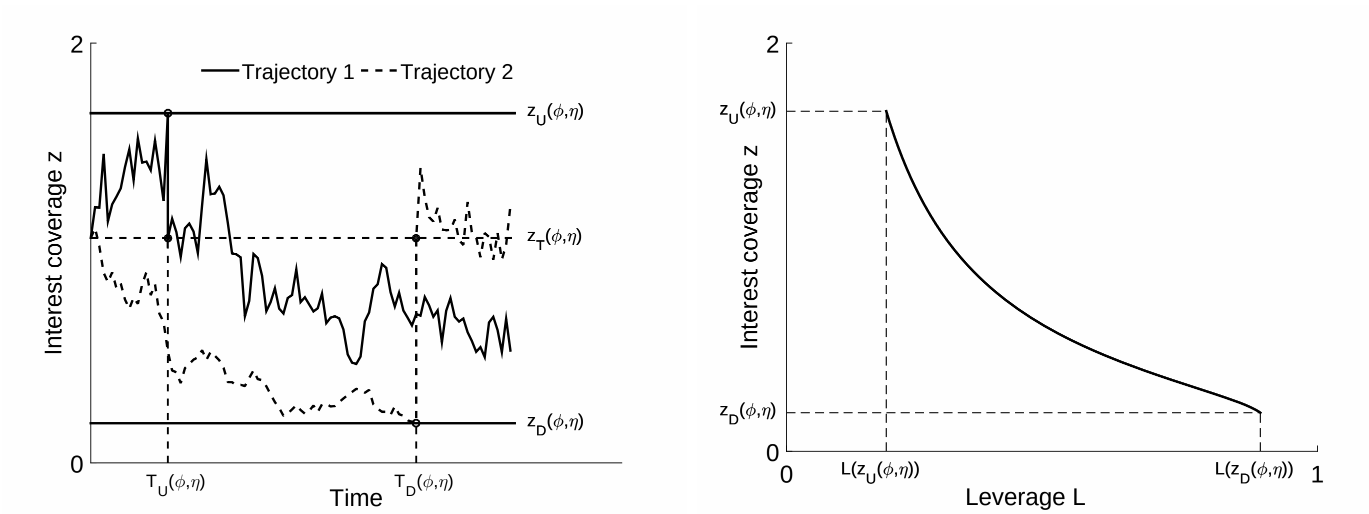
				Counterfactuals	
Country	Agency costs	Transfers due to rents	Financial distortions	No APR deviation	No benefits of control
All firms	5.4	3.1	2.3	4.2	1.3
Civil law	5.7	3.9	1.7	4.3	1.2
Common law	5.0	2.1	2.9	4.1	1.3
AUT	3.8	1.4	2.4	2.5	1.5
CHE	5.3	2.6	2.7	3.2	3.2
DEU	4.5	2.1	2.4	2.8	1.8
DNK	6.8	4.3	2.5	5.2	2.1
ESP	5.4	3.6	1.8	4.7	1.1
FRA	7.1	4.5	2.6	6.8	1.9
GBR	4.8	2.7	2.1	2.8	2.4
IRL	8.2	5.7	2.5	6.5	2.3
ITL	6.3	5.0	1.3	4.8	1.4
JPN	5.6	4.1	1.4	4.2	0.9
NLD	4.0	0.9	3.1	3.8	1.5
POL	8.6	6.1	2.5	6.8	2.4
PRT	6.8	5.3	1.4	6.5	0.9
USA	5.0	1.9	3.2	4.4	0.9

Table 13
Robustness:
Descriptive statistics for control advantage and shareholder advantage

The table reports average predicted control advantage CADV and predicted shareholder advantage SADV, for each firm in our sample and split by country for a set of robustness tests. First, issuance costs, λ, are set to 0.5% (vs. 1% in the main specification). Second, renegotiation costs, κ, are set to 15% (vs. 0%). Third, non-agency parameters, $\theta_i^\star$, are set to time-varying estimates, $\theta_{it}^\star$ (vs. time-invariant). Forth, controlling shareholder ownership, φ_i, is set to the ownership of the 5 (vs. 1) largest shareholders. Fifth, we use a broader definition of leverage. Sixth, the function h is set to the inverse logit transformation (vs. the Normal cumulative density function). Seventh, the random variables capturing firm-specific unobserved heterogeneity, $\epsilon_i = (\epsilon_i^\phi, \epsilon_i^\eta)$, are drawn from the skewed t distribution (vs. the normal distribution). Panel A (B) documents the distribution of CADV (SADV). All variables are measured in fractions.

Country	(1) Main spec.	(2) Issuance costs	(3) Reneg. costs	(4) Auxiliary parameters	(5) Ownership	(6) Leverage	(7) h-function	(8) Distributional assumptions
				Panel A: Control advantage CADV (%)				
All firms	4.4	4.7	5.1	4.6	5.3	2.9	4.5	4.4
AUT	1.9	2.0	1.7	2.2	2.2	1.3	1.3	1.8
CHE	4.5	5.0	3.7	4.3	5.2	2.6	3.2	4.3
DEU	2.9	3.0	3.5	3.6	4.4	1.5	3.4	3.0
DNK	4.8	4.8	4.9	5.9	6.1	2.8	3.2	4.4
ESP	4.5	5.2	4.4	6.2	5.1	3.7	3.6	4.8
FRA	6.6	6.8	7.0	7.6	6.9	4.4	7.0	6.8
GBR	3.7	3.9	4.3	3.7	3.9	1.8	3.2	3.5
IRL	6.5	7.1	4.4	5.2	6.9	3.7	3.5	5.1
ITL	5.4	5.9	5.8	4.2	6.1	4.1	1.3	3.7
JPN	4.8	5.3	6.1	4.5	5.9	3.6	5.3	4.8
NLD	2.2	2.5	2.2	2.0	2.5	1.0	1.9	1.8
POL	6.9	7.8	6.5	8.5	8.8	5.5	7.7	7.0
PRT	6.2	6.4	6.5	8.5	7.6	4.5	5.2	7.9
USA	4.1	4.2	4.5	4.7	5.1	2.5	4.2	4.2
				Panel B: Shareholder advantage SADV (%)				
All firms	42.3	42.1	44.9	42.4	42.0	30.3	37.5	41.7
AUT	39.0	39.2	42.4	35.3	31.2	22.4	41.3	36.4
CHE	45.1	41.3	50.7	50.8	40.0	32.8	44.8	43.2
DEU	44.9	44.5	53.5	52.6	46.3	29.7	40.7	44.4
DNK	42.8	43.3	34.9	46.6	39.1	27.2	41.5	45.6
ESP	41.9	44.4	42.4	40.5	42.9	34.7	34.3	42.0
FRA	49.1	50.2	56.6	51.7	48.8	36.3	49.1	50.3
GBR	44.9	43.3	47.1	39.1	44.5	32.0	38.0	44.4
IRL	41.9	40.5	43.8	43.7	39.9	28.6	42.1	36.8
ITL	40.3	37.7	41.4	38.7	37.5	30.0	34.6	38.5
JPN	43.4	42.5	49.0	44.2	44.6	28.8	37.8	43.7
NLD	45.1	46.5	51.6	43.8	38.6	26.3	44.5	44.7
POL	46.4	46.1	51.0	47.1	43.8	31.6	40.7	45.8
PRT	34.3	28.8	32.3	39.1	33.9	15.9	26.3	27.5
USA	39.9	40.0	36.7	38.4	37.6	31.0	34.4	38.5

Panel A: Dynamics of interest coverage (left) and interest coverage-to-leverage mapping (right)



Panel B: Dynamics of leverage (left) and model-implied leverage density (right)

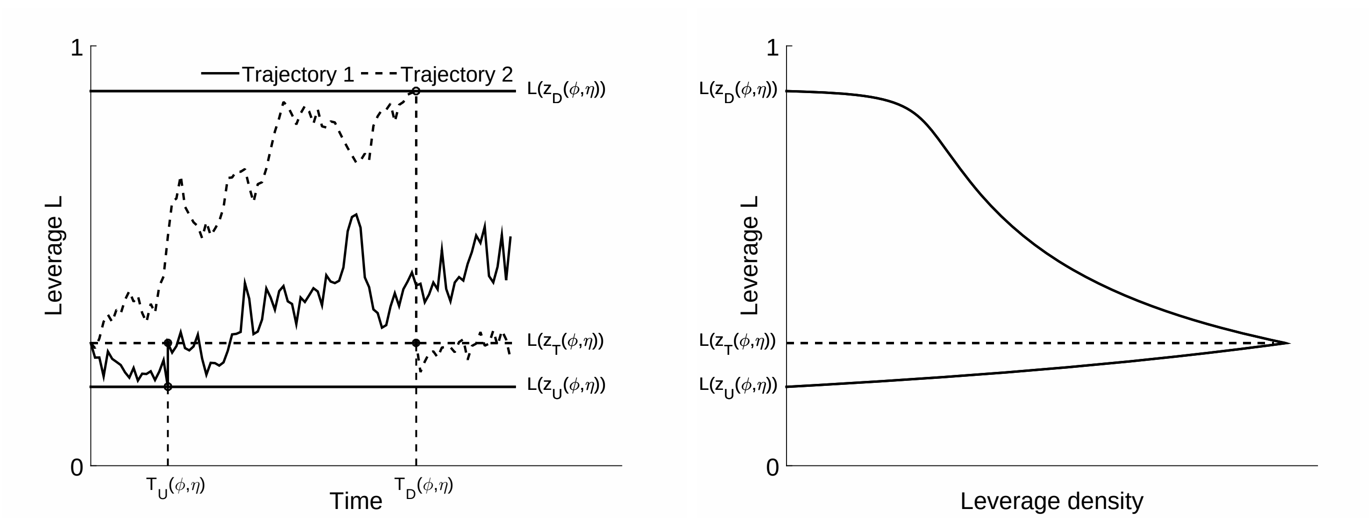
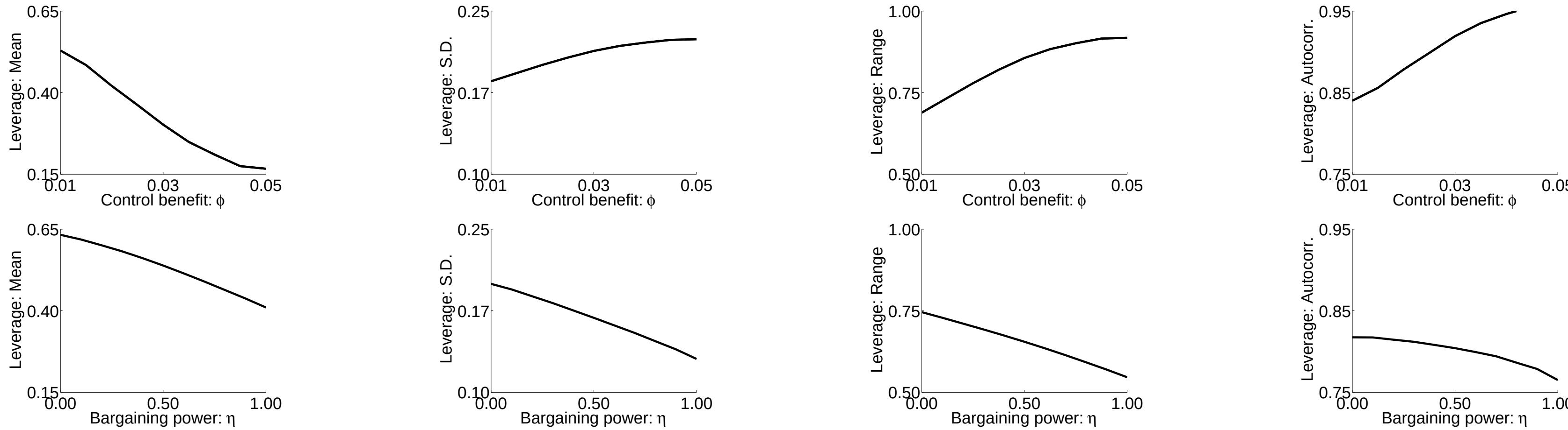


Figure 1
Leverage dynamics in the model

The figure illustrates the firm's optimal policy with two trajectories for interest coverage (Panel A) and leverage (Panel B). The right plot in Panel A shows the endogenous mapping between interest coverage z and leverage $L(z)$. The right plot in Panel B illustrates the resulting statistical distribution for leverage. Both trajectories lead to a reset in the firm's capital structure, following either an improvement in the firm's fortunes at time $T_U(\phi, \eta)$ (Trajectory 1) or a default at time $T_D(\phi, \eta)$ (Trajectory 2). The firm optimally relevers when interest coverage exceeds threshold z_U (i.e., leverage falls below $L(z_U)$), and it renegotiates outstanding debt when interest coverage drops below threshold z_D (i.e., leverage rises above $L(z_D)$). In both cases, the firm resets its interest coverage (leverage) ratio to the target level z_T ($L(z_T)$).

Panel A: Moments based on leverage (From left to right: Mean, S.D., Range, Autocorrelation)



Panel B: Moments based on leverage changes and corporate events (From left to right: Range, Autocorrelation, Pr(Debt issuance), Pr(Default))

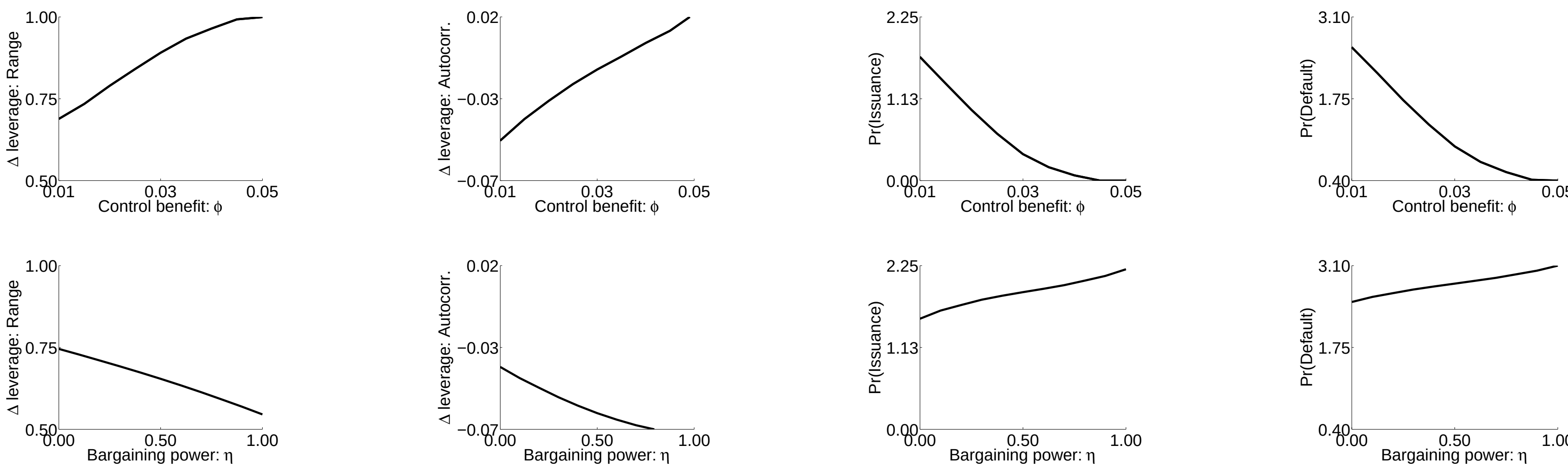
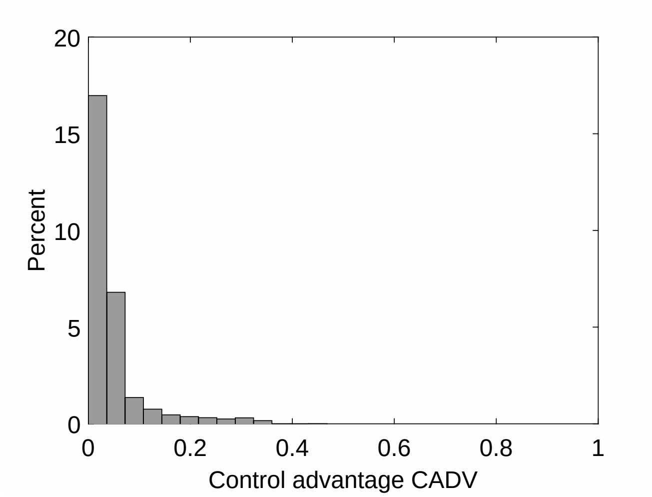


Figure 2
Model identification

Figure 2 depicts the relation between the control benefit, ϕ, and the bargaining power, η, and moments used for the model identification. Panel A reports moments on leverage: mean, standard deviation, range, and autocorrelation. Panel B reports moments on the range of leverage changes, its autocorrelation, probability of issuance and default.

Panel A: Distribution across firms in control advantage CADV



Panel B: Distribution across firms in shareholder advantage SADV

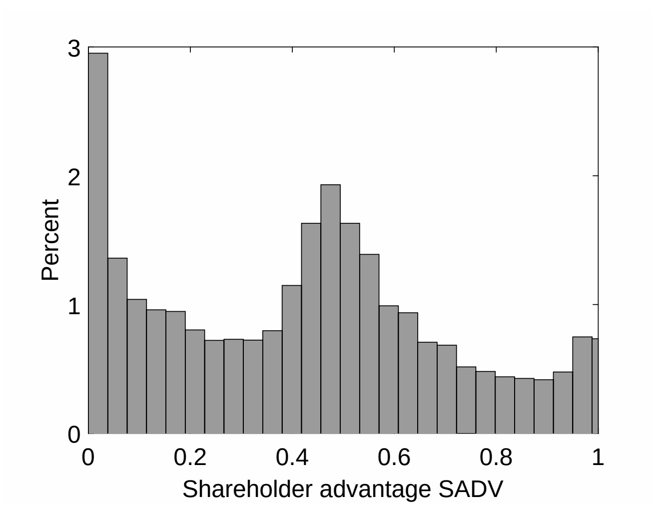
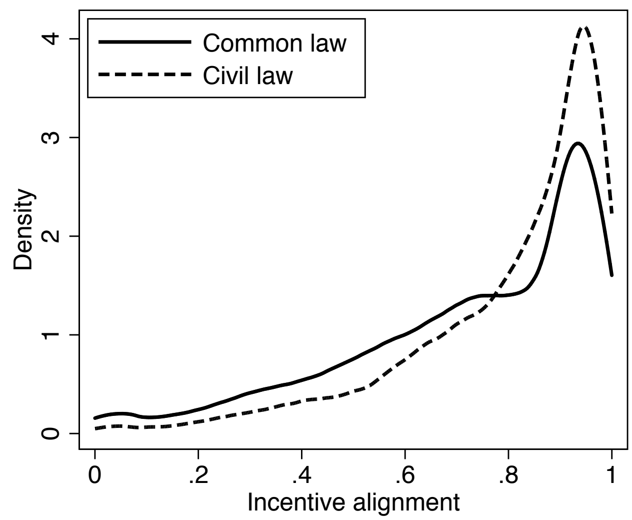


Figure 3

Control benefits and shareholder renegotiation power across firms

The figure shows the distribution of predicted control benefits CADV, defined as $\mathbb{E}[\phi|\ell;\widehat{\theta}]$, and the predicted shareholders' renegotiation power SADV, defined as $\mathbb{E}[\eta|\ell;\widehat{\theta}]$. In Panel A, the histograms plot CADV (left) and SADV (right) across all firms in the sample. In Panel B, we plot the average concentration in direct ownership in a country against the magnitude of agency conflicts, as measured by CADV (left) and SADV (right). The line represents the linear prediction and the shaded area depicts the confidence interval obtained from the standard error of the linear prediction.

Panel A: Incentive alignment factor $\frac{\varphi}{\varphi(1-\phi)+\phi}$



Panel B: Compensation mix across countries

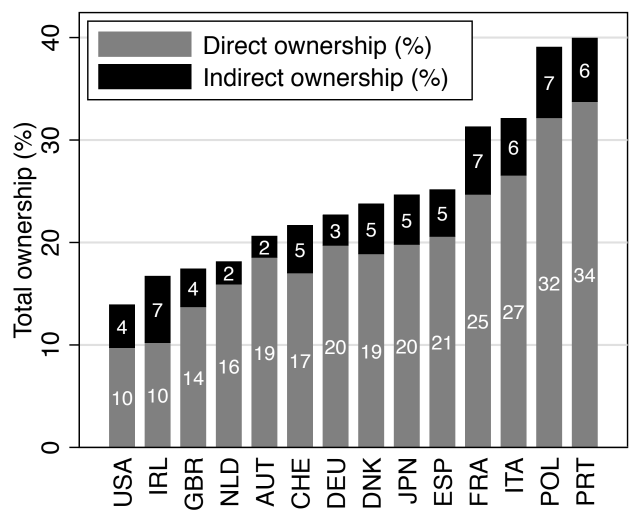


Figure 4

Distribution of the incentive alignment in civil vs. common law countries

The figure shows the incentive alignment factor and the compensation mix across countries. In Panel A, we plot the density of the incentive alignment factor for common and civil law countries. In Panel B, we show the compensation mix between direct and indirect ownership across countries. Indirect ownership is measured by the control benefits CADV.