Agency Conflicts Around the World*

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Abstract

We use a dynamic model of financing decisions to quantify agency conflicts across legal and institutional environments and decompose their effects into wealth transfers among stakeholders and value losses from policy distortions. Our estimates show that agency costs are large and vary widely across and within countries. Legal origin and provisions for investor protection affect agency costs, but they are more relevant for curtailing governance excesses than guarding the typical firm. Agency costs split about equally into wealth transfers and value losses from policy distortions, the latter being larger where ownership is dispersed. Incentive misalignment captures 60% of country variation in leverage.

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

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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 (see La Porta, Lopez-de Silanes, Shleifer, and Vishny (1998, 1999, 2000, 2002)). Such conflicts of interests within firms are severe impediments to the efficient allocation of capital. They depress market valuations and distort leverage and securities issuance decisions. Despite their prevalence, an inherent difficulty in measuring agency conflicts and their effects on policy choices, valuations, and other outcome variables is that these conflicts are not directly observable and good empirical proxies for their severity are difficult to construct.

To resolve these issues, we develop a dynamic model of financing decisions with agency conflicts and use data on observable variables—corporate leverage decisions—to infer properties of unobserved variables—agency conflicts. We do so by using a novel data set on international ownership structures and a simulated maximum likelihood (SML) method that captures cross-sectional firm heterogeneity within countries. This approach yields indexes for agency conflicts at the firm level that are based on observed policy choices for a broad set of 12,652 firms from 14 countries.

Our structural estimation requires a tractable, yet credible model to benchmark actual corporate behavior to the model-implied first- and second-best behaviors under varying degrees of agency conflicts.[1] A large theoretical literature has shown that conflicts of interest can cause distortions in corporate financial policies (Jensen and Meckling (1976), Jensen (1986), Stulz (1990), Hart and Moore (1995), Zwiebel (1996)). In this paper, we therefore 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 this model to infer agency conflicts from the distortions they induce in both the levels and time series of corporate leverage and decompose and compare the associated cost estimates to the governance provisions in place. A simplified version of the model has been shown to capture the main stylized facts about U.S. corporate capital structures (see e.g. Strebulaev (2007), Morellec, Nikolov, and Schürhoff (2012), Danis, Rettl, and Whited (2014)). We broaden the literature by the cross-country nature of the estimation, which is necessary for comparing legal

[1] 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).

environments, and the addition of two layers of agency conflicts, which we show is key for capturing variation in international 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, we assume that controlling shareholders can pursue private benefits at the expense of minority shareholders (as in e.g. Zwiebel (1996), Hart and Moore (1995), or Lambrecht and Myers (2008)). Second, we consider that 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 in the model that each firm is run by a controlling shareholder who sets the firm's investment, financing, and default policies. 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 the free cash flow available for cash diversion but debt choices are not ex-ante contractible (as in Zwiebel (1996)), leading to a mapping between agency conflicts and financing choices. Firms that perform well releverage to exploit the debt tax shields embedded in the controlling shareholders' equity stake. Firms that perform poorly default and renegotiate existing debt contracts, leading to an increase in the cost of debt and to a drop in optimal debt levels. In this environment, we determine leverage dynamics and characterize the effects of agency conflicts on target leverage, default risk, and the pace and size of capital structure changes.

The model implies a specific time-series behavior of financial leverage for each firm. The policy predictions include the 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 leverage. Our identification strategy uses data on these observables to infer properties of the unobserved control benefits and bargaining power of shareholders (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 stationary and conditional time-series distribution of leverage ratios under agency frictions. In a second step, we use a simulated maximum likelihood procedure that allows for cross-sectional firm heterogeneity to estimate from panel data the firm-specific levels of agency frictions—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 three main results. First, conflicts of interest between controlling and minority shareholders and creditors are widespread and economically sizable in most countries. Private control benefits CADV represent 4.4% (3.2%) of free cash flows for the average (median) firm in our sample, ranging from 2% in Austria and the Netherlands to 7% in Ireland and in France. The median tends to be lower than the mean—suggesting that control benefits are of moderate importance for the typical firm but large for some firms in all countries. Shareholders' renegotiation power SADV is distributed more symmetrically. Shareholders can extract substantial concessions from creditors when firms approach financial distress, on average 42% (45% at median) of the renegotiation surplus in default. The highest bargaining power can be attributed to shareholders in France and Switzerland, while Portugal tends to give almost all cash flow rights to creditors. CADV and SADV are positively correlated, so that minority shareholders' value loss from private benefits of control is partially offset by stronger cash-flow rights in financial distress. By contrast, for debtholders both agency costs are exacerbated by powerful owners.

These agency conflicts translate into 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 varies strongly across countries. In countries where incentives are less aligned, such as the U.S., financial distortions constitute a larger portion (60%) of total agency costs, 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. That is, we find that improving corporate governance to diminish private benefits of control has a larger effect than strengthening creditor rights alone.

Second, there exists systematic variation in agency conflicts both between and within countries. Model-implied agency costs correlate strongly with indicators for the quality of governance. Legal origin and provisions for creditor and minority shareholder protection all have an effect on the severity of agency conflicts. Private benefits of control and shareholder advantage in default are significantly higher in civil than in common law countries and when creditor rights are weak. Anti-director and creditor rights provisions have differential impact on agency conflicts depending on their exact nature—as one would expect if they are determined to address existing agency problems.

Despite these sensible results, cross-sectional regressions in which we explore the determinants of agency costs at different quantiles of the firm distribution show that investor protection provisions are more relevant for curtailing governance excesses than for guarding the typical firm. Consistent with these results, we also find that the impact of governance mechanisms on the average firm is small compared to variation within country. Atanasov, Black, and Ciccotello (2011) argue that decisions to tunnel funds reflect both legal and informal constraints. This suggests that firm-specific arrangements and governance determinants may be more important at curbing rent extraction and tunneling of funds than country-wide legal factors. Consistent with this view, we find that country of origin and industry determine only about 28% of all variation in control benefits across firms and 20% of variation in shareholders' cash flow rights in default. Firm-specific factors including market-to-book, cash holdings, firm size, profitability, asset tangibility, and ownership structure explain variation in agency conflicts better than country factors.

Third, incentive misalignment can explain several stylized facts about financial leverage. Figure 1 shows histograms of leverage ratios for each country in our sample. In most countries leverage is low on average despite the tax benefits of debt. Even more strikingly, the zero-leverage puzzle is pervasive across countries (see Strebulaev and Yang (2013) for the U.S.). Still, there exists significant within- and cross-country variation in capital structures. While underleverage is predominant in countries in which ownership is dispersed (such as the U.S. and U.K.), the fit is far from perfect.

Insert Figure 1 Here

What matters for financial policies is the mix of direct and indirect compensation. The reason is that while ownership concentration improves incentives and raises leverage closer to first-best, a counterbalancing effect is that concentration also increases the scope for control benefits and bargaining power in default, which lowers leverage away from first-best. As an illustration, consider Italy versus the United States. Control benefits represent on average 4.1% of cash flow in U.S. corporations and 5.6% in Italian corporations. But because public ownership is more dispersed in a U.S. than an Italian corporation, shareholder incentives are better aligned in Italy. In the U.S., 30% of total compensation is due to control benefits, compared to 18% in Italy. As a result, the average leverage of 38% in Italian corporations, compared to 22% for the U.S., is closer to first-best. The zero-leverage puzzle is more pronounced in the U.S. than the rest of the world since compensation packages are more adversely biased toward indirect compensation. Overall, a composite of our governance indexes captures 60% of all cross-country variation in financial leverage.

Complementing the prior literature that focuses on governance provisions, we quantify the severity of the underlying agency frictions and their effects on policies and valuations across countries. The international corporate governance literature, which relies mainly on reduced form analysis, has shown that there is wide variation in governance practices across countries. Empirical researchers have constructed informative corporate governance indexes based on the fact that agency problems depend in large part on protection safeguarding outside investors.[2] The existing indexes count the governance provisions that are put in place to address a common root cause—the expropriation of outside investors. Only a handful of studies quantify agency conflicts directly using unique data for specific countries and in special settings (see, for example, Mironov (2013)). What we gain from structural estimation is the quantitative assessment of the severity of agency conflicts over a broader set of firms and how they stack up against governance mechanisms. Another benefit of our structural approach is that we can decompose agency costs between transfers among stakeholders and value losses due to policy distortions and conduct counterfactual analysis to measure the sensitivity of agency costs to their various determinants.

Our paper relates more broadly to the large literature initiated by Jensen and Meckling (1976) on the relation between agency conflicts, corporate policies, and firm performance.[3] As relevant as it is for regulation and policy evaluation to quantify these conflicts and measure their impact on behavior and valuations, there are surprisingly few papers addressing this problem. Albuquerque and Schroth (2010) use a model of block trades to estimate private benefits of control of 3 to 4%

[2]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 (2006, 2008) and Favara, Morellec, Schroth, and Valta (2016) construct indexes capturing the enforcement of debt contracts. La Porta et al. (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.

[3]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), 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.

of equity value in the U.S. only, a number close to our own estimates. Morellec, Nikolov, and Schürhoff (2012) use a capital structure model to estimate managerial private benefits of control of 1 to 2% of equity value in the U.S.. One important difference between our paper and these earlier contributions is that we base our analysis on a large cross-section of countries that differ significantly 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.[4] Another key difference is that these papers do not incorporate conflicts of interests between shareholders and creditors in their analysis. Our paper shows that both private control benefits and deviations from the absolute priority rule are important in explaining variation in capital structure.

Lastly, 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.[5] In addition, and as discussed above, this theory has been shown to perform well at explaining the financing patterns of U.S. firms (see e.g. Strebulaev (2007), Korteweg (2010), Morellec, Nikolov, and Schürhoff (2012), or Danis, Rettl, and Whited (2014)). 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 structural estimation on a set of countries in which these factors should be less important and the trade-off theory should work best. Still, one has to believe in the model and estimation procedure to believe in the estimates. To address this issue, we perform a battery of robustness checks to reassure that the estimates are reliable and if they vary, we explain why. As argued in the paper, our estimates also have sensible magnitudes and correlate with variables one would expect them to.

[4] 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.

[5] A number of recent papers have extended the pecking order theory to dynamic environments; see for example Morellec and Schürhoff (2011) or Strebulaev, Zhu, and Zryumov (2015). 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 these papers show that there usually exists multiple equilibria that may involve multiplicity in financial policies. This multiplicity has made it difficult to develop tests of the pecking order theory and, to date, empiricists have struggled identifying the effects of asymmetric information on financing choices.

1 Agency Conflicts and Financing Dynamics

This section develops a dynamic model of the firm in which financing and default decisions follow an (S, s) policy that reflects the tax advantage of debt, costs of issuing securities, bankruptcy costs, and agency conflicts between controlling shareholders, minority shareholders, and creditors. In the next sections, we use this model to estimate agency costs at the firm level.

1.1 Model assumptions

Throughout the section, we operate under the risk-neutral probability measure $\mathbb{Q}$ and assume that the risk-free rate $r > 0$ is constant. We consider an economy with a large number of firms, indexed by $i = 1, \ldots, N$, and allow all parameters to vary across firms. Firms 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. As in Miao (2005) or Abel and Eberly (2011), there are no costs of adjusting capital so that the optimal capital stock maximizes static profits.

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 constant parameters and $(Z_{it})_{t \geq 0}$ is a Brownian motion that captures uncertainty. Given a realization x_i of X_i and a size k_i, the operating profit of firm i is $x_i G(k_i) - \delta k_i$.

Cash flows from operations are taxed at rate τ^c. As a result, firms have an incentive to issue debt to shield profits from taxation. To stay in a simple time-homogeneous setting, we consider debt contracts that are characterized by a perpetual flow of coupon payments c and 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 proportional cost λ, but they can only reduce their indebtedness in default.[6] 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. The personal tax rate on dividends τ^e and coupon payments τ^d are identical for all investors in a given country. These features are shared with numerous other capital structure models, including Leland (1998), Goldstein, Ju, and Leland (2001), Hackbarth, Miao, and Morellec (2006), Strebulaev (2007), Bhamra, Kuehn, and Strebulaev (2010), and Morellec, Nikolov, and Schürhoff (2012).

Agency conflicts 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 free cash flow to equity as private control benefits (as in La Porta, Lopez-de Silanes, Shleifer, and Vishny (2002), Lambrecht and Myers (2008), or Albuquerque and Wang (2008)).[7] The controlling shareholder owns a fraction φ_i of the firm's equity and has discretion over the size of the firm k_i and its financing decisions. These assumptions imply that when choosing firm size, the controlling shareholder chooses k_i to maximize[8]

$$\pi_{ic}(x_i, k_i) \equiv \{(1-\tau^e)\left[\phi_i + (1-\phi_i)\,\varphi_i\right]\left[(1-\tau^c)(x_i k_i^{\gamma} - \delta k_i - c_i) - r k_i\right]\}, \tag{2}$$

the solution to which is given by $k_i^* = \{\frac{(1-\tau)\gamma}{(1-\tau)\delta + (1-\tau^e)r}\}^{\xi} x_i^{\xi}$, 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. In our analysis of financing and default policies, it will be more convenient to work with the (capacity-adjusted) technology shock $Y_i \equiv X_i^{\xi}$ with realizations denoted by y_i and dynamics given by

$$dY_{it} = \mu_i Y_{it} dt + \sigma_i Y_{it} dZ_{it}, \qquad Y_{i0} = \mathcal{T}_i X_{i0}^{\xi} > 0, \tag{3}$$

[6]While in principle management can both increase and decrease future 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 (2013) for a similar result in a one-period model.

[7]In our analysis, we take ϕ_i as a fixed parameter that reflects the severity of conflicts of interests between controlling and minority shareholders. Our objective in the empirical section is to estimate its magnitude. Alternatively, we could assume that diverting cash is costly and estimate the cost of diverting cash. Notably, we could assume that the cost of diverting a fraction ϕ_i of net income is given by $(\eta_i/2)\,\phi_i^2 \times$ net income, where $\eta_i > 0$ as in La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2002). Under this specification, the optimal level of diversion for the controlling shareholder is $\phi_i^* = \eta_i^{-1}(1-\varphi_i)$, where η_i is the parameter to be estimated empirically.

[8]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.

where $\mu_i = \xi \mu_{Xi} + \xi(\xi - 1)\sigma_{Xi}^2/2$, $\sigma_i = \xi \sigma_{Xi}$, and the constant $\mathcal{T}_i > 0$ is defined in the Appendix. Plugging k_i^* in equation (2) and using this change of variable, it is immediate to show that the after-tax cash flows to minority and controlling shareholders, denoted by $\pi_{im}(y_i)$ and $\pi_{ic}(y_i)$, satisfy

$$\begin{aligned} &\text{Cash flows to minority shareholders:} && \pi_{im}(y_i) = (1 - \varphi_i)(1 - \phi_i)(1 - \tau)(y_i - c_i), \\ &\text{Cash flows to controlling shareholders:} && \pi_{ic}(y_i) = [\phi_i + (1 - \phi_i)\varphi_i](1 - \tau)(y_i - c_i). \end{aligned} \tag{4}$$

The expression for π_{im} in (4) shows that minority shareholders receive a fraction $(1-\varphi_i)$ of the cash flows from operations y_i net of the coupon payment c_i, the fraction ϕ_i of cash flows captured by the controlling shareholder, and the taxes paid on corporate and personal income. The expression for π_{ic} shows that controlling shareholders get the rents that they extract from the firm, given by $\phi_i(1 - \tau)(y_i - c_i)$, in addition to a fraction φ_i of the dividend payments. Our objective in the empirical section is to estimate the magnitude of the parameter ϕ_i representing the severity of conflicts of interests between controlling and minority shareholders.

Firms that perform well may releverage to exploit the debt tax shields embedded in the controlling shareholders' equity stake. Firms whose conditions deteriorate may default on their debt obligations. Default can lead either to liquidation or to renegotiation. We consider that 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 $Y_{iT} = (1 - \alpha_i)Y_{iT^-}$ in case of liquidation and $Y_{iT} = (1 - \kappa_i)Y_{iT^-}$ 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 the firm's assets in default.[9] In addition to the estimates of ϕ_i, the paper provides estimates of η_i.

Agency costs typically depend on the allocation of control rights within the firm. We consider that the controlling shareholder has decision rights over the firm's initial capital structure and the firm's restructuring and default policies. When making policy choices, the controlling shareholder maximizes the present value of the cash flows π_{ic} from its equity stake and private benefits (see

[9]Consistent with this modeling, Favara, Schroth, and Valta (2012) find using an international cross-section of stocks that cross-country differences in bankruptcy procedures lead to cross-country differences in default decisions.

Appendix A). As in Leland (1998), Strebulaev (2007), and Morellec, Nikolov, and Schürhoff (2012), we focus on barrier policies whereby the firm's initial capital structure remains fixed until cash flows reach a low level (the default barrier) and the firm goes into default or cash flows rise to a sufficiently high level (the restructuring barrier) and the firm calls the debt and restructures with newly issued debt.[10] We can thus view the controlling shareholder's policy choices (and hence agency conflicts) as determining the initial coupon payment, the restructuring barrier, and the default barrier.

1.2 Leverage dynamics and agency conflicts

In Appendix A, we solve the model and derive the policy choices that maximize the total cash flows to the controlling shareholders. Under these policies, the firm's interest coverage ratio $z_{it} \equiv Y_{it}/c_{it}$ follows a geometric Brownian motion with drift μ_i and volatility σ_i, 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 or the (endogenous) higher restructuring barrier z_U. Figure 2, Panel A shows two trajectories for the interest coverage ratio z_{it} that lead to a reset of the firm's 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 in such a way that its interest coverage ratio is reset to the target level z_T.

Insert Figure 2 Here

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 $z_T(\phi_i, \eta_i)$, $z_D(\phi_i, \eta_i)$, and $z_U(\phi_i, \eta_i)$. Notably, equation (4) shows that control rents decrease with debt, so that the controlling shareholder's choice of debt differs from the efficient choice of debt

[10]Hugonnier, Malamud, and Morellec (2015) show that barrier strategies are optimal in dynamic leverage models when firm value is homogeneous of degree one in (Y, c), so that we need not consider alternative strategies.

(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. Lastly, the economic environment in each country provides additional variation. For instance, an increase in corporate tax rate leads to an increase in the tax benefits of debt and thus to an increase in the target leverage z_T and the default threshold z_D and to a decrease in the restructuring threshold z_U, but differently so depending on (ϕ_i, η_i).

Our objective in the paper is to use the model implied distribution of financial leverage and observed financing choices to infer the level of agency conflicts around the world. The leverage ratio ℓ_{it} being a monotonic, decreasing function of the interest coverage ratio (see the top right panel of Figure 2), 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 2). The model-based distribution of financial leverage (bottom right panel in Figure 2) 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 follows:

$$f_\ell(\ell_i) = f_z\left(L^{-1}(\ell_i)\right) \left| \left(\frac{\partial \ell_i}{\partial L^{-1}(\ell_i)} \right)^{-1} \right|. \tag{5}$$

Equation (5) 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 leverage distributions, given the interest coverage ratio $z_T(\phi_i, \eta_i)$ and the restructuring and default policies $z_U(\phi_i, \eta_i)$ and $z_D(\phi_i, \eta_i)$ selected by the controlling shareholder.

1.3 Identification of the agency parameters

Before proceeding to the empirical analysis, it will be useful to build intuition for how leverage choices allow identifying the parameters describing unobserved agency conflicts. Our identification strategy exploits the panel nature of the data and the model predictions for different moments of leverage. For an individual firm in a given country, the model implies a specific time-series behavior of the firm's leverage ratio. In addition, the model yields comparative statics of the leverage distribution 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 in the data.

Figure 3 illustrates the relation between the agency parameters ϕ_i (Panel A) and η_i (Panel B) and the model-implied stationary time-series distribution of financial leverage. The left plots depict the distribution function for different parameter values. The right plots depict moments of the leverage distribution. We report the median (dashed line) and the low and high of leverage (solid lines) as functions of the agency parameters. Panel A shows that an increase in private benefits of control, as measured by ϕ, lowers both the target leverage and the debt issuance trigger. As a result, the expected leverage drops, the range of inertia over leverage widens, and the speed of mean reversion declines with ϕ_i. The intuition for this result 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 by restructuring less frequently (lower refinancing trigger and, hence, less mean reversion) than optimal for minority shareholders.

Insert Figure 3 Here

Panel B of Figure 3 shows that deviations from the absolute priority rule lead, in contrast to Panel A, to lower target leverage but accelerated default. Shareholders have an incentive to default earlier when η_i is larger since they capture a larger fraction of the surplus in default. They also select a lower debt level, since higher renegotiation power η_i results in costlier debt (as bondholders anticipate shareholders' strategic action in default and require a higher risk premium on debt). As a result, the leverage distribution shifts to the left and the speed of mean reversion increases.

More formally, identification requires that the parameters (ϕ_i, η_i) have a distinct effect on the intertemporal evolution of leverage. A sufficient condition for identification is a one-to-one mapping between the structural parameters and a set of data moments of the same dimension.[11] The first

[11]Heuristically, a moment m is informative about an unknown parameter θ if that moment is sensitive to changes in the parameter and the sensitivity differs across parameters. In formal terms, local identification requires the Jacobian

column of Table 1 lists a broad choice of data moments that are a-priori informative about the agency conflict parameters we seek to estimate—much like in method-of-moments estimation. In our simulated maximum likelihood estimation, these moments are chosen optimally. The main moments to consider are the mean, standard deviation, range, and mean reversion of leverage and the quarterly changes in leverage.

Insert Table 1 Here

Table 1 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. Overall, the different sensitivities reveal that the structural parameters can be identified by combining time-series data on financial leverage (pinning down α_ϕ and α_η introduced below) with cross-sectional information on variation in leverage dynamics across firms (pinning down σ_ϕ, σ_η, and $\sigma_{\phi\eta}$ introduced below).

1.4 Empirical implementation

Our structural estimation uses simulated maximum likelihood (SML) and exploits the structural restrictions of the model to estimate from panel data the level of agency conflicts that best explains observed financing behavior. In the data, each firm $i = 1, \ldots, N$ is characterized by a set of parameters $\widetilde{\theta}_i$ that determine the cash flow growth rate μ_i and volatility σ_i, cash flow beta β_i, liquidation costs α_i, shareholders' bargaining power η_i, management's equity stake φ_i, private benefits ϕ_i, renegotiation costs κ, corporate and personal taxes τ^c, τ^e, and τ^d, issuance costs λ, the risk-free rate r, and the market risk premium ψ.

determinant, $det(\partial m/\partial \theta)$, to be nonzero. A concern with the standard approach is that local identification may not guarantee identification globally. We have therefore simulated the model moments and computed sensitivities in two ways, as marginal effect at different sets of baseline parameters and as average effect over a range of parameter values. Table 1 reports the sensitivity $(\partial m/\partial \theta)/m$ in the baseline. Alternatively, we have computed the differential effect as the average sensitivity over the range of parameter values generating non-zero leverage and normalized by the average effect on the mean. The marginal effect captures local identification, while the average effect gives an idea of which moments yield global identification and which parameters have strong nonlinear impact on the model moments. We find that average sensitivities are more similar across parameters than marginal effects.

Estimating the parameter vector $\widetilde{\theta}_i$ for each firm using solely data on financial leverage is infeasible. We therefore split the parameter vector into two parts: observable parameters that we directly estimate and unobservable parameters that we structurally estimate. Given the dimensionality of the estimation, we first directly estimate the 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 below. We estimate firm-specific values for the subscripted parameters. The remaining parameters are specific to each country. We then keep these parameters fixed when estimating the parameters (ϕ_i, η_i) from data on financial leverage. In a last step, we investigate the effect of sampling error in $\theta_i^\star$ on our estimates. 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:

$$\phi_i = h(\alpha_\phi + \epsilon_i^\phi) \text{ and } \eta_i = h(\alpha_\eta + \epsilon_i^\eta), \tag{6}$$

where $h : \mathbb{R} \to [0, 1]$ is a transformation that guarantees that the parameters stay in their natural domain and the $\epsilon_i = (\epsilon_i^\phi, \epsilon_i^\eta)$ are bivariate random variables capturing firm-specific unobserved heterogeneity. As in linear dynamic random-effects models, the firm-specific random effects ϵ_i are assumed independent across firms and, for all firms $i = 1, \ldots, N$, are normally distributed:

$$\begin{pmatrix} \epsilon_i^\phi \\ \epsilon_i^\eta \end{pmatrix} \sim \mathcal{N}\left(0, \begin{bmatrix} \sigma_\phi^2 & \sigma_{\phi\eta} \\ \sigma_{\phi\eta} & \sigma_\eta^2 \end{bmatrix}\right). \tag{7}$$

This setup is sufficiently flexible to capture cross-sectional variation in the parameter values while imposing the model-implied structural restrictions on the domains of the parameters. In summary, the set of parameters that we estimate structurally for each country is $\theta = (\alpha_\phi, \alpha_\eta, \sigma_\phi, \sigma_\eta, \sigma_{\phi\eta})$.

The likelihood function $\mathcal{L}$ of the parameters θ given the data and $\theta^\star$ is based on the probability of observing the leverage ratio ℓ_{it} for firm i at date t. 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

$$f(\ell_i, \epsilon_i|\theta) = f(\ell_i|\epsilon_i; \theta)\, f(\epsilon_i|\theta) = \left(f(\ell_{i1}|\epsilon_i; \theta) \prod_{t=2}^{n_i} f(\ell_{it}|\ell_{it-1}, \epsilon_i; \theta) \right) f(\epsilon_i|\theta), \tag{8}$$

where $f(\epsilon_i|\theta)$ is the bivariate normal density corresponding to (7). Explicit expressions for $f(\ell_{i1}|\epsilon_i; \theta)$

and $f(\ell_{it}|\ell_{it-1},\epsilon_i;\theta)$ are derived in Propositions 1 and 2 of Appendix B. Integrating out the random effects from the joint likelihood $f(\ell,k,\epsilon|\theta)=\prod_{i=1}^{N} f(\ell_i,\epsilon_i|\theta)$, we obtain the marginal log-likelihood function (since the ϵ_i are drawn independently across firms) as

$$\ln \mathcal{L}(\theta;\ell)=\sum_{i=1}^{N}\ln\int_{\epsilon_i} f(\ell_i,\epsilon_i|\theta)\,d\epsilon_i. \tag{9}$$

We evaluate the integral in equation (9) using Monte-Carlo simulations. When implementing this procedure, we use the empirical analog to the log-likelihood function, which is given by:

$$\ln \mathbb{L}(\theta;\ell)=\sum_{i=1}^{N}\ln\frac{1}{U}\sum_{u_i=1}^{U}\left(f(\ell_{i1}|\epsilon_i^{u_i};\theta)\prod_{t=2}^{n_i} f(\ell_{it}|\ell_{it-1},\epsilon_i^{u_i};\theta)\right), \tag{10}$$

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.[12]

The first step in our empirical procedure consists in estimating the parameters θ. This is done by recognizing that the SML estimator is defined as: $\widehat{\theta}=\arg\max_\theta \ln\mathbb{L}(\theta;\ell)$. In a second step, we construct firm-specific measures of control benefits and of shareholders' bargaining power in default as the conditional expected value of ϕ_i and η_i given the data ℓ_i and the parameter estimates $\widehat{\theta}$.

2 Data and Agency Conflict Estimates

2.1 Data and estimation

Estimating agency costs from corporate behavior requires merging data from various sources. We obtain financial statements from Compustat U.S. and Global, stock prices from CRSP and Datastream, ownership data from Thomson Reuters, and tax rates from the OECD. We collect proxies for the legal environment and other institutional determinants used in the law and finance literature from Andrei Shleifer's website.[13] We remove all regulated (SIC 4900-4999) and financial

[12]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.

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

firms (SIC 6000-6999). Observations with missing total assets, market value, long-term debt, debt 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.[14] 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%).

Some of the model parameters are observable and can be directly estimated from stock prices and other publicly available sources. They are not the focus of our estimation. The parameters $\theta = (\alpha_\phi, \alpha_\eta, \sigma_\phi, \sigma_\eta, \sigma_{\phi\eta})$ capturing agency conflicts are unobservable and must be estimated in our SML procedure. The model parameters that are directly estimated 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.

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 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 following relation (implied by Itô's lemma): $\sigma_{it} = \sigma_{it}^E / (\frac{\partial \mathbf{E}(x,c)}{\partial x} \frac{x}{\mathbf{E}(x,c)})$, where σ_{it}^E is the stock return volatility and $\mathbf{E}(x,c) \equiv \mathbf{V}(x,c) - d\,(x,c)$ is the model-implied stock price.

Our source for ownership data is the Thomson-Reuters Global Institution Ownership Feed. It is a commercial database compiling public records on the declarable ownership stakes in companies

[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.

around the world and is updated quarterly. It allows separating between ownership by individuals, institutions, and mutual funds.[15] 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. Gilson, John, and Lang (1990) provide evidence that renegotiation costs are negligible. We thus set the renegotiation costs parameter, κ, to zero. We estimate liquidation costs following Berger, Ofek, and Swary (1996): $\alpha_{it} = 1 - (\text{Tangibility}_{it} + \text{Cash}_{it})/\text{Total Assets}_{it}$, where Tangibility_{it} equals $0.715 * \text{Receivables}_{it} + 0.547 * \text{Inventory}_{it} + 0.535 * \text{Capital}_{it}$.

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 $\frac{\mathcal{R}}{\mathcal{R}-1}\lambda$, where $\mathcal{R} \equiv \frac{z_U}{z_0}$ is the restructuring threshold multiplier. We observe a median value of 2 for $\mathcal{R}$ 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). Table 2, Panel A reports the country means for all these parameters.

Insert Table 2 Here

2.2 Agency conflict estimates

With the parameters $\theta^\star$ as inputs, we estimate the structural parameters of interest using the SML procedure discussed in Section 1.4. For this, we split the data into country samples and perform the SML estimation separately for each country. For every country, we obtain statistical estimates for the five parameters $\theta = (\alpha_\phi, \alpha_\eta, \sigma_\phi, \sigma_\eta, \sigma_{\phi\eta})$. Table 2, Panel B reports the point estimates and standard errors in parenthesis. Standard errors are robust to heteroskedasticity and clustered at the industry level (4-digit SIC). The parameters representing the control benefits and the bargaining power of shareholders in default are well identified in the data. 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.

[15] 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.

Using the parameter estimates in Table 2, we can now construct firm-level measures of the control advantage (CADV) and shareholder advantage in default (SADV) in our sample. CADV is the predicted value for firm i of the parameter ϕ_i that governs the control benefits of controlling shareholders. SADV is the predicted value for firm i of the parameter η_i, which captures shareholders' renegotiation power in default.

We define the controlling shareholder advantage in firm i as

$$\text{CADV}_i \equiv \mathbb{E}[\phi_i|\ell_i;\widehat{\theta}] = \int\limits_{\epsilon_i^\eta}\int\limits_{\epsilon_i^\phi} h(\alpha_\phi + \epsilon_i^\phi)\frac{f(\epsilon_i^\phi, \epsilon_i^\eta, \ell_i|\widehat{\theta})}{f(\ell_i|\widehat{\theta})} d\epsilon_i^\phi d\epsilon_i^\eta. \tag{11}$$

In expression (11), $f(\epsilon^\phi, \epsilon^\eta, \ell|\widehat{\theta}) = f(\ell|\epsilon^\phi, \epsilon^\eta; \widehat{\theta})f(\epsilon^\phi, \epsilon^\eta|\widehat{\theta})$ 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 $\widehat{\theta}$. Explicit expressions for the density $f(\ell|\epsilon^\phi, \epsilon^\eta; \widehat{\theta})$ are derived in Appendix B. Similarly, the shareholder advantage in firm i is

$$\text{SADV}_i \equiv \mathbb{E}[\eta_i|\ell_i;\widehat{\theta}] = \int\limits_{\epsilon_i^\eta}\int\limits_{\epsilon_i^\phi} h(\alpha_\eta + \epsilon_i^\eta)\frac{f(\epsilon_i^\phi, \epsilon_i^\eta, \ell_i|\widehat{\theta})}{f(\ell_i|\widehat{\theta})} d\epsilon_i^\phi d\epsilon_i^\eta. \tag{12}$$

Plugging in the estimates from Table 2, we obtain CADV and SADV for each firm as the predicted ϕ_i and η_i given the data on leverage $\ell_i = (\ell_{i1}, ..., \ell_{in_i})'$ and the parameter estimates $\widehat{\theta}$.[16] 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.

Figure 4 and Table 3 provide descriptive statistics for the predicted control benefits CADV and shareholders' renegotiation power SADV for the firms in our sample, split by the country of origin. The median (average) control benefit represents 3.2% (4.4%) of total cash flows and 2.9% (4.0%) of equity value. The median (average) renegotiation power of shareholders is 45% (42%). There is sizable variation in CADV and SADV across countries and across firms in each of the countries.

[16] Note that these conditional expectations are unbiased. Indeed, let v_i be omitted explanatory variables. 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 following moment condition on the error e_i:

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

The largest median control benefits can be found in Poland (5.5%), France (5.1%), USA (3.9%), and Portugal (3.5%). The lowest is in the Netherlands (0.9%) and Austria (1.1%). 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 the top panel of Figure 4, which plots the histogram of CADV (left) and SADV (right) across all firms.

Shareholders' renegotiation power is distributed more symmetrically, with a standard deviation of 24%. 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 than across countries. Given the magnitude of bankruptcy and renegotiation costs (Table 2), 42% average bargaining power implies shareholders can capture about 20% of firm value on average by renegotiating outstanding claims in default.

Insert Figure 4 and Table 3 Here

The bottom panel of Figure 4 explores the relation between CADV and SADV across countries and ownership structure. Both correlations are positive. Thus, powerful controlling shareholders can extract more benefits during normal times and more concessions from debtholders in default than well-governed firms. The minority shareholder value loss from private benefits of control is thus partially offset by stronger cash flow rights in financial distress. By contrast, for debtholders both agency costs are exacerbated by powerful owners.

When we perform an analysis of variation for CADV and SADV, a maximum of 28.7% of the variation in control benefits across firms in our sample and 20.1% in shareholders' renegotiation power can be attributed to the country of origin and the industry (4-digit SIC). The remainder is determined by factors that are unrelated to origin and industry.

2.3 Agency cost decomposition and policy experiments

The previous section has shown that agency conflicts vary significantly across countries. This section shows that the value loss from agency conflicts and the composition of the loss—i.e. the part due to rent extraction and the part due to financial distortions—also vary significantly across countries. Importantly, 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 4, Panel A 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 5.3% on average, with 2.9% of net transfers and 2.4% of net losses due to financial distortions. Total agency costs range from 3.7% in Austria to 8.5% in France, while the U.S. (5.1%) is close to the median.

Insert Table 4 Here

Panel A also shows that 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:

$$\text{Total ownership} = \text{Direct ownership} + \text{Rents} = \varphi * (1 - \text{CADV}) + \text{CADV}. \tag{13}$$

Panel A of Figure 5 shows the compensation mix for the 14 countries in our sample. While controlling shareholders in Italy extract 5.6% of equity value on average in control benefits (compared to 4.1% in the United States), 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 are due to control benefits. As a result, incentives between majority and minority shareholders are more aligned in Italy than the United States or Great Britain.

Table 4 shows that in countries where the total compensation of controlling shareholders is more tilted toward indirect compensation, including 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 countries with concentrated ownership structure, such as France, Italy, or Poland.

Insert Figure 5 Here

The last two columns of Table 4 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 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 4.3%, or 80% of the total. Most agency costs arise from control benefits and the financial frictions that they cause. With perfect monitoring of controlling shareholders, $\phi = 0$ and agency costs would be reduced to 1.4%.

Lastly, Table 4 shows how financial policies change with agency conflicts. Panel B reports a number of key characteristics of leverage decisions and their implications for credit spreads. If agency could be eliminated, average firm leverage would rise to 40% from an observed 28%, and default and issuance probabilities would almost double while debt issuance sizes would decline. As a result, the speed of adjustment (SOA) would rise from 12% to 19%. 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.

3 The Determinants of Agency Conflicts

Many studies have identified factors that purport to explain variation in agency conflicts across and within countries. However, direct evidence for their effects and magnitude are sparse. The extent and cost of agency conflicts between various stakeholders are hard to measure and, hence, their determinants difficult to study. The CADV and SADV measures estimated in the previous section provide firm-by-firm proxies for agency conflicts, that one can use to explore the effects of various governance mechanisms on agency costs. We first review the most prominent factors identified in the literature and then explore how they are linked to our agency cost estimates.

Table 5 provides a summary description of the determinants of agency conflicts that we use in the regressions. Most of the legal determinants and governance mechanisms are set at the country level. It will therefore be informative to not only measure their effect on the average firm in different countries but also explore how they affect different types of firms in each country.

Insert Table 5 Here

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 principals and mechanics of debt enforcement influence the design of investor protection (Djankov, Hart, McLiesh, and Shleifer, 2008). We assess the importance of legal origin by defining dummy variables that identify the heritage of the bankruptcy 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 therefore expect CADV to be significantly higher in civil law countries than in common law countries. Table 6 shows civil law countries have indeed up to 3–4% higher control advantage than common law countries, though this number is not statistically significant in all specifications. The number corresponds to an additional 3 to 4 out of a 100 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.

Insert Tables 6 and 7 Here

Similarly, creditors' interests are poorly protected in civil law countries. Most civil law countries recognize some kind of security interest or, for that matter, priority among creditors. But this tends to be severely restricted to certain types of assets and enforcement is burdensome. None recognizes unified or specialized security interests similar to the U.S. or UK. As a result, creditors' enforcement rights upon default are rather weak. Consistent with this enforcement hypothesis, we estimate shareholders' bargaining power in default is, across specifications in Table 7, between 8% and 13% higher in civil than in common law countries. In civil law countries, investors tend to be more unsecured and thus a priori hesitant to invest, with the result that secured debt is essentially priced as unsecured or simply unavailable, and firms are forced to take less leverage.

In addition to the corporate governance variables, we include in our regressions standard control variables for firm attributes. 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 stronger the larger 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 coefficients on the firm characteristics are both economically and statistically significant and the signs are as expected. CADV is larger the higher M/B, cash, ROA, and the smaller firm size and tangibility. SADV also rises strongly with M/B and cash holdings and drops marginally with size and tangibility.

The literature has summarized the design of shareholder and debtholder protection by forming various indexes. These studies generally compile a list of certain statutory legal and other governance provisions for different countries and aggregate them by an equal-weighted sum. Compliance with each ex-ante determined criterion gives a point for the legal system. The more points, the better the protection. The most common indexes are the creditor rights index, anti-director rights index, and anti-self-dealing index. The creditor rights index, following La Porta, Lopez de Silanes, Shleifer, and Vishny (1998), aggregates the statutory rights of secured lenders as defined in laws and regulations. It ranges from 0 (weak creditor rights) to 4 (strong creditor rights). See Table 5 for definitions of each provision. We expect strong creditor rights to curb rent seeking by controlling shareholders and allocate more bargaining power to debtholders in distress situations. The anti-director rights index, following La Porta et al. (1998), aggregates shareholders' statutory rights. It ranges from 0 (weak shareholder rights) to 6 (strong shareholder rights). Finally, the anti-self-dealing index of Djankov, Hart, and Shleifer (2008), similar to the anti-director rights index, aggregates provisions designed to curb self-dealing by executives and controlling shareholders.

We find that the investor protection indexes tend to impact CADV and SADV, but the magnitude of their effects on the average firm is small and not robust across all specifications (Tables 6 and

7, columns (5) through (9)).[17] Investor protection provisions are likely endogenous and put in place to curb excesses. Creditor rights have a larger and more robust curtailing effect on both control benefits and shareholder advantage than anti-director and anti-self-dealing rights. The difference in control benefits between the countries with the weakest and the strongest creditor rights is 3% of cash flows (4 times -0.80). At the same time, shareholders capture 5% (4 times -1.25) less of the renegotiation surplus in default.

The ownership structure of a firm is another important aspect of governance and gives an indication for how pronouced agency conflicts between different stakeholders are in a publicly traded company. We measure controlling shareholder ownership by the stake of the largest shareholder (alternatively the five largest shareholders), expressed as a fraction of market capitalization. Specifications (2) and (4)–(9) in Table 6 show that ownership concentration by family and other individuals is, consistent with agency theory, one of the single most important determinants of control benefits. A one percent increase in individual ownership predicts a 4–6 basis point rise in rent extraction and, hence, a decline of similar magnitude in the firm's market value. Ownership by institutions and mutual funds, in contrast, does not systematically affect CADV.

Enforcement of statutory governance provisions is crucial to ensure efficacy of these provisions and the magnitude of agency conflicts (see also Favara, Morellec, Schroth, and Valta (2016)). 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 have little effect on CADV and SADV. By contrast, governance provisions should have larger impact on CADV and SADV when agency costs are sizable. Simply speaking, good governance should preclude massive control failures and agency excesses in the country.

Tables 8 and 9 check these predictions in the cross section. To do so, we use quantile regressions that allow us to determine the effect of legal provisions not just on the average firm in a country but on different types of firms—firms with low, medium and, respectively, high agency conflicts. The

[17]Complementing the multivariate firm-level regressions in Tables 6 and 7, the univariate relation between the protection indexes and agency conflicts at the country level is similar.

civil law dummies affect, statistically speaking, the right tail of CADV more than the median and left tail. 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 (as measured in the model by ϕ). This is likely due to better enforcement. Large intangibles, cash, and profitability facilitate resource diversion especially in poorly governed firms (i.e., the coefficients are monotonically rising with the CADV quantile). Similarly, ownership concentration is responsible for the very large agency excesses. While a 1 percent increase in individual ownership leads to 1 basis point increase in private benefits at the bottom of the distribution, the same variation yields a 15 basis point rise in rent extraction in the top 5% of firms. SADV exhibits much less variability in all civil law countries. Creditor rights provisions lower shareholders' advantage across the board. Anti-self-dealing provisions, on the other hand, mainly stop shareholders from exerting very high renegotiation power in default.

Insert Tables 8 and 9 Here

Overall, three facts emerge. First, our estimates of agency conflicts are related to a number of governance mechanisms. Variables associated with stronger investor protection relate negatively to our estimates of agency conflicts. Concentrated family ownership, bankruptcy proceedings, and creditor rights provisions have the largest impact on agency conflicts and, hence, on financing decisions. Second, bankruptcy proceedings have an important ex-ante disciplining effect on controlling shareholders. Third, enforcement costs are material. Investor protection provisions are more successful at curtailing massive governance excesses than guarding the average firm in a country.

4 Model Fit and Robustness

The previous section has shown that investor protection provisions significantly affect the extent and costs of agency conflicts. We now explore the fit of our model by checking if agency frictions, as measured by CADV and SADV, are related to financial leverage choices. We start by reviewing some stylized facts about international capital structure and then link agency conflicts to financial leverage in different countries.

Figure 1 shows for each country the distribution of financial leverage over time and pooled across all firms between 1997 and 2011. There exists large within- and cross-country variation in capital structures. Leverage tends to be low on average in most countries despite the tax benefits of debt. Leverage ratios vary between zero and close to 100% in most countries. The peak at zero in almost all plots shows that the zero-leverage puzzle is pervasive across countries. Zero leverage is not confined to the United States (see Strebulaev and Yang (2013) for the U.S. evidence), though it is most pronounced in the U.S. and UK where ownership is most dispersed. While not illustrated by the pooled distribution, leverage is also persistent and mean-reverting over time across all countries, which is consistent with our model. Still, there exists significant cross-country variation in capital structure, on top of the within-country variability.

The left graph in Figure 5, Panel B plots country-level leverage against ownership structure and shows that underleverage is predominant where ownership is dispersed. The weak positive relation between ownership concentration in a country (ownership here is averaged across firms and time) and leverage suggests that separation between ownership and control indeed matters for leverage. The relation is, however, far from perfect.

What matters for financial policies is the mix of direct and indirect compensation, not concentration by itself. The reason is that while ownership concentration improves incentives and thus raises leverage towards first-best, it creates a counterbalancing force by increasing control benefits (CADV) and bargaining power in default (SADV), as shown by Tables 6 and 7. Panel B in Figure 4, in particular, shows that more concentrated ownership is associated with larger CADV (left) and SADV (right). Higher CADV and SADV diminish incentives to take high leverage in our model. The net effect on financial leverage is thus not clear without knowing the compensation mix.

To capture this tradeoff, we aggregate CADV, SADV, and the equity stake φ into a single index. Table 10 reports the coefficients when we include CADV scaled by total ownership, SADV, and the interaction between scaled CADV and SADV in a standard capital structure regression. We run this regression at both the firm and country level. The coefficients have the predicted sign—both CADV (normalized) and SADV introduce financial distortions while their interaction captures concavity. The coeficients on all three agency variables are highly significant. The R^2 is 36% in the firm-level regression and, respectively, 60% in the country regression. By contrast, direct ownership is not significant (Specification (2)). Alternative tests compare the predictive power of the LLSV governance indexes, including the creditor rights, anti-director rights, and anti-self-dealing index (Specification (3)). The coefficients on the LLSV indexes are insignificant at country level.

Insert Table 10 Here

Based on the regression results that both scaled CADV and SADV explain variation in leverage, we define Incentive Alignment as the predicted value from the country-level results, with intercept set to zero and the coefficients estimated as follows (Specification (1) at country level in Table 10):

$$\text{Incentive Alignment} = -7.1 * \frac{\text{CADV}}{TtlOwn} - 3.7 * \text{SADV} + 16.0 * \text{SADV}\frac{\text{CADV}}{TtlOwn}. \tag{14}$$

Misaligned incentives correspond to negative values for the Incentive Alignment index, and Incentive Alignment=0 corresponds to CADV=SADV=0 which is the base case.

The coefficients in expression (14) provide, by construction, the best fit to explain country leverage with a single index, Incentive Alignment. The question is how well agency conflicts, as measured by CADV and SADV, can capture cross-country variation in leverage. The right plot in Figure 5, Panel B shows how good the fit is. We plot Incentive Alignment against country leverage. Incentives are more aligned in Italy than the United States and, as a result, leverage in Italian corporations is with an average of 38% much closer to first-best than the 22% average leverage in the United States. The overall R^2 of Incentive Alignment is 60%, compared to 10% in the left plot.

Our analysis therefore suggests that the zero-leverage puzzle is more pronounced in the U.S. than in the rest of the world, not because controlling shareholders extract more control benefits but because their total compensation is more adversely biased toward indirect compensation.

Finally, we assess the out-of-sample performance of the model by computing the root-mean-square error, RMSE, and the normalized RMSE for all countries in our sample. The RMSE is based on the difference between the observed leverage, ℓ_t, and the predicted leverage $\mathbb{E}[\ell_t|\ell_{t-1};\widehat{\theta}]$. The normalized RMSE is the RMSE divided by the difference between maximum and minimum observed leverage. The normalized RMSE controls for differences in the support of the distribution of leverage and thus allows a direct comparison across countries.

Results reported in Table 11 reveal that our model performs reasonably well out-of-sample. The average RMSE and normalized RMSE across countries are 0.12 and 0.14, respectively. The lowest normalized RMSE can be found in Switzerland (0.08), Danemark (0.11), and the U.S. (0.12). The largest is in Poland (0.34), Spain (0.25), and France (0.24).

4.1 Robustness checks

We have made a number of assumptions when implementing the empirical estimation of the parameters governing agency conflicts. One may thus be concerned about the robustness of our estimates. To address this issue, we have performed a number of robustness checks. First, we have set the cost of debt issuance to 0.5% of the issue size and re-estimated the agency parameters. Second, we have defined φ_{it} as the total ownership share of the five largest shareholders, instead of the single largest shareholder. Third, we have changed the cost of debt renegotiation from 0% to 15%. Fourth, we have used a broader definition of leverage. Fifth, we have allowed parameters to vary period-by-period assuming controlling shareholders are myopic about this time variation.

Our estimates (unreported due to a lack of space) 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 our base estimates. Overall, the main conclusions seem resilient to the specific parametric assumptions, and any observed deviation has an intuitive justification.

5 Conclusion

This paper offers a novel approach to quantifying agency conflicts. We construct theory-grounded indexes of agency conflicts based on revealed 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 governance indexes show that conflicts of interest vary significantly across countries and 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., financial distortions constitute a larger portion (60%) of total agency costs, 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.

Our estimates for agency costs correlate with the governance quality in different countries. Legal origin and provisions for creditor and minority shareholder protection all have an effect on the severity of agency conflicts. Control benefits and shareholders' renegotiation advantage are significantly higher in civil than in common law countries and when creditor rights are weak. Consistent with material enforcement costs, we find that investor protection provisions are more relevant for curtailing governance excesses than for guarding the typical firm. Finally, incentive misalignment can explain several stylized facts about financial leverage internationally. A composite of our governance indexes explains up to 60% of cross-country variation in financial leverage.

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Appendix

A. Model derivation

In this Appendix, we omit the dependency of the technology shock and of the parameters on i. To derive the value of the controlling shareholder's claim, we first characterize its value for the period over which neither the default threshold nor the restructuring threshold are hit and the firm does not change its debt policy. In this region, the value of the controlling shareholder's claim $\texttt{cs}(x)$ solves

$$0 = \max_{k \geq 0} \left\{ \frac{1}{2}\sigma_X^2 x^2 \frac{\partial^2 \texttt{cs}(x)}{\partial x^2} + \mu_X x \frac{\partial \texttt{cs}(x)}{\partial x} - r\texttt{cs}(x) + (1-\tau^e)\left(\phi + (1-\phi)\varphi\right)\left[(1-\tau^c)(xk^\gamma - \delta k - c) - rk\right] \right\}$$

for any given coupon payment $c \geq 0$. Since k there are no costs of adjusting capital, k only appears in the firm operating cash flow and we can solve this maximization problem for k to get $k^* = \left\{ \frac{\gamma(1-\tau)}{(1-\tau)\delta + (1-\tau^e)r} \right\}^\xi x^\xi$, with $\xi \equiv \frac{1}{1-\gamma} > 1$ and where the tax rate $\tau \equiv 1 - (1-\tau^c)(1-\tau^e)$ reflects corporate and personal taxes. In our analysis of corporate policies, it will be more convenient to work with the (capacity-adjusted) technology shock $Y_i \equiv X_i^\xi$ with realizations denoted by y and dynamics given by

$$dY_t = \mu Y_t dt + \sigma Y_t dZ_t, \qquad Y_0 = \mathcal{T} X_0^\xi > 0$$

with $\mu = \xi\mu_X + \xi(\xi-1)\sigma_X^2/2$, $\sigma = \xi\sigma_X$ and

$$\mathcal{T} \equiv \frac{(1-\gamma)\left[(1-\tau)\delta + (1-\tau^e)r\right]}{\gamma} \left\{ \frac{\gamma(1-\tau)^\gamma}{(1-\tau)\delta + (1-\tau^e)r} \right\}^{\frac{1}{1-\gamma}}.$$

Denote respectively by y_U and y_D the restructuring and default thresholds. Using this change of variable, we get that the controlling shareholder's value function solves in the inaction region (y_D, y_U):

$$r\texttt{cs}(y) = \frac{1}{2}\sigma^2 y^2 \frac{\partial^2 \texttt{cs}(y)}{\partial y^2} + \mu y \frac{\partial \texttt{cs}(y)}{\partial y} + \left[\phi + (1-\phi)\varphi\right](1-\tau)y,$$

Both the controlling and minority shareholders are entitled to a cash flow stream that is proportional to the firm's net income $(1-\tau)(y-c)$. 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 $T_s = \inf\{t \geq 0 : Y_t = y_s\}$, $s = U, D$. 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, we can write the solution to equation (A1) as:

$$n(y,c) \;=\; (1-\tau)\left[\frac{y}{r-\mu} - \frac{c}{r} - p_U(y)\left(\frac{y_U}{r-\mu} - \frac{c}{r}\right) - p_D(y)\left(\frac{y_D}{r-\mu} - \frac{c}{r}\right)\right], \tag{A2}$$

where [see Revuz and Yor (1999, pp. 72)]

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

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 Morellec, Nikolov, and Schürhoff, 2012). In addition, the selected coupon rate c is linear in y. Thus, if two firms i and j are identical except that $y_0^i = \Lambda y_0^j$, then the selected coupon rate and default threshold satisfy $c^i = \Lambda c^j$ and $y_D^i = \Lambda y_D^j$ and every claim will be scaled by the same factor Λ. For the 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 (i.e., it is optimal to choose $c^1 = \rho c^0$, $y_D^1 = \rho y_D^0$, $y_U^1 = \rho y_U^0$). Subsequent restructurings scale up these variables again by the same ratio. If default occurs prior to restructuring, firm value is reduced by a constant factor $\eta(\alpha-\kappa)\gamma$ with $\gamma \equiv y_D/y_0$, 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, we have for $y_D \leq y \leq y_U$:

$$\underset{\substack{\text{Total value}\\ \text{of the claim}}}{\mathbf{N}(y,c)} = \underbrace{n(y,c)}_{\substack{\text{Value over}\\ \text{one cycle}}} + \underbrace{p_U(y)\,\rho\mathbf{N}(y_0,c)}_{\substack{\text{PV of claim on net}\\ \text{income at a restructuring}}} + \underbrace{p_D(y)\,\eta(\alpha-\kappa)\,\gamma\mathbf{N}(y_0,c)}_{\substack{\text{PV of claim on net}\\ \text{income in default}}}. \tag{A3}$$

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

$$\mathbf{N}(y_0,c) = \frac{n(y_0,c)}{1 - p_U(y_0)\,\rho - p_D(y_0)\,\eta(\alpha-\kappa)\,\gamma} \equiv n(y_0,c)\ \mathbf{S}(y_0,\rho,\gamma), \tag{A4}$$

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 $d(y,c)$ of the debt issued at time $t=0$. Since the issue is called at par if the firm's cash flows reach y_U before y_D, the current value of corporate debt satisfies at any time $t \geq 0$:

$$d(y,c) = \underbrace{b(y,c)}_{\text{Value of debt over one cycle}} + \underbrace{p_U(y)\ d(y_0,c)}_{\text{PV of cash flow at a restructuring}}. \tag{A5}$$

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

$$b(y,c) = \frac{(1-\tau^i)\,c}{r}\left[1 - p_U(y) - p_D(y)\right] + p_D(y)\left[1 - (\kappa + \eta(\alpha-\kappa))\right]\left(\frac{1-\tau}{r-\mu}\right) y_D. \tag{A6}$$

The first term on the right-hand side of (A6) 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 claim over all the financing cycles is given by $b(y_0,c)\,\mathbf{S}(y_0,\rho,\gamma)$, where $\mathbf{S}(y_0,\rho,\gamma)$ is defined in equation (A4). Because flotation costs are incurred each time the firm adjusts its capital structure, the total value of adjustment costs at time $t = 0$ is in turn given by $\lambda\, d\,(y_0, c)\; \mathbf{S}(y_0, \rho, \gamma)$. 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

$$\mathbf{V}\,(y_0, c) \;=\; \mathbf{S}(y_0, \rho, \gamma)\; \{\, n\,(y_0, c) \,+\, b\,(y_0, c) \,-\, \lambda\, d\,(y_0, c) \,-\, \phi\, n\,(y_0, c)\,\}\,. \tag{A7}$$

Denote the present value of the controlling shareholder's cash flows by $\mathbf{CS}(y, c)$. This value is the sum of the controlling shareholder's equity stake and the value of private benefits. The value of equity at the time of debt issuance is equal to total firm value, $\mathbf{V}(y, c)$, because debt is fairly priced. We can then express the total value of the controlling shareholder's claims as:

$$\mathbf{CS}(y, c) \;=\; \underbrace{\varphi\, \mathbf{V}(y, c)}_{\text{Equity stake}} \;+\; \underbrace{\phi\, \mathbf{N}(y, c)}_{\text{Cash diversion}} \tag{A8}$$

where φ represents the fraction of the firm's equity owned by the manager. The objective of the controlling shareholder is to maximize the ex-ante value of his claims by selecting the coupon payment c and the scaling factor $\rho = y_U / y_0$. Thus, the controlling shareholder solves

$$\sup_{c,\rho}\; \mathbf{CS}(y, c) \;=\; \sup_{c,\rho}\; \{\varphi\, \mathbf{V}(y, c) + \phi\, \mathbf{N}(y, c)\}\,. \tag{A9}$$

Since $\mathbf{N}(x, c)$ decreases with c, this equation implies that the efficient choice of debt differs from the controlling shareholder's choice of debt whenever $\phi > 0$. In particular, the model predicts that the debt level selected by the controlling shareholder is *lower* than the debt level that maximizes firm value.

In a rational expectations model, the solution to the problem (A9) reflects the fact that following the flotation of corporate debt, the controlling shareholder chooses a default trigger policy to maximize the value of his claim after debt has been issued. As in Leland (1998) or Strebulaev (2007), the default threshold results from a tradeoff between continuation value outside of default and the value of claims in default. Our model implies that all claims are scaled down by the same factor in default so that the controlling and minority shareholders agree on the firm's default policy. The value of equity at the time of default satisfies the value-matching condition:

$$\mathbf{V}(y, c) - d\,(y, c) = \eta\,(\alpha - \kappa)\,\gamma \mathbf{V}(y, c). \tag{A10}$$

The default threshold can then be determined by solving the smooth-pasting condition:

$$\left.\frac{\partial\,[\mathbf{V}(y, c) - d\,(y, c)]}{\partial y}\right|_{y=y_D} = \left.\frac{\partial \eta\,(\alpha - \kappa)\,\gamma \mathbf{V}(y, c)}{\partial y}\right|_{y=y_D}. \tag{A11}$$

Hugonnier, Malamud, and Morellec (2015) demonstrate that there exists a unique solution to this optimization problem, given the values of the parameters used to estimate our model. The full problem of the controlling shareholder thus consists of solving (A9) subject to (A11). A closed-form solution to this problem does not exist and thus standard numerical procedures are used.

B. Leverage distribution

Equation (5) 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 $\iota = \inf\{t \geq 0 : z_t \notin (z_D, z_U)\}$ the first time that the firm changes its capital structure or defaults and define

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

$\mathcal{I}(z; z_D, s)$ 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

$$\frac{1}{2}\sigma^2 z^2 \frac{\partial^2}{(\partial z)^2}\mathcal{I}(z; z_D, s) + \mu z \frac{\partial}{\partial z}\mathcal{I}(z; z_D, s) + 1_{\{z \leq s\}} = 0 \tag{A12}$$

on the interval (z_D, z_U) subject to the boundary condition $\mathcal{I}(z_D; z_D, s) = \mathcal{I}(z_U; z_D, s) = 0$. 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*

$$f_z(s) = \frac{\frac{\partial}{\partial s}\mathcal{I}(z; z_D, s)}{\mathcal{I}(z; z_D, z_U)}, \tag{A13}$$

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

$$\mathcal{I}(z; z_D, s) = \begin{cases} \frac{e^{\vartheta \ln(z/s)} - e^{\vartheta \ln(z/z_D)}}{2b^2} - \frac{p_B}{b\sigma}\ln\left(\frac{s}{z_D}\right) - \frac{p_U}{2b^2}\left[e^{\vartheta \ln(z_U/s)} - e^{\vartheta \ln(z_U/z_D)}\right], \; s \leq z, \\ \frac{1 - e^{\vartheta \ln(z/z_D)}}{2b^2} + \frac{1}{b\sigma}\ln\left(\frac{s}{z}\right) - \frac{p_B}{b\sigma}\ln\left(\frac{s}{z_D}\right) - \frac{p_U}{2b^2}\left[e^{\vartheta \ln(z_U/s)} - e^{\vartheta \ln(z_U/z_D)}\right], \; s > z, \end{cases} \tag{A14}$$

with $b = \frac{1}{\sigma}(\mu - \frac{\sigma^2}{2})$, $\vartheta = -2b/\sigma$, $p_B = (z^\vartheta - z_U^\vartheta)(z_D^\vartheta - z_U^\vartheta)^{-1}$, 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 (5). 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 $b = \frac{1}{\sigma}(\mu - \frac{\sigma^2}{2})$ 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

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

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

$$F_z(z|z_0) = \mathbb{P}(W_t \leq \frac{1}{\sigma}\ln(z)|W_0 = w). \tag{A15}$$

We are interested in computing the conditional density function

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

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:

$$\mathcal{J}(w, x, \rho) = \int_0^\infty e^{-\rho t} g(w, x, t)dt. \tag{A16}$$

The last step will then involve the inversion of the Laplace transform (A16) 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

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

Since W is instantly set back at T when it reaches either of the restructuring barriers L or H, we must have $\mathcal{G}(H,x,\rho) = \mathcal{G}(L,x,\rho) = \mathcal{G}(T,x,\rho)$ 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 $\mathcal{G}(w,x,\rho)$ satisfies

$$\mathcal{G}(w,x,\rho) = \Psi(w,x,\rho) + \mathcal{G}(T,x,\rho)\Phi(w,\rho), \tag{A17}$$

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

$$\frac{\partial}{\partial x}\mathcal{G}(w,x,\rho) = \mathcal{J}(w,x,\rho), \tag{A18}$$

to get the following result:

Proposition 2 *The function $\mathcal{J}(w,x,\rho)$ satisfies*

$$\mathcal{J}(w,x,\rho) = \Theta(w,x,\rho) + \frac{\Phi(w,\rho)}{1-\Phi(T,\rho)}\Theta(T,x,\rho), \tag{A19}$$

where

$$\Theta(w,x,\rho) = \begin{cases} \left(\frac{A_H(x,\rho)\Delta_H''(x,\rho) - A_L(x,\rho)\Delta_L''(x,\rho) - \Lambda''(x,\rho)}{\Delta_H(x,\rho)\Delta_L'(x,\rho) - \Delta_L(x,\rho)\Delta_H'(x,\rho)}\right)\Delta_H(x,\rho)\Delta_L(w,\rho), & \text{if } w \in [L,x], \\ \left(\frac{A_H(x,\rho)\Delta_H''(x,\rho) - A_L(x,\rho)\Delta_L''(x,\rho) - \Lambda''(x,\rho)}{\Delta_H(x,\rho)\Delta_L'(x,\rho) - \Delta_L(x,\rho)\Delta_H'(x,\rho)}\right)\Delta_L(x,\rho)\Delta_H(w,\rho), & \text{if } w \in [x,H], \end{cases} \tag{A20}$$

and

$$\Phi(w,\rho) = \frac{e^{(b+\upsilon(\rho))L}}{e^{2\upsilon(\rho)L} - e^{2\upsilon(\rho)H}}\Delta_H(w,\rho) - \frac{e^{(b+\upsilon(\rho))H}}{e^{2\upsilon(\rho)L} - e^{2\upsilon(\rho)H}}\Delta_L(w,\rho), \tag{A21}$$

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

Table 1
Model identification

The table presents sensitivities of data moments with respect to the model parameters. We obtain the model-implied moments and sensitivities by Monte-Carlo simulation. The baseline parameter values are $(\phi, \eta) = (0, 0)$. The column titled 'Baseline value' reports the model moment at the baseline parameter values, and the columns titled 'Sensitivity' report $(\partial m/\partial \theta)/m$ for each of the structural parameters.

		Sensitivity	
Data moment	Baseline value	CADV ϕ	SADV η
Leverage:			
Mean	0.53	-11.42	-0.39
S.D.	0.19	4.54	-0.34
Range	0.74	8.47	-0.23
Autocorrelation 1yr	0.75	6.66	-0.02
Changes in leverage:			
Mean	0.00	-23.95	-0.03
S.D.	0.06	-7.88	-0.34
Range	0.66	11.91	-0.31
Autocorrelation 1yr	-0.03	-3.32	0.26
Event frequencies:			
Pr(Default)	0.32	-35.03	0.14
Pr(Issuance)	2.62	-26.60	0.15
Issue size (%)	0.13	12.11	-0.59

Table 2
Parameter estimates

The table reports the parameter estimates by country. Panel A reports the model parameters that are directly estimated. The risk free rate r and the tax rates τ^c, τ^i,τ^e, and the tax advantage of debt $\tau^* \equiv (1-\tau^i) - (1-\tau^c)(1-\tau^d)$ are country specific. The rest of the parameters are firm specific. For these parameters, the table reports the country means. With these estimates as inputs, we apply the SML procedure discussed in Section 1.4. 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 $\theta = (\alpha_\phi, \alpha_\eta, \sigma_\phi, \sigma_\eta, \sigma_{\phi\eta})$. Panel B 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 A: Model parameters

Country	Firms	r	τ^c	τ^i	τ^e	τ^*	μ_P	σ	β	φ	α
AUT	61	0.031	0.298	0.429	0.250	0.045	0.015	0.308	0.373	0.292	0.495
CHE	178	0.016	0.235	0.376	0.360	0.134	0.083	0.283	0.607	0.281	0.489
DEU	595	0.030	0.407	0.482	0.272	0.086	0.089	0.389	0.407	0.314	0.525
DNK	107	0.033	0.289	0.536	0.423	0.053	0.085	0.316	0.464	0.329	0.492
ESP	102	0.035	0.335	0.452	0.246	0.047	-0.099	0.271	0.403	0.343	0.540
FRA	588	0.031	0.364	0.378	0.369	0.221	-0.011	0.348	0.510	0.380	0.531
GBR	1459	0.041	0.295	0.417	0.270	0.069	0.137	0.398	0.618	0.287	0.509
IRL	42	0.041	0.179	0.430	0.410	0.086	0.135	0.353	0.532	0.196	0.494
ITL	204	0.037	0.341	0.423	0.150	0.018	-0.145	0.281	0.387	0.384	0.550
JPN	3274	0.005	0.411	0.468	0.212	0.069	0.035	0.330	0.447	0.362	0.468
NLD	138	0.030	0.311	0.521	0.341	0.026	0.039	0.323	0.490	0.305	0.500
POL	236	0.057	0.249	0.280	0.181	0.105	0.171	0.460	0.594	0.533	0.481
PRT	37	0.045	0.310	0.374	0.218	0.087	-0.132	0.256	0.272	0.545	0.596
USA	5631	0.033	0.393	0.426	0.310	0.155	0.152	0.473	0.731	0.101	0.522

Panel B: Parameter estimates for agency conflicts

Country	α_ϕ (SE)	α_η (SE)	σ_ϕ (SE)	σ_η (SE)	$\sigma_{\phi\eta}$ (SE)	$\ln \mathcal{L}$
AUT	-4.639 (0.011)	-0.361 (0.069)	1.138 (0.004)	1.050 (0.047)	-0.135 (0.085)	-2,745
CHE	-4.352 (0.022)	0.001 (0.006)	1.665 (0.031)	1.330 (0.050)	-0.018 (0.070)	-14,991
DEU	-4.700 (0.038)	-0.278 (0.031)	1.760 (0.017)	1.213 (0.059)	-0.053 (0.031)	-48,656
DNK	-3.978 (0.021)	-0.067 (0.233)	1.421 (0.020)	1.164 (0.239)	1.041 (0.080)	-5,323
ESP	-4.807 (0.010)	-0.164 (0.007)	1.845 (0.002)	1.111 (0.005)	-0.346 (0.003)	-6,780
FRA	-3.617 (0.046)	0.014 (0.010)	1.424 (0.012)	1.242 (0.054)	-0.077 (0.058)	-57,712
GBR	-4.078 (0.019)	-0.081 (0.033)	1.261 (0.003)	1.151 (0.095)	-0.151 (0.116)	-146,203
IRL	-4.270 (0.042)	-0.180 (0.106)	2.320 (0.047)	1.051 (0.148)	-0.166 (0.202)	-4,037
ITA	-3.592 (0.019)	-0.164 (0.004)	2.585 (0.013)	1.029 (0.003)	0.166 (0.027)	-16,507
JPN	-3.755 (0.104)	-0.007 (0.354)	1.422 (0.046)	1.150 (0.521)	0.404 (0.080)	-268,496
NLD	-4.303 (0.011)	-0.113 (0.046)	1.196 (0.017)	1.068 (0.031)	-0.022 (0.013)	-12,118
POL	-3.492 (0.116)	-0.118 (0.096)	1.368 (0.062)	1.088 (0.081)	-0.258 (0.115)	-8,975
PRT	-3.784 (0.074)	-2.316 (0.042)	1.276 (0.015)	1.043 (0.004)	-0.139 (0.006)	-1,211
USA	-3.496 (0.069)	-0.009 (0.013)	0.986 (0.007)	8.026 (1.883)	-0.395 (0.247)	-472,767

Table 3
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 distrbution of CADV (SADV). All variables are measured in fractions.

Panel A: Control advantage CADV					
Country	Mean	Std	5%	Median	95%
ALL	4.41	5.44	0.38	3.19	14.59
AUT	1.90	4.40	0.10	1.08	5.85
CHE	4.18	5.87	0.17	2.32	15.29
DEU	2.88	3.97	0.11	1.94	10.61
DNK	4.74	8.46	0.10	1.43	21.23
ESP	4.83	8.67	0.12	1.49	19.93
FRA	7.13	7.16	0.51	5.09	21.38
GBR	3.73	4.48	0.42	2.74	12.66
IRL	6.82	10.17	0.04	2.54	30.52
ITL	5.56	11.80	0.03	1.12	18.32
JPN	4.94	6.91	0.35	2.70	19.95
NLD	1.99	3.95	0.12	0.91	5.52
POL	6.28	5.73	0.70	5.46	18.93
PRT	6.71	11.36	0.42	3.54	17.66
USA	4.09	3.50	0.70	3.87	10.24
Panel B: Shareholder advantage SADV					
Country	Mean	Std	5%	Median	95%
ALL	41.95	24.15	0.93	45.25	88.69
AUT	42.35	16.98	16.15	38.81	77.71
CHE	50.37	20.91	20.73	48.93	90.63
DEU	44.22	17.83	14.06	43.62	80.66
DNK	42.29	22.86	11.75	39.90	87.11
ESP	41.99	21.29	6.06	44.00	75.96
FRA	50.93	19.11	19.24	49.71	85.00
GBR	44.78	15.30	17.14	46.46	71.49
IRL	43.78	18.22	10.76	44.58	76.94
ITL	38.62	20.36	6.49	42.57	68.70
JPN	45.28	16.75	19.72	45.12	77.86
NLD	45.82	16.54	19.23	46.43	81.98
POL	49.30	16.54	24.45	46.89	84.94
PRT	13.33	12.45	1.02	10.44	34.54
USA	37.72	29.98	0.30	44.13	96.83

Table 4
Agency cost decomposition and counterfactual corporate policies

The table quantifies in Panel A 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. Panel B 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 ($\phi = 0$).

Panel A: Agency costs

				Counterfactuals	
Country	Agency costs (%)	Transfers due to rents (%)	Financial distortions (%)	No APR deviation (%)	No benefits of control (%)
ALL	5.28	2.86	2.42	4.27	1.36
AUT	3.71	1.47	2.24	2.79	1.22
CHE	5.80	2.83	2.97	3.40	2.83
DEU	4.31	2.10	2.21	2.93	2.00
DNK	6.36	3.93	2.43	5.25	2.29
ESP	5.63	3.88	1.75	4.79	1.08
FRA	8.47	6.26	2.21	6.71	2.03
GBR	4.61	2.07	2.54	3.11	2.08
IRL	7.82	5.66	2.16	6.81	1.97
ITL	6.24	4.82	1.42	5.20	1.32
JPN	5.17	3.28	1.89	4.36	1.14
NLD	4.35	1.49	2.86	3.49	1.29
POL	8.33	5.50	2.83	7.06	2.62
PRT	6.90	5.13	1.77	6.31	0.94
USA	5.10	2.05	3.05	4.25	1.05

Panel B: Agency effect on corporate policies

		Counterfactuals		
Data moment	Agency	No agency	No APR deviation	No benefits of control
Leverage (%)	28.23	40.20	33.69	34.47
Pr(Default) (%)	1.67	2.66	1.71	2.97
Credit Spread (%)	2.67	4.44	2.85	3.72
Pr(Issuance) (%)	5.63	9.06	5.59	10.73
Issue size (%)	29.69	26.90	35.58	24.29
SOA	0.12	0.19	0.12	0.15
Autocorrelation 1yr	0.76	0.59	0.77	0.57

Table 5
Determinants of agency conflicts

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 individual	Ownership of the 1 (5) largest individual shareholders, measured as a fraction of market capitalization.
Ownership institutions	Ownership of the 1 (5) largest institutional shareholders, measured as a fraction of market capitalization.
Ownership mutual funds	Ownership of the 1 (5) largest 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.

Continued

Table 5
Determinants of agency conflicts—*Continued*

Variable	Description
Statutory governance provisions (Source: La Porta et al., 1998; Djankov et al., 2006, 2008)	
Creditor rights index	Index aggregating creditor rights, following La Porta et al. (1998). A score of one is assigned when each of the following rights of secured lenders is defined in laws and regulations: First, there are restrictions, such as creditor consent or minimum dividends, for a debtor to file for reorganization. Second, secured creditors are able to seize their collateral after the reorganization petition is approved, i.e. there is no "automatic stay" or "asset freeze." Third, secured creditors are paid first out of the proceeds of liquidating a bankrupt firm, as opposed to other creditors such as government or workers. Finally, if management does not retain administration of its property pending the resolution of the reorganization. The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights).
Anti-director rights index	Index aggregating the shareholder rights which we labeled as "anti-director rights." The index is formed by adding 1 when: (1) the country allows shareholders to mail their proxy vote to the firm; (2) shareholders are not required to deposit their shares prior to the General Shareholders' Meeting; (3) cumulative voting or proportional representation of minorities in the board of directors is allowed; (4) an oppressed minorities mechanism is in place; (5) the minimum percentage of share capital that entitles a shareholder to call for an Extraordinary Shareholders' Meeting is less than or equal to 10 percent (the sample median); or (6) shareholders have preemptive rights that can only be waived by a shareholders' vote. The index ranges from 0 to 6.
Anti-self-dealing index	Index aggregating provisions designed to curb self-dealing by executives and controlling shareholders. The index is constructed by averaging the indexes of ex-ante and ex-post private control of self-dealing. Source: Djankov et al., 2008, "The Law and Economics of Self-Dealing."

Table 6
Legal environment and control advantage

The table reports the determinants of private benefits of control. Estimates are obtained from cross-sectional regressions. CADV is expressed in percent. All specifications include industry fixed effects. Standard errors are robust to heteroskedasticity and clustered at the country level. The number of observations is 12,652. Significance levels are indicated by * (10%), ** (5%), *** (1%).

Determinant	(1)	(2)	(3)	(4)	(5)	(6)	(7)
French civil law	2.10**	2.25**	1.61				3.10**
	(0.82)	(0.81)	(0.96)				(1.20)
German civil law	0.93	0.88	-0.14				3.28**
	(0.53)	(0.89)	(0.75)				(1.31)
Scandinavian civil law	1.23***	1.36***	0.77				4.45***
	(0.14)	(0.24)	(0.44)				(1.07)
Creditor rights index				-0.80***			-1.18***
				(0.12)			(0.11)
Anti-director rights index					-0.51**		-0.16
					(0.23)		(0.29)
Anti-self-dealing index						-1.75	7.56**
						(1.79)	(2.60)
M/B		0.29**	0.37**	0.32*	0.36**	0.39**	0.33**
		(0.11)	(0.16)	(0.15)	(0.17)	(0.17)	(0.14)
Cash		5.36**	4.62***	4.08***	4.25***	3.97***	3.84***
		(1.76)	(1.25)	(1.01)	(1.09)	(0.97)	(1.03)
Size		0.00	0.00	-0.07***	-0.01	-0.08	-0.18***
		(0.12)	(0.09)	(0.02)	(0.05)	(0.06)	(0.04)
ROA		1.39	1.20	1.73*	1.48	1.53	1.97*
		(1.24)	(0.90)	(0.96)	(1.00)	(0.96)	(0.92)
Tangibility		-2.28**	-2.29**	-2.52**	-2.58**	-2.54**	-2.46**
		(0.85)	(0.88)	(0.83)	(0.94)	(0.95)	(0.92)
Ownership individuals			4.27**	5.56***	5.13***	4.64***	4.56**
			(1.76)	(1.24)	(1.34)	(1.42)	(1.81)
Ownership institutions			1.75	-0.60	0.38	1.40	0.28
			(1.20)	(0.91)	(1.05)	(0.98)	(0.49)
Ownership mutual funds			-4.03*	1.92	-1.12	-1.94	1.88
			(2.07)	(2.49)	(2.23)	(2.15)	(2.32)
R^2	0.070	0.094	0.113	0.123	0.111	0.110	0.129

Table 7
Legal environment and shareholder advantage

The table reports the determinants of shareholders' renegotiation power. Estimates are obtained from cross-sectional regressions. SADV is expressed in percent. All specifications include industry fixed effects. Standard errors are robust to heteroskedasticity and clustered at the country level. The number of observations is 12,652. Significance levels are indicated by * (10%), ** (5%), *** (1%).

Determinant	(1)	(2)	(3)	(4)	(5)	(6)	(7)
French civil law	7.66**	9.02**	6.87				11.46**
	(3.36)	(3.47)	(4.00)				(5.15)
German civil law	7.92***	10.36***	8.41**				12.26*
	(2.01)	(2.68)	(3.66)				(6.29)
Scandinavian civil law	4.34**	5.69**	4.23				8.34
	(1.99)	(2.07)	(2.87)				(5.53)
Creditor rights index				0.13			-1.25**
				(1.20)			(0.53)
Anti-director rights index					1.23		3.77*
					(1.26)		(1.94)
Anti-self-dealing index						-7.37	5.84
						(4.71)	(13.92)
M/B		1.96***	1.99***	1.81***	1.90***	1.86***	2.11***
		(0.57)	(0.40)	(0.40)	(0.36)	(0.35)	(0.34)
Cash		17.39***	15.34***	16.79***	15.60***	16.50***	13.64***
		(3.29)	(3.11)	(3.50)	(3.16)	(3.50)	(2.65)
Size		-0.47	-0.57*	0.13	0.00	-0.05	-1.01***
		(0.29)	(0.30)	(0.15)	(0.12)	(0.15)	(0.23)
ROA		4.78	2.55	1.98	2.16	1.89	3.25
		(4.57)	(4.00)	(4.88)	(4.60)	(4.29)	(4.00)
Tangibility		-5.80*	-5.42*	-5.92*	-5.50	-5.40*	-5.29
		(2.85)	(3.00)	(3.02)	(3.16)	(2.85)	(3.26)
Ownership individuals			12.40***	15.71***	15.33***	16.43***	7.30***
			(2.03)	(3.15)	(3.05)	(3.47)	(1.55)
Ownership institutions			0.29	-6.75	-5.28	-5.91	6.18
			(6.42)	(7.93)	(6.61)	(5.77)	(3.93)
Ownership mutual funds			20.09**	22.44*	21.68**	23.89***	15.22*
			(8.13)	(11.30)	(7.80)	(5.59)	(7.57)
R^2	0.083	0.103	0.112	0.104	0.105	0.106	0.118

Table 8
Law enforcement and the cross section of control advantage

The table reports the determinants of control benefits for different moments of the cross-sectional distribution of CADV. Estimates are obtained from cross-sectional quantile regressions. The control variables are M/B, cash, size, ROA, tangibility, and ownership share by individuals, institutions and, respectively, mutual funds. All specifications include industry fixed effects. Standard errors are robust to heteroskedasticity and clustered at the country level. The number of observations is 12,652. Significance levels are indicated by * (10%), ** (5%), *** (1%).

	Distribution of control advantage at x% quantile				
Determinant	x =5%	x =25%	x =50%	x =75%	x =95%
French civil law	-0.02	-0.00	0.26	2.53***	9.52***
	(0.09)	(0.21)	(0.28)	(0.77)	(2.69)
German civil law	0.53***	0.59***	0.88***	2.73***	8.22***
	(0.11)	(0.22)	(0.29)	(0.77)	(2.59)
Scandinavian civil law	0.31**	0.41*	0.74**	2.83***	13.69***
	(0.16)	(0.24)	(0.32)	(1.01)	(4.96)
Creditor rights index	-0.28***	-0.62***	-1.03***	-1.30***	-2.28***
	(0.01)	(0.02)	(0.03)	(0.08)	(0.34)
Anti-director rights index	-0.02	0.20***	0.43***	0.17	-0.44
	(0.04)	(0.05)	(0.10)	(0.31)	(0.97)
Anti-self-dealing index	1.58***	1.68***	2.01***	5.82***	15.16**
	(0.28)	(0.48)	(0.66)	(1.88)	(5.93)
M/B	0.04	0.15***	0.17***	0.37***	0.59***
	(0.03)	(0.02)	(0.03)	(0.06)	(0.22)
Cash	1.72***	2.34***	1.83***	2.93***	9.94***
	(0.26)	(0.20)	(0.19)	(0.41)	(2.50)
Size	-0.07***	-0.14***	-0.21***	-0.27***	-0.40***
	(0.01)	(0.01)	(0.01)	(0.03)	(0.11)
ROA	-0.26	-0.18	0.58***	1.32***	4.70***
	(0.19)	(0.18)	(0.22)	(0.32)	(1.20)
Tangibility	-0.14*	-0.77***	-1.48***	-1.66***	-2.83***
	(0.07)	(0.13)	(0.16)	(0.28)	(0.80)
Ownership individuals	1.04***	1.92***	1.96***	3.30***	14.70***
	(0.13)	(0.14)	(0.12)	(0.33)	(2.07)
Ownership institutions	0.85***	0.70***	0.08	0.28	0.72
	(0.14)	(0.18)	(0.21)	(0.34)	(0.85)
Ownership mutual funds	0.57	0.73**	1.62***	1.06	1.45
	(0.43)	(0.37)	(0.54)	(0.89)	(2.97)
R^2	0.086	0.114	0.114	0.082	0.243

Table 9
Law enforcement and the cross section of shareholder advantage

The table reports the determinants of shareholders' renegotiation power for different moments of the cross-sectional distribution of SADV. Estimates are obtained from cross-sectional quantile regressions. The control variables are M/B, cash, size, ROA, tangibility, and ownership share by individuals, institutions and, respectively, mutual funds. All specifications include industry fixed effects. Standard errors are robust to heteroskedasticity and clustered at the country level. The number of observations is 12,652. Significance levels are indicated by * (10%), ** (5%), *** (1%).

	Distribution of shareholder advantage at x% quantile				
Determinant	x =5%	x =25%	x =50%	x =75%	x =95%
French civil law	20.57***	30.13***	11.35***	1.32	-19.78***
	(2.81)	(3.56)	(2.20)	(1.86)	(3.71)
German civil law	23.30***	28.03***	11.88***	-0.40	-17.74***
	(4.35)	(3.78)	(2.57)	(2.71)	(4.03)
Scandinavian civil law	16.66***	15.28***	6.49**	0.49	-11.30*
	(4.43)	(3.35)	(3.31)	(5.66)	(6.82)
Creditor rights index	0.75	1.55***	-1.70***	-2.21***	-3.61***
	(0.57)	(0.38)	(0.33)	(0.36)	(0.87)
Anti-director rights index	4.14***	5.52***	2.03**	2.35***	-0.38
	(1.23)	(1.21)	(0.91)	(0.75)	(1.72)
Anti-self-dealing index	24.69**	22.52***	15.08**	-5.18	-30.92***
	(10.96)	(8.37)	(6.14)	(5.62)	(9.86)
M/B	-0.11	0.97**	1.38***	2.71***	2.40***
	(0.15)	(0.41)	(0.22)	(0.36)	(0.48)
Cash	2.37	16.74***	9.48***	7.52***	14.25***
	(1.72)	(2.66)	(1.33)	(2.20)	(3.41)
Size	-0.62***	-1.38***	-0.86***	-0.39**	0.08
	(0.15)	(0.13)	(0.11)	(0.16)	(0.26)
ROA	4.04***	7.20**	1.43	1.90	4.53*
	(1.29)	(3.35)	(1.04)	(1.34)	(2.42)
Tangibility	-1.60	-7.32***	-6.12***	-4.55***	-1.35
	(1.25)	(1.99)	(1.55)	(1.42)	(4.17)
Ownership individuals	2.27**	4.29***	3.22***	8.10***	17.05***
	(1.12)	(1.40)	(1.02)	(1.23)	(2.95)
Ownership institutions	3.08**	6.72***	3.08	1.92	4.65
	(1.36)	(1.91)	(2.37)	(1.64)	(4.01)
Ownership mutual funds	0.44	13.13***	10.84*	13.56***	14.41
	(4.20)	(4.82)	(5.73)	(4.10)	(10.68)
R^2	0.192	0.193	0.066	0.048	0.166

Table 10
Incentive alignment and international capital structure

The table reports the determinants of firm leverage (Panel A) and, respectively, country leverage (Panel B). All specifications at the firm level include industry fixed effects. Standard errors are robust to heteroskedasticity and clustered at the country level. The number of observations is 12,652. Significance levels are indicated by * (10%), ** (5%), *** (1%).

Panel A: Firm leverage			
Determinant	(1)	(2)	(3)
$\frac{\text{CADV}}{TtlOwn}$	-0.33**	-0.33**	-0.30**
	(0.12)	(0.13)	(0.11)
SADV	-0.37***	-0.37***	-0.37***
	(0.10)	(0.09)	(0.09)
SADV* $\frac{\text{CADV}}{TtlOwn}$	0.41***	0.41***	0.36***
	(0.13)	(0.13)	(0.09)
Direct ownership		-0.00	
		(0.04)	
Creditor rights index			-0.01
			(0.01)
Anti-director rights index			0.03**
			(0.01)
Anti-self-dealing index			-0.15***
			(0.02)
R^2	0.362	0.362	0.378

Panel B: Country leverage			
Determinant	(1)	(2)	(3)
$\frac{\text{CADV}}{TtlOwn}$	-7.14***	-6.73***	-7.91***
	(1.07)	(1.65)	(0.77)
SADV	-3.71***	-3.60***	-4.30***
	(0.47)	(0.73)	(0.56)
SADV* $\frac{\text{CADV}}{TtlOwn}$	16.04***	15.22***	17.59***
	(2.50)	(3.73)	(1.43)
Direct ownership		0.15	
		(0.18)	
Creditor rights index			-0.02
			(0.02)
Anti-director rights index			0.00
			(0.02)
Anti-self-dealing index			-0.04
			(0.08)
R^2	0.598	0.625	0.760

Table 11
Out-of-sample goodness-of-fit

The table reports the root-mean-square error, RMSE, and the normalized RMSE for all countries in our sample. The RMSE is based on the difference between the observed leverage, ℓ_t, and the predicted leverage $\mathbb{E}[\ell_t|\ell_{t-1};\widehat{\theta}]$. The normalized RMSE is the RMSE divided by the difference between maximum and minimum observed leverage.

Country	RMSE	Normalized RMSE
ALL	0.12	0.14
AUT	0.13	0.17
CHE	0.07	0.08
DEU	0.12	0.16
DNK	0.09	0.11
ESP	0.14	0.25
FRA	0.17	0.24
GBR	0.12	0.14
IRL	0.14	0.16
ITL	0.18	0.22
JPN	0.12	0.13
NLD	0.11	0.15
POL	0.23	0.34
PRT	0.15	0.23
USA	0.11	0.12

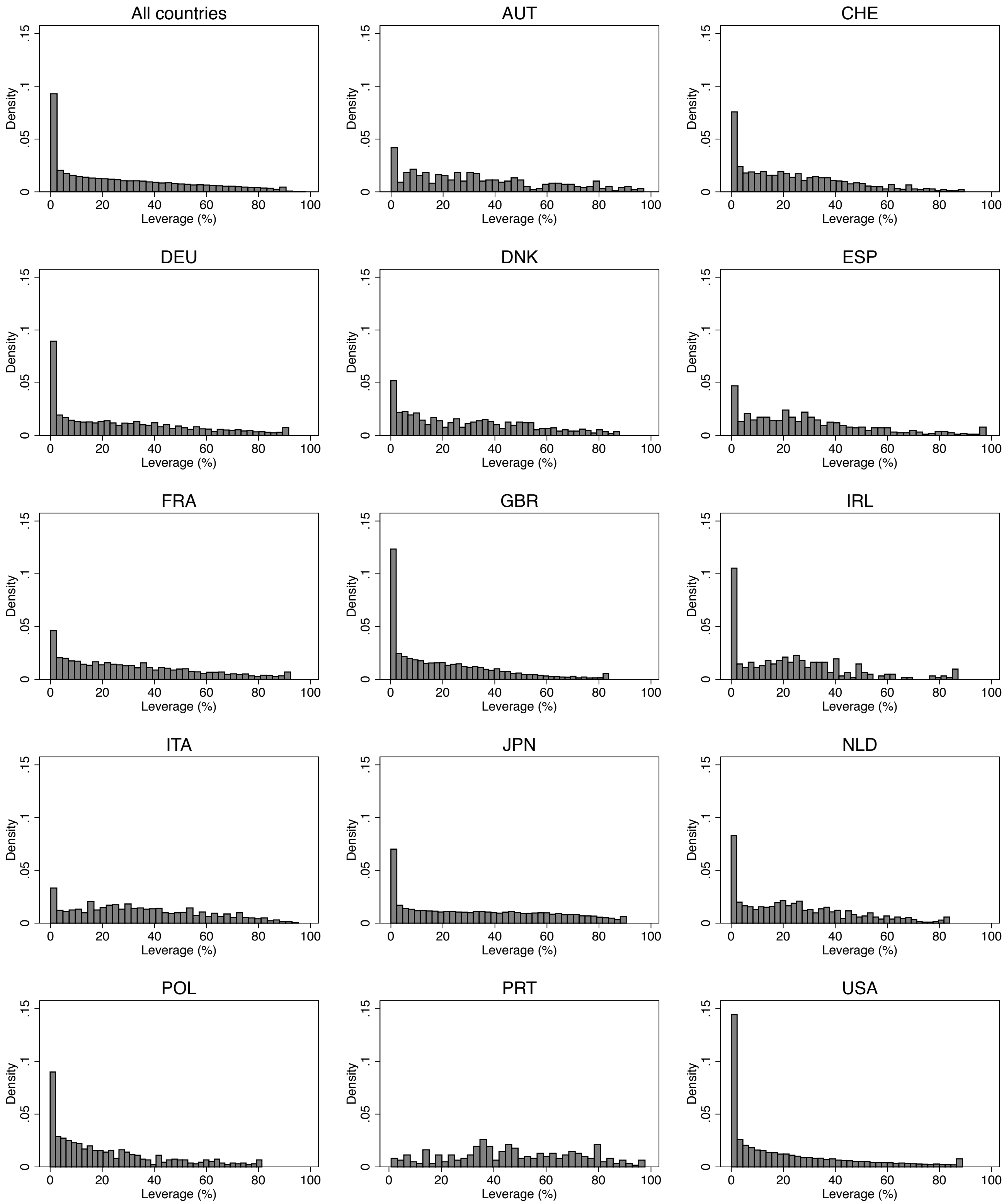
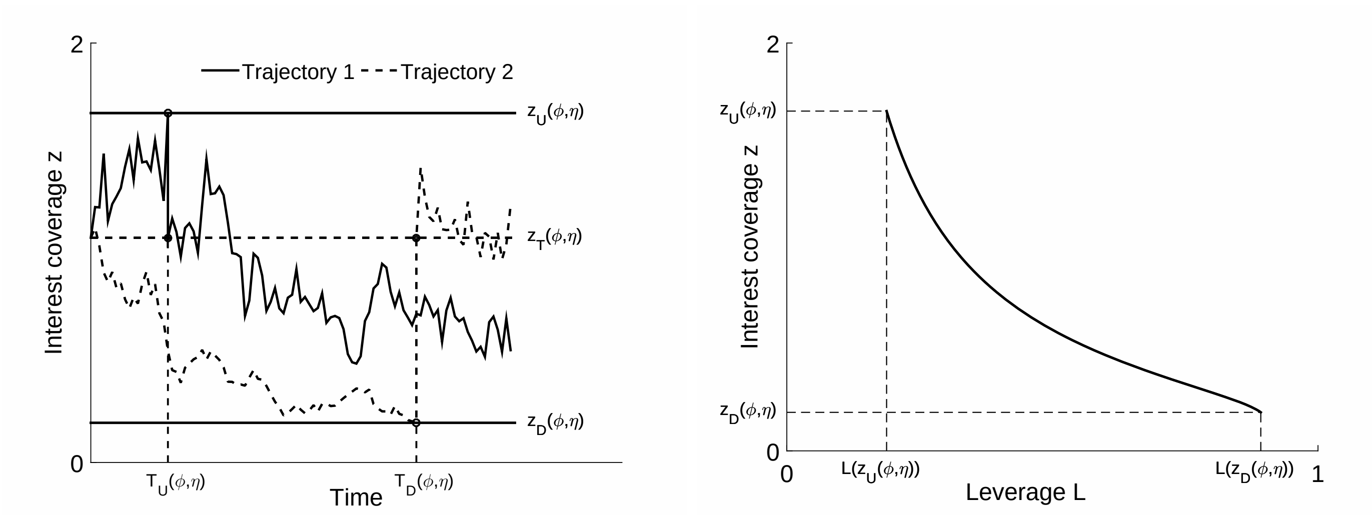


Figure 1
Evidence on international capital structure
The figure shows the within-country pooled distribution of financial leverage across all 12,652 firms between 1997 and 2011 (top left) and separately for each of the 14 countries in our sample.

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)

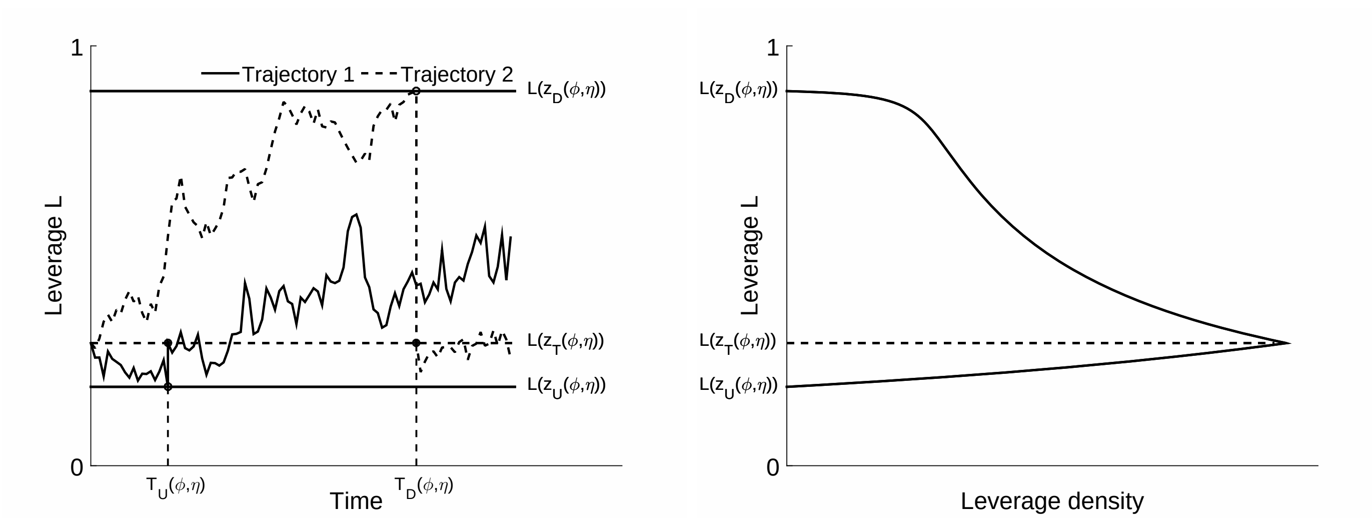
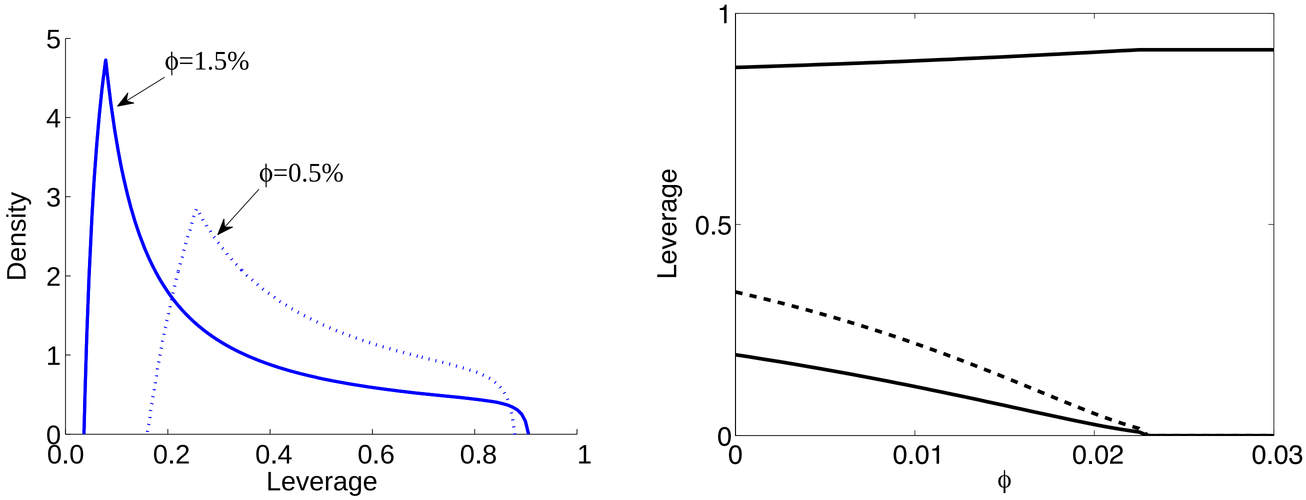


Figure 2
Leverage dynamics in the model

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: Impact of control benefit ϕ on leverage distribution



Panel B: Impact of bargaining power η on leverage distribution

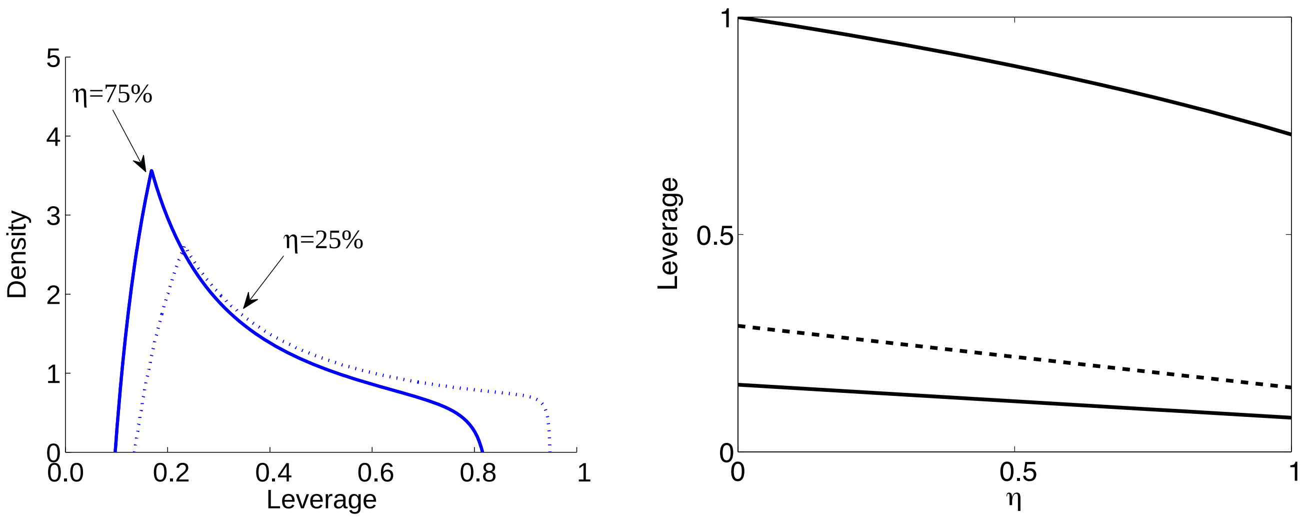
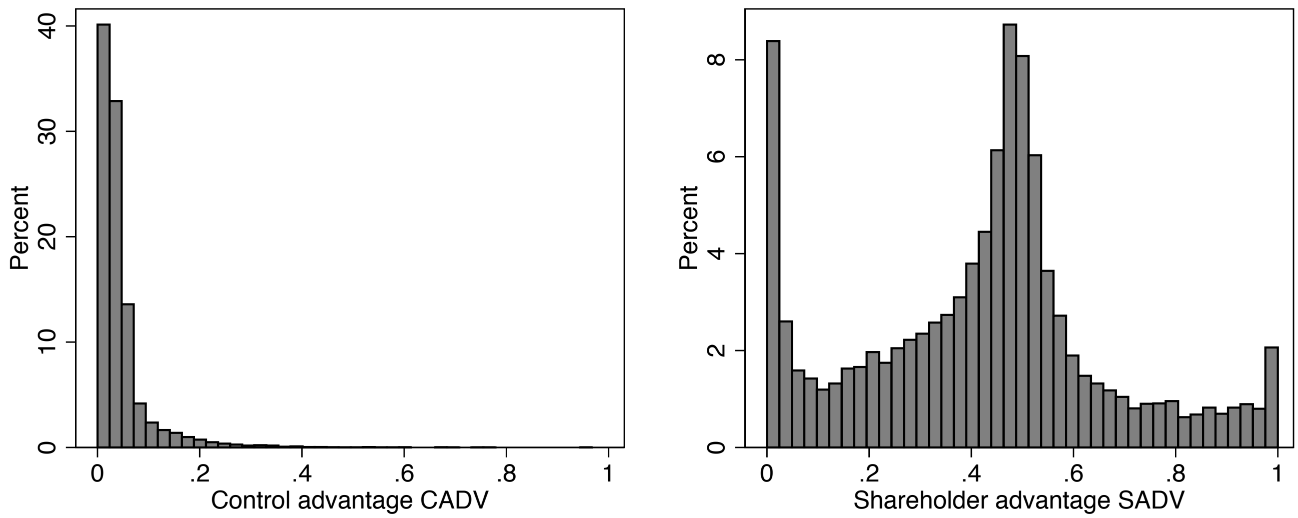


Figure 3

Leverage distribution over time and across firms

The figure shows comparative statics for the time-series distribution of financial leverage. We vary the degree of control benefits ϕ in Panel A and shareholder bargaining power η in Panel B around the baseline values $(\phi, \eta) = (.005, .25)$. The left plots depict the distribution function of leverage for different parameter values. The right plots depict the moments of the leverage distribution for different parameter values. The three lines depict the median (dashed line) and the low and high of leverage (solid lines).

Panel A: Distribution across firms in CADV (left) and SADV (right)



Panel B: Link between ownership concentration and CADV (left) and SADV (right)

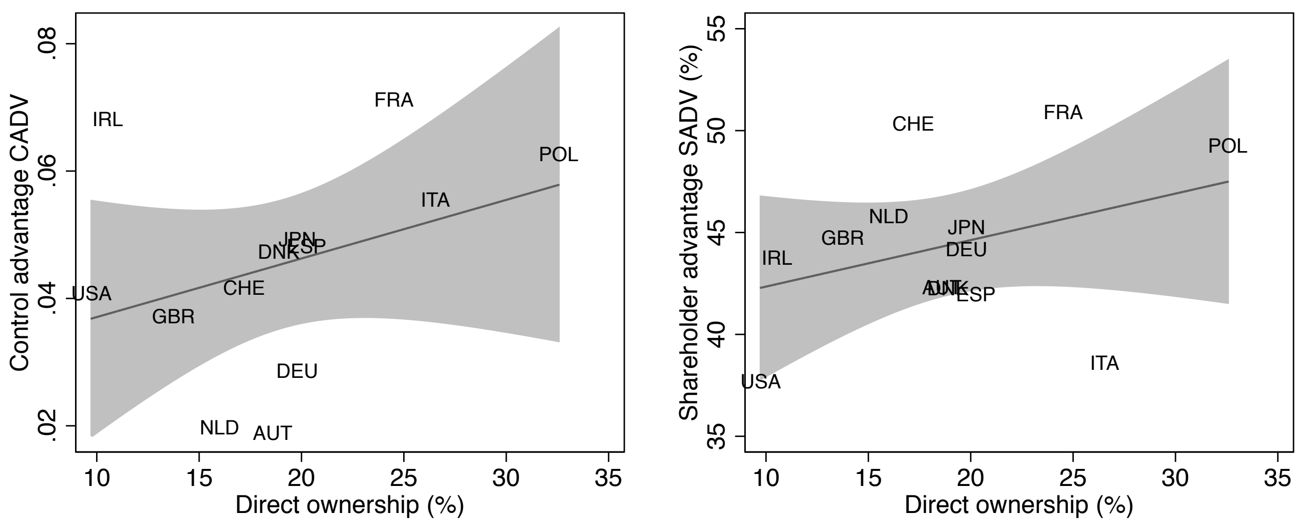
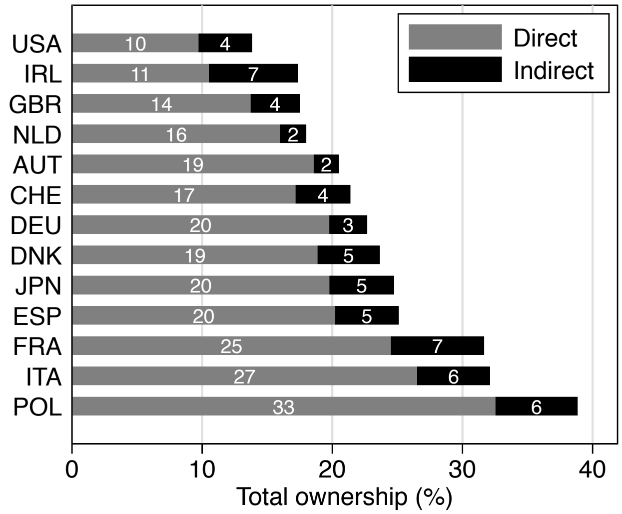


Figure 4

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: Compensation mix across countries



Panel B: Incentive alignment and country leverage

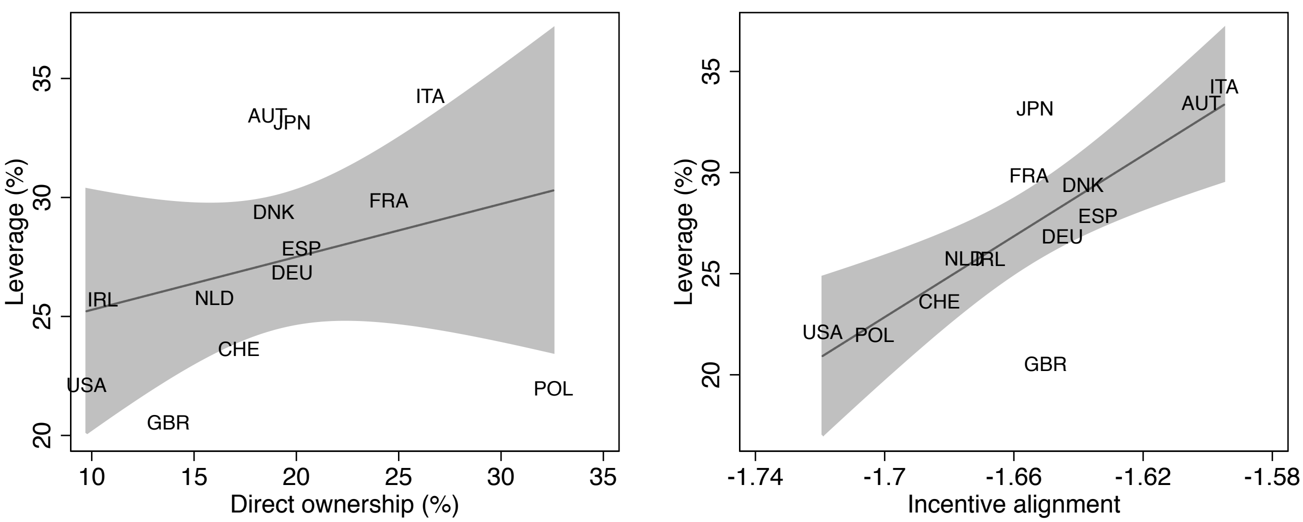


Figure 5

Compensation mix, incentive alignment, and international capital structure

The figure shows the relation between compensation mix, incentive alignment, and international capital structure. Panel A shows the compensation mix between direct and indirect ownership across countries. Indirect ownership is measured by the control benefits CADV. The left graph in Panel B plots the direct ownership share of the controlling shareholder against average country leverage for all countries in our sample. The line represents the linear prediction and the shaded area depicts the confidence interval obtained from the standard error of the linear prediction. The right graph in Panel B shows the relation between incentive alignment and average financial leverage across the countries in our sample. Incentive alignment is measured by the composite index (14).