Debt and private benefits appropriation by a controlling shareholder: Introducing a creditors' holdup effect

H. de La Bruslerie[1]

Abstract

Debt is analyzed in relation to the conflict between three parties, a controlling shareholder, outside investors and creditors. We follow Jensen and Meckling's (1976) and Myers' (1977) intuitions that debt can be a tool to transfer value to creditors while at the same time acting to discipline private benefits appropriation. A contingent claim valuation model is used to show that debt is *also* a key governance variable because it can moderate or enhance private benefits and because incentivization triggers a transfer of value to creditors. We show that debt is a complex regulation tool in an agency contract approach, as it is simultaneously an expropriation device and a limitation tool. Debt is a disciplinary tool for shareholders, but to avoid a holdup by creditors, we also need to discipline the disciplinary tool.

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[1] Professor of Finance, DRM Finance, University Paris Dauphine, Place du Maréchal de Lattre 75116 Paris, France; tel.: +(33) 1 44 05 43 27; e-mail: hlb@dauphine.fr.
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Abstract

Debt is analyzed in relation to the conflict between three parties, a controlling shareholder, outside investors and creditors. We follow Jensen and Meckling's (1976) and Myers' (1977) intuitions that debt can be a tool to transfer value to creditors while at the same time acting to discipline private benefits appropriation. A contingent claim valuation model is used to show that debt is *also* a key governance variable because it can moderate or enhance private benefits and because incentivization triggers a transfer of value to creditors. We show that debt is a complex regulation tool in an agency contract approach, as it is simultaneously an expropriation device and a limitation tool. Debt is a disciplinary tool for shareholders, but to avoid a holdup by creditors, we also need to discipline the disciplinary tool.

1. Introduction

Jensen and Meckling's (1976) seminal paper analyzes the relationship between entrepreneurs' ownership stake, non-financial revenues (perquisites, etc.), and debt. Among others, debt is an incentive tool for the managing shareholder. He can choose the asset volatility and divert wealth from the bondholders to the shareholders. However, debtholders are not naïve, and efficient markets will integrate it. Creditors can invest in monitoring, such as implementing debt provisions and limiting the riskiness of the projects. From the viewpoint of the controlling shareholder or the managers, debt may be seen as an expropriation device similar to control enhancement mechanisms. It helps to control more economic resources. This is well known, and it led Jensen and Meckling to develop a theory whereby outside equity holders will monitor the manager–owner who rules the firm. Debt in Jensen's

(1986) framework is considered a disciplinary tool. It is a limiting device to control free cash-flow misuse by managers or controlling shareholders similar to other control enhancement mechanisms.

Jensen and Meckling's initial focus is to look at ownership structure, not financial structure. The agency relationship between creditors and the managing shareholder is not in their scope. This does not mean that it does not exist but that they chose not to develop it. In a footnote, they mention that they do not consider the case to be symmetric to the one-way wealth transfer from creditors to shareholders, in which "bondholders (…) can force management to take actions which would transfer wealth from the equity holder to the bondholders (…). One can easily construct situations where such actions could make the bondholder better off, hurt the equity holders, and actually lower the total value of the firm". They do not consider such a possibility and recognize that this assumption "allows us to avoid the incentive effect associated with bondholders potentially exploiting stockholders" (footnote 49, page 339).

A large strand of the literature has focused on the capital structure decision integrating agency costs and problems. The basic framework is the agent and principal relationship between managers and shareholders considered as a whole group. As stated by Dewatripont and Tirole (1994) "capital structure is a disciplinary device for managers as well as an incentive scheme for outsiders" (page 1049). The latter are both shareholders and debt holders. Creditors are exposed to a specific financial distress and bankruptcy risk. Myers (1977) has identified the "debt overhang" problem where, in the context of investment, shareholders will not finance a valuable investment if such investment would result in a large increase in the value of existing debt. Shareholders would bear the full cost of investing but due to the transfer to debtholders, will get only part of the corresponding value creation. The point has been revisited since then and extended to "effort" as opposed to "under-investment" problems (He 2011). The idea is similar and relies on the fact that an increase in the value of existing debt acts as a tax and thus reduces incentives for shareholders to incur the cost of increasing firm value.

This avenue of research has been developed in the context of private benefits, i.e., the agency conflict between outside investors and a controlling shareholder. Private benefits have been recognized

in the managers / global shareholder context with private benefits seized by the agent without any investment in equity (Dewatripont and Tirole 1994; De Marzo and Sannikov 2006; DeMarzo and Fishman 2007; Lambrecht and Myers 2008). The main result is that private benefits or rents are endogenously determined and interfere with the capital structure.

In this situation, debt may help to extract private benefits, but it may also be a tool to limit and pressure the wealth appropriation by managers or the controlling shareholder. The purpose of this paper is to explore this intuition in a controlling shareholder's private benefits scheme with outside shareholders (La Porta et al. 1998, 1999, 2000) as well as in a managers' perquisite conflict with dispersed shareholders. The difference is that the controlling shareholder both extracts private benefits and largely invests in equity capital. The managers/global shareholders conflict appears as a special case of controlling/outsider shareholder by assuming a null investment in the firm's equity. In these two contexts, debt plays a similar role in the incentivization of the dominant shareholder/manager ruling the firm as it places more resources at the disposal of the controlling shareholders and facilitates tunneling activities (Claessens et al. 2002; Paligorova and Xu 2012; Buchuk et al. 2014; Qian and Yeung 2014). Debt may be seen as an expropriation device similar to control enhancement mechanisms. Referring to leverage leads the bankruptcy risk to be taken into account. This eventuality is implied in the debt contract and is integrated by the shareholders as the probability of distress will constrain both the equity value and private benefit appropriation. Debt may divert additional wealth both to and from the creditors and may condition private benefits appropriation from outside shareholders. It makes the regulation story more complex, as the game is between three parties rather than two (He 2011). As a result, debt is a sophisticated regulation tool in an agency contract approach, as it is both an expropriation device and a limitation tool. Debt is a disciplinary tool for shareholders, but to avoid a holdup, we also need to discipline the disciplinary tool. Here holdup describes the appropriation by the incumbent creditors of the additional value created by incentivized shareholders in a context of private benefits.

Ownership concentration and control can potentially have an impact on a firm's financing decisions, particularly its choices regarding leverage. Private benefits are an incentive ensuing from an implicit control contract between the controlling shareholder and the outside shareholders. Our

understanding of the relationship between dominant shareholder ownership and firm debt levels is addressed in recent corporate governance studies (Faccio et al. 2010; He 2011; Liu and Tian 2012) and is somewhat limited. Our motivation is different; we explore the two-way effect of debt as a disciplinary tool for controlling shareholders and as a tool to transfer wealth to creditors. Indebtedness curbs the controlling shareholders' private appropriation and at the same time the private benefit incentive initiates a holdup to creditors. We develop a simple theoretical relation between controlling shareholders, private benefits, and corporate debt levels. This paper highlights an asymmetric and self-regulated relationship between debt levels and controlling shareholders' private benefits. First, it is known that the controlling shareholder is incentivized to increase debt in order to dominate more of the firm's resources and to transfer some risk to creditors. On the other hand, more leverage induces a risk of default and weighs on the controlling shareholders' wealth. We introduce a third effect due to the endogenous incentivization of the controlling shareholder through a control contract between both categories of shareholders. Enhancing firm profitability will result in a transfer of value to creditors, whose debt value improves because of the lower default risk. This holdup to the creditor is an opportunity cost to any shareholder but is asymmetrically shared between outside and controlling shareholders. The capital structure decisions and private benefits choices depend on the trade-off between these three effects. Although the first and the second are well identified in the literature, the third is relatively new in a corporate governance framework as we explicitly introduce a difference between controlling and outside shareholders.

Similar to John and Kedia (2006), this paper outlines the two issues resulting from the concentration of power by a controlling group. The first is the existence of private benefits as an implicit compensation scheme of the controlling shareholder, and the second is the choice of a debt structure with senior standard debt and equity, as the latter belongs at the same time to the controlling shareholders and to outside investors. We show that the two questions are linked in a financial governance framework. We explicitly identify the creditors' holdup problem, which should be integrated into a three party equilibrium based on incentivization. Moreover, we introduce two contractual frameworks of benefits incentivizing a controlling shareholder, and we compare private direct expropriation with an additional sharing of public profit.

Our study contributes to the extant literature on the relationship between private benefits and capital structure in several ways. First, we develop a model using the option valuation framework. This justifies referring to a risk-neutral hypothesis, as in Liu and Miao (2006), DeMarzo and Fishman (2007), or Morellec et al. (2012). Second, we emphasize the role of debt leverage in agency conflicts because the controlling shareholders often find it easier to modify the leverage ratio than to modify their share of capital. However, our analysis also applies to situations involving dominant managers who are incentivized to appropriate benefits through an implicit contract with shareholders. We refer to the existence of an implicit control contract between the controller and outside shareholders, whose argument is the amount of private benefits seized by one party to reduce managerial costs and/or to enhance the value growth process. Outside shareholders will implicitly accept a trade-off because of the incentive characteristics of private benefits. In the context of dominant control, we show that the existence of a control contract is possible and that the debt-level decision is of the utmost importance for its design. We add to the literature on claim design by introducing expropriation of private benefits and by integrating the possibility of a debt value holdup by creditors. We explicate an asymmetric and disciplinary relationship between debt and private benefits. Aside from the standard Merton case, which uses the simple framework of zero coupon debt with a fixed nominal value and maturity, we follow Leland (1994), He (2011), Barsotti et al. (2012), Morellec et al. (2012), and Attaoui and Poncet (2013), who refer to a dynamic framework with a failure risk defined with regard to the continuous coupon payment of perpetual debt. Contrary to the previous literature, this allows us to consider private appropriation by the controlling shareholders as endogenous and not exogenous. Moreover, we distinguish between two possible designs for rewarding the controlling shareholder, implicit private benefits and the explicit profit sharing design.

As a result, we show that creditors will benefit from a holdup situation through the additional value drift resulting from incentivized controllers and managers. We determine a threshold debt leverage ratio *above* which debt is moderately disciplinary and relatively helpful for private appropriation. Contrary to He (2011), we show that an increase in indebtedness is a way to avoid the creditors' holdup problem. Low leverage below the threshold exposes shareholders to a transfer of value to creditors. Moreover, debt influences the solution of the controlling–outside shareholders'

conflict and applies enhanced disciplinary pressure to the controlling shareholder. A self-regulation mechanism is identified that constrains the appropriation of private benefits. This self-regulation mechanism will develop differently according to the two contractual frameworks of incentivizing benefits, i.e., direct private expropriation and additional sharing of public profit. We derive practical and testable implications. An empirical study on target firms after an acquisition in the US is proposed. It supports our findings, as the leverage ratios increase after an acquisition, particularly for the most profitable firms.

The remainder of this paper is organized as follows. Section 2 reviews the literature related to the topic. Section 3 presents the model and analyzes the effect of debt on the shareholders' wealth of the controlling shareholder. Section 4 identifies the specific role of debt in a corporate governance framework. An empirical analysis of the debt leverage structure of target firms after an acquisition is proposed in Section 5. The conclusion follows.

2. Review of the literature

The links between corporate governance and debt were first identified by Jensen and Meckling (1976). Capital structure is not solely explained by shareholders' value maximization. Debt is seen as a disciplinary tool that limits the free cash flow that can be used discretionarily by managers (Jensen, 1986). This first approach analyzes debt in the traditional agency conflict between managers and shareholders, in which the managers are willing to entrench (Claessens et al. 2002). Debt increases when the pressure of the controlling or majority shareholders develops. The conclusions are twofold. On the one hand, Harris and Raviv (1988) and Stulz (1988) suggest that debt is positively related to the managers' equity ownership. On the other hand, some empirical studies confirm that the managers' equity ownership negatively affects the firm debt level (Jensen, Solberg and Zorn 1992). Indeed, when managers hold a large stake in the firm's capital, they become less diversified, which may cause them to reduce debt levels to limit the default risk. These diverging results have shifted the focus toward the possibility of a nonlinear relationship between ownership structure and indebtedness. Mikkelson and

Partch (1989) find a negative relationship between inside ownership and leverage. Holderness et al. (1999) find no relationship and show that managerial stock ownership does not increase with the leverage ratio. Brailsford et al. (2002) propose an empirical test that highlights a nonlinear relation between the percentage of capital held by managers and the debt levels. Symmetrical to debt is cash holding. Excess cash holding is linked to managerial power and discretionary decisions of the controlling shareholder. It contributes less to firm value in a control situation with poor corporate governance (Belkhir et al. 2014).

Controlling ownership enlarges the above analyses, which mainly focus on agency conflicts with managers. Recent empirical studies on corporate governance show the prevalence of firms with a dominant shareholder (La Porta et al. 1997, 1998, 2002; Faccio et al. 2002, 2003). This situation is quite common in Europe. Even in the US, a large number of corporations are actually controlled by large shareholding groups (Holderness 2009; Albuquerque and Schroth 2010). Furthermore, the world's most common form of controlling ownership is family ownership. Since the dominant shareholder may extract private benefits of control at the expense of outside shareholders (La Porta et al. 1999), the fundamental agency problem turns out to be between controlling shareholders and outside shareholders (Bebchuk and Neeman 2010). This situation is identified in the literature through the idea of tunneling (Young et al. 2008). Private benefits are at the same time the symptom, the goal, and the regulating variable of an implicit contract between controlling shareholders and outside investors. Private benefits introduce a long-term perspective, and an implicit agency relationship develops over time. It is set in an implicit contract framework in which ownership is determined by the controlling shareholder, who takes into account the expected profit and characteristics of the firm (Gibbons 2002; At et al. 2006). The first consequence is that private appropriation of benefits appears as the cost associated with a concentration of power and control by the dominant shareholders. Barclay and Holderness (1989) and Dyck and Zingales (2004) provide evidence of private benefits when trades of blocks are set at a premium compared with the market price. The characteristics of private benefit appropriation are empirically studied by Leuz et al. (2002). In an international comparison, Bhattacharya et al. (2002) are also led to the conclusion of the existence of private benefits for controlling shareholders. The empirical relation between private benefits and leverage is analyzed in

relatively few papers (except Kang and Kim 2006; Faccio et al. 2010; Liu and Tian 2012; La Bruslerie 2016).

The role of debt in corporate governance depends on the structure of corporate ownership and control. Indeed, debt can play two contrasting roles in relation to financial governance. On the one hand, in the traditional manager–shareholder conflict, debt is seen as a disciplinary device that limits managerial opportunism in widely held corporations (Jensen and Meckling 1976; Jensen 1986). On the other hand, in firms dominated by controlling shareholders, debt is used to enhance the voting power of the controlling shareholders and to expropriate the outside shareholders further (Claessens et al. 2002; Paligorova and Xu 2012; Qian and Yeung 2014; Buchuk et al. 2014). The role of debt in the conflict between controlling and outside shareholders also involves third parties, such as banks or other creditors. Debt imposes limits on the behavior of controlling shareholders, and outside investors publicly know its amount. This external limitation interferes with the process of appropriating private earnings. The literature on the role of debt in the agency relationship between managers and shareholders has been well established since Myers (1977) and Dewatripont and Tirole (1994). Debt appears to be the "safest security" for outside investors because of the asymmetry of information enjoyed by creditors (Myers and Majluf 1984; Modigliani and Perotti 2000). From a theoretical point of view, a payment default transfers the control from the borrower to the lender (Grossman and Hart 1982; Aghion and Bolton 1992). The relationship between debt levels and control is seen as a positive device to protect the controller's situation (Harris and Raviv 1988) or to allow a "risk-shifting effect" (Zhang 1998). Debt enhances the economic power of the controlling shareholder without modifying the structure of ownership. Risky debt introduces specific bankruptcy costs to the creditors and increases the probability of default. On the other side, the "debt overhang" problem creates a specific cost to shareholders, and as such, it is internalized in the controlling shareholder's decisions (Blazy et al. 2013). In the context of a supposed situation of control linked to the presence of a family, Ellul et al. (2009) provide a comprehensive empirical study on leverage that shows the balancing forces between managing the control and the expropriation possibilities on the one side and the disciplinary effect introduced by the risk of bankruptcy on the other side. A similar result is also highlighted in European family firms by Croci et al. (2010). Considering US firms, Nielsen (2006) empirically

documents the existence of a trade-off between a tightly levered financial structure and low shareholding.

On theoretical grounds, Harris and Raviv (1990), Zhang (1998), and Almeida and Wolfenzon (2005) address the problem of debt level and controlling–outside shareholder conflict within the context of information asymmetry. The optimal claim design is analyzed in the agency contracting literature. For instance, Gale and Hellwig (1985) introduce implicit incentive contracts and outline the importance of debt contracts in solving problems concerning the asymmetry of information. Bolton and Scharfein (1990) analyze one-period risky cash flows that can partly be diverted by managers. Berglof and Von Thadden (1994) and Dewatripont and Tirole (1994) show the coexistence of multiple outside claims, which can be interpreted as debt and outside equity. Berglof and Von Thadden distinguish between two categories of debt holders with long-term lenders and short-term bank credit lines as part of an optimal contract. DeMarzo and Sannikov (2006) and DeMarzo and Fishman (2007) describe financial contracting in a setting of private benefits through cash flow appropriation. They also introduce two categories of debt, long-term debt and a line of credit. Similarly, in a continuous-time setting, Liu and Miao (2006) examine the controlling shareholder's optimal choice of capital structure. The interaction between debt and ownership structure is analyzed in a global governance framework by John and Khedia (2006) and Lambrecht and Myers (2008). In a recent paper, Burkart et al. (2014) analyze the private diversion of the future profit resulting from a takeover. They focus on the financing constraint as debt fills the gap between the takeover cost and the bidder's equity. As in At et al. (2006), an optimal compensation contract using private benefits is identified for the controlling shareholder. It is shown that the level of investor protection plays an important role in funding the acquisition, as private benefits are not pledgeable.

This problem is also analyzed theoretically through models derived from an option framework. Debt is first presented as a zero coupon bond (Merton 1974) with a fixed known maturity. This framework is equivalent to a one-period model. In Leland (1994) (or Uhrig-Hombourg 2005), debt is a perpetual constant coupon bond and default is endogenous. The definition of failure is different from that in Merton's scheme, in which the default is triggered at maturity by simply comparing the asset value of the firm with the nominal bond due at maturity. In the continuous set-up of permanent debt,

the cash flow generated by the assets should cover the coupon flow to be paid indefinitely to the debtholders. This analysis leads to the uncertain time of bankruptcy being determined endogenously. Morellec (2004), Lambrecht and Myers (2008), and He (2011) analyze leverage in a contingent claims framework when the managers are disciplined by outside equity holders. He (2011) refers to the Leland (1994) model. He shows that debt will introduce specific "debt overhang costs to the shareholders that will endogenously affect the managers/shareholder efforts. Morellec et al. (2012) develop a dynamic model in which the cash flow is partly appropriated by the managers. This modifies the failure risk of the firm and interferes with the capital structure decision. A trade-off is identified between the tax subsidy advantage of debt and the liquidation costs. An extension to the payout policy is proposed by Barsotti et al. (2012) and for junior-type debt by Attaoui and Poncet (2013). However, the question of private benefits in an optimal contracting set-up is not addressed by the latter.

3. Modeling debt and private benefits contracts

The model stands from the controlling shareholder's point of view. The goal is to determine whether debt modifies the equilibrium terms of his/her control contract with outside investors.

A. Valuation framework and design of the private benefits contract

We refer to the framework developed in a continuous setting by Leland (1994). Creditors, the controlling shareholder, and outside investors have claims on the firm's assets. At time $t = 0$ the drift ruling the asset's growth is inflated with value creation resulting from the incentive flow produced by the controller's action.[2] In a risk-neutral framework, the market is complete and the firm's assets are tradable and contractible. The firm uses debt and equity to finance them. However, the incentive contract resulting from the controlling shareholder's activity is implicit and is not a tradable asset. It

[2] This state variable is standardly based on the firm's asset dynamic. Ebit or cash-flow dynamics have been suggested by Goldstein et al. (2001). They privilege an Ebit dynamic as it is invariant to capital structure and to the way the Ebit "pie" is shared (p. 488). In our framework, we cannot assume that an Ebit state variable is exogenous as we want to model the incentivization effect of the payments between the different claimants.

results in a payment added to the asset value because of extra profitability drawn from the economic environment or resulting from cost savings. It can also be thought that the managers do not need to be monitored strictly, so the monitoring cost previously expended by the firm is saved and adds continuously to the asset's drift as a percentage, η. The firm value A follows the process as shown by formula (1a):

$$\frac{dA}{A} = (\mu + \eta)dt + \sigma dW \qquad (1a)$$

The previous formula differs from the literature, which usually refers to a negative cash outflow considered as a dividend payment to shareholders or a coupon payment to bondholders. The assumption of a possible positive cash inflow finds its source back in Merton (1974) or Black and Cox (1976).[3]

The controlling shareholder seizes part of this extra generated inflow at the source. We define γ as the percentage of the η inflow rate appropriated by the controlling shareholder. The controlling shareholder (or, equivalently, the managers) diverts part of the additional free cash flow that is generated. However, the variable γ is not exogenous, as supposed in Morellec et al.'s (2012) setting. It is part of the problem as the implicit regulation variable in the contract of control between the controlling shareholder and the outside shareholders. Our setting is designed with regard to a controlling shareholder who has the ultimate decision rights over the firm's economic asset and financial structure choices. However, the context is similar if, as in Morellec et al. (2012), we consider the case where managers divert private benefits and have decision rights over the firm's asset and capital structure. As a result, the process followed by the asset is inflated by a net $(\eta - \gamma\eta)$ cash inflow. This framework is symmetrically opposed to the cash outflows paid by the firm to security holders as dividends or interest payments in Leland's scheme. We suppose that this global inflow resulting from the incentivization of the controlling shareholder is continuously proportional to the

[3] For Merton (1974), a payout in the firm's drift equation can be either negative or positive (p.450). Black and Cox (1976) refer explicitly to "the net total payout made, or inflow received, by the firm", which is identified in the valuation equation with either a positive or a negative sign (see Equation 1, p.352).

asset value, ηA_t, and is only shared with him. In a risk-neutral set-up, the asset value follows a geometric Brownian motion. Its drift is $r + \eta - \eta\gamma$ (with *r* as a risk-free rate):[4]

$$\frac{dA}{A} = (r + \eta - \eta\gamma)dt + \sigma dW \quad (1b)$$

At inception, before setting an implicit contract of control that introduces appropriation, the firm comprises equity, *E*, and debt, *D*, belonging respectively to shareholders and lenders. Just before the setting at time 0, $A_0 = E_0 + D_0$. Once the contract is agreed upon, a positive continuous cash flow proportional to *A* adds to the asset drift. However, the controlling shareholders will divert some of the additional flow. These shareholders own a stake, α, in the equity. Globally considered from the lender's point of view, these benefits are appropriated within the shareholders' group between a controlling shareholder and the minor investors. We can refer equivalently to the scheme of managers ruling a dispersed-ownership firm and incentivized by seizing a share of the additional cash flow.[5] Apparently, the financial situation of the creditors may seem unchanged as they own a perpetual debt and receive a previously stated continuous coupon payment, *C*.

The nominal amount of debt was set at inception, and we do not need to refer to it to define bankruptcy as no reimbursement is scheduled. [6]We suppose, as in Leland (1994), that solvency is only linked to the possibility of financing a coupon payment with the issue of equity. It will stop if the equity value is below zero. At default, the firm cannot raise capital to pay its creditors. Bankruptcy does not define itself with regard to the nominal value of debt, D_0. This approach is different, as it does not yield a closed-form solution. Attaoui and Poncet (2013) links prior-to-maturity default with an interest payment lower than the net cash outflows drawn from the firm. We do not address the issue

[4] See Merton (1973), Equation 7, p.452, in a no arbitrage framework. As mentioned in Black and Cox (1976), the instantaneous return is the risk free rate, so the instantaneous mean of the price should be adapted for the cash in(out)flow stream (Equation 1, p. 352). Similar settings are made in Leland (1994), Barsotti et al. (2012), Equation 1, and Attaoui and Poncet (2013), Assumption 2.

[5] In our scheme, we rule out the possibility of a pure predatory controlling shareholder who expropriates cash flow without any value creation. Then, the additional drift becomes purely negative. This situation is detrimental to both outside investors and creditors. The latter will react by monitoring the controller. They will limit asset substitution, cash-flow diversion, or dividend payment by introducing provisions to constrain the controlling shareholder's behavior. This is the standard Jensen and Meckling disciplinary role of debt.

[6] We only know that the nominal value of debt at inception D_0 is linked to the perpetual nominal coupon flow C in the real world by a risk adjusted valuation rate r_0^{debt} such that $D_0 = C/r_0^{debt}$.

of the global capital structure with debt priority (e.g., Attaoui and Poncet 2013) but that of a mix with private benefits ranking before net equity.

In a risk-neutral framework, the value of a perpetual claim, F, continuously paying a coupon C, where the assets' drift is inflated by a proportional cash inflow $(1-\gamma)\eta$ according to (1), follows the differential equation (Leland 1994; p.1241):

$$\frac{1}{2}\sigma^2 A^2 F_{AA} + (r + (1-\gamma)\eta)AF_A - rF + C = 0 \quad (2)$$

The general solution submitted to bounding conditions is (Leland 1994, Eq. 33 to 35):

$$F = X_0 + X_1 A^{-y} + X_2 A^{-z} \quad (3)$$

with

$$z = \frac{\left\{(r + \eta - \eta\gamma - 0.5\sigma^2) + [(r + \eta - \eta\gamma - 0.5\sigma^2)^2 + 2\sigma^2 r]^{\frac{1}{2}}\right\}}{\sigma^2}$$

$$y = \frac{\left\{(r + \eta - \eta\gamma - 0.5\sigma^2) - [(r + \eta - \eta\gamma - 0.5\sigma^2)^2 + 2\sigma^2 r]^{\frac{1}{2}}\right\}}{\sigma^2}$$

Default occurs when the assets reach the minimum value A_b. At that time, the assets liquidate and the creditors suffer liquidation costs calculated as a percentage, *l*, of the remaining assets. The other binding condition for debt is that it converges to a perpetual cash flow valued at the risk-free rates when the assets converge to infinity. The debt *D* claim satisfies:

$$F = D \rightarrow (1-l)A_b \text{ for } A = A_b \quad (4)$$

$$F = D = \frac{C}{r} \text{ for } A \rightarrow \infty \quad (5)$$

with $\eta(1-\gamma) > 0$; as by definition $0 < \gamma < 1$, we obtain $z \geq 0$ and $z < \frac{2(r+\eta(1-\gamma))}{\sigma^2}$. Similarly, we find $y \leq 0$. As a result, we obtain $X_1 = 0$ in Equation (3) to satisfy Condition (4). Bounding Condition

(5) gives the value $X_0 = \frac{C}{r}$. At the limit value, $A = A_b$, the value of debt, *D*, satisfies Equation (4): $D(A_b) = (1 - l)A_b = \frac{C}{r} + X_2 A^{-z}$. We obtain X_2, and the debt value is:

$$D(A) = \frac{C}{r} + \left[(1 - l)A_b - \frac{C}{r}\right]\left(\frac{A}{A_b}\right)^{-z} \quad (6a)$$

Rearranging produces the well-known result that the debt value is a weighted average between a pure risk-free perpetuity and the current liquidation value of the firm when bankrupt. The weight is the present value of 1 dollar of liquidated assets in the event that a default has occurred. It is also termed as the risk-neutral probability that a default will occur.

$$D(A) = \frac{C}{r}\left(1 - \left(\frac{A}{A_b}\right)^{-z}\right) + [(1 - l)A_b]\left(\frac{A}{A_b}\right)^{-z} \quad (6b)$$

When valuing a firm, we need to account for tax deductibility gains. As interest is tax deductible, the present value of the tax savings will add to the equity and debt value. We define τ as the tax rate. The present value of tax shield $TS(A)$ in a continuous and risk-free setting is $\frac{\tau C}{r}$. When *A* is high, the tax shield value tends towards that value. For low values of *A* nearing the default threshold from above, the tax shield value is null. The tax shield claim is valued using Equation (3), but we need to adapt the bounding conditions:

$$TS = 0 \text{ for } A = A_b$$

$$TS = \frac{\tau C}{r} \text{ for } A \to \infty$$

$$TS(A) = \frac{\tau C}{r} - \frac{\tau C}{r}\left(\frac{A}{A_b}\right)^{-z} \quad (7)$$

Bankruptcy costs are claims due to third parties when default occurs. They are estimated as a percentage, *l*, of the assets at default, that is, when $A = A_b$. As a result, they amount to lA_b. When the

assets are very high, the eventuality of bankruptcy is null and the ex ante bankruptcy costs are negligible. This gives the boundary condition for $BC(A)$.

$$BC = lA_b \text{ for } A = A_b$$

$$BC = 0 \text{ for } A \to \infty$$

$$BC(A) = lA_b \left(\frac{A}{A_b}\right)^{-z} \quad (8)$$

The total market value, *v(A)*, adds the tax shield and the bankruptcy cost to the asset value. We derive the equity market value, *E(A)*, by subtracting the debt value from the total market value.

$$v(A) = A + TS(A) - BC(A) = A + \frac{\tau C}{r} - \frac{\tau C}{r}\left(\frac{A}{A_b}\right)^{-z} - lA_b \left(\frac{A}{A_b}\right)^{-z} \quad (9)$$

$$E(A) = v(A) - D(A) = A - \frac{(1-\tau)C}{r} + \left[\frac{(1-\tau)C}{r} - A_b\right]\left(\frac{A}{A_b}\right)^{-z} \quad (10)$$

The firm's equity market value does not depend on parameter *l* because the loss rate is the creditors' problem. From (10), we derive the threshold value, A_b, which triggers the default as the one when the equity value is null $E(A_b) = 0$ because when $v \to$D, it is no longer possible to issue equity to finance any interest payments. The value A_b should be set as a limit condition in which $\frac{dE}{dA} \to 0$ when $A \to A_b$. This "smooth-pasting" condition gives the A_b value:

$$A_b = \frac{z}{1+z}\frac{(1-\tau)C}{r} \quad (11)$$

As z is positive, we obtain $A_b < (1-\tau)\frac{C}{r}$. Looking at Equation (10), the derivative of equity *E(.)* with regard to A is positive but decreasing. The equity value increases with the asset value but is a convex function of the firm's assets (Leland 1994; Barsotti et al. 2012).

Private benefits *PB(A)* have to be taken into account in the valuation scheme. However, by definition, they add only to the controlling shareholder's wealth. They are a claim on the firm's assets

that produces a continuous cash flow, $\gamma\eta A$, diverted from the global incentivization cash flow. They are valued as perpetuity in a continuous risk-free context. Of course, their value collapses to zero when the firm defaults. The *PB(A)* boundary limit conditions are:

$$PB = 0 \text{ for } A = A_b$$

$$PB = \frac{\gamma\eta A}{r} \to \infty \text{ for } A \to \infty$$

$$PB(A) = \frac{\gamma\eta A}{r} - \frac{\gamma\eta A_b}{r}\left(\frac{A}{A_b}\right)^{-z} \quad (12)$$

The global value of the firms covers the market value, v (A), and a non-tradable claim on private benefits, which is a partial counterparty of the economic value creation due to incentivization. We obtain $w(A) = v(A) + PB(A)$. The controlling shareholder's wealth consolidates a fraction of the market-valued equity, *α*, which gives him control and private benefits, *PB*.

$$w_c(A) = \alpha E(A) + PB(A) \quad (13)$$

The terms of an implicit contract are agreed ex ante between minor investors and the controlling investor. The key characteristic of this implicit contract is that the drift in the creation of value is a positive function of the private benefits, B_t, appropriated at time *t* by the controlling shareholder. We state: $\eta = \eta(PB_t) = \eta(\gamma)$, with $PB_t = \eta\gamma A_t$. This incentive condition is controlled by parameter *γ*. Thus, the rate of the creation of value is set as $\eta = a_1\gamma$ (with $a_1 > 0$ and $\frac{dPBt}{d\gamma} = 2a_1\gamma > 0$).

B. Analysis of debt value and determinants

When A_b is small, debt *D(A)* has a value that increases with the continuous coupon, C. However, when *C* is high, the value of A_b increases, the probability of default becomes higher, and the value of debt converges down to the liquidation value $(1 - l)A_b$ (see Equation 6b). Two opposite forces explain the debt value: One is the coupon flow value, and the other is the present value of the

net liquidation flow in the event of default. We need to identify the coupon level that gives the optimal debt value balancing these two forces. The coupon level that maximizes the debt value, *C**, is such that $\frac{dD}{dC} = 0$. Solving this first-order condition gives:

$$C^{max} = \frac{rA(1+z)}{z(1-\tau)} \left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z} \quad (14)$$

As seen in Equation (14), a maximum affordable coupon exists. It is a positive function of the asset value. It permits the identification of a maximum affordable debt value from the creditors' point of view.

$$D^{max} = \frac{A}{(1-\tau)} \left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z} \quad (15a)$$

The maximum debt capacity is a positive function of the asset value. It allows the identification of a maximum affordable debt value from the creditors' point of view. It is dependent on asset size *A* but depends on the firm characteristics through *z*. Calling leverage $\lambda = D/A$, we define:

$$\lambda^{max} = \frac{1}{(1-\tau)} \left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z} \quad (15b)$$

We observe that D^{max} and λ^{max} are directly influenced by the firm's choices ruling the *z* value. The *z* parameter depends for instance on the assets' volatility, σ. It also depends on the increase in the assets' drift, η, and on the private benefits appropriation, γ. The specific case of no private benefits simplifies the formula to $z = \frac{2r}{\sigma^2}$ (Leland 1994). At the start when *C* is small (i.e., below C^{max}), or, equivalently, when the leverage is low and below λ^{max}, the debt value increases with the size of the coupon flow.

1. The setting of the debt level

The setting of debt is in the managers'/controlling shareholder's hands. Equation (6a) shows that the debt value decreases as the default threshold increases. The second term of Equation (6a) has a negative sign since it results from Equation (11) that $A_b < (1-\tau)\frac{C}{r}$. The first way to limit creditors' wealth is to increase the default limit, which in turn will increase the risk-neutral probability of default $\left(\frac{CA_b}{A}\right)^z$. The question is actually more complex, as any increase in A_b will also result in a better liquidation value in the event of default. To assess the net effect, we need to examine further the strategic determinants of default, that is, the manageable determinants of *z*. We analyze the derivative of debt with regard to *z* (Annex 1.2, Equation A5), as we know that *z* is positively linked to the value creation drift η.

The derivative of debt *D* versus *z* is positive when the following condition is satisfied:

$$A > A_b exp\left(\frac{(\tau+l(1-\tau))-1}{\left(1+z(\tau+l(1-\tau))\right)(1+z)}\right) \quad (16)$$

This means that when *A* is large with regard to the turning point defined by the RHS of Equation (16), the debt value increases with *z*. This is always verified because *l* and τ are between 0 and 1 and $\left(\tau + l(1-\tau)\right)$ is lower than 1. Then the turning point stands below the default threshold. As the value A_b is a binding limit to *A*, the condition (16) is always satisfied and the derivative of debt with regard to *z* is always positive.

As a result, the value of debt increases when value creation incentivization is implemented through a private benefit contract with the controlling shareholders.

Proposition 1 ("Debt overhang"). As the derivative of the debt value with regard to z is strictly positive, the higher drift in value creation is partly captured by the creditors.

A transfer of value initiates with private benefits incentives. The debt value increases with the higher growth rate of the firm's assets. Creditors benefit from value-creative incentivization in the

firm. However, this creditor's holdup effect is limited by private benefits appropriation. The fear of a creditors' holdup may trigger private benefit appropriation by the controlling shareholder. Contrary to Jensen's debt disciplinary pressure effect, debt may stimulate private appropriation in a control situation to avoid or limit creditors' holdup. As $\frac{dD}{dz}$ is positive, the controller will use the determinants of *z* in such a way that *z* becomes negative with regard to the variable to control.

- The holdup effect is directly controlled by the private benefits appropriation rate. We assume positive incentivization with $\eta = a_1\gamma$. The net asset growth after private benefits is $a_1(\gamma - \gamma^2)$. It is positive for any value below the maximum appropriation rate of 100%. However, the derivative becomes negative with regard to changes in the appropriation rate if it is larger than 50%. Then, we obtain $\frac{dz}{d\gamma} < 0$. As creditors capture part of the additional flow increasing the firm's asset value, a way to limit this holdup effect is to increase the private benefits appropriation and to raise its rates above 50%. This will trigger massive private benefits behavior from the controlling shareholder. From that point of view, a paradoxical consequence of the debt holdup situation for outside investors is accepting private benefits, as this will curb the creditors' situation.
- The second tool is *σ*, that is, the choice of assets' volatility, which is well analyzed in the Leland (1994) case without private benefits. In such a situation, we obtain $z = 2r/\sigma^2$. The only usable determinant available in this case is asset volatility through an asset substitution policy (Bigus 2002; Garvey and Mawani 2005; Tarentino 2013). For instance, an increase in volatility, substituting less risky assets with more risky ones, will decrease *z* and consequently decrease the debt value.
- The third tool is debt leverage. As identified in Equation (15b), the debt value increases first with the size of the coupon flow. Above the maximum leverage, the debt value decreases as the bankruptcy fear overcomes the payment effect. The controlling shareholder will increase the leverage ratio above the maximum and add more debt, that is, more coupon outflow payments, to curb the transfer of value to the creditors. This will be analyzed later.

Proposition 2. In a private benefit appropriation scheme, the contract between the controlling shareholder and outside investors is grounded in the common goal of avoiding a side value transfer to creditors. This justifies private appropriation to maintain outside investors' wealth.

The economic intuition is quite simple. The creditors' holdup risk is limited if the amount at stake is limited by an upstream appropriation by the controlling shareholder. By limiting the risk of holdup, private appropriation may paradoxically "protect" outside investors against a possible transfer of value to creditors.

Proposition 3. In a case in which the debt value increases with the setting of a private benefits scheme of incentivization, a way to avoid or limit the holdup by creditors is to substitute assets and to increase the firm's asset risk.

When introducing incentivization and three parties' agency conflict, the well-known asset substitution mechanism (Jensen and Meckling 1976) can be re-interpreted not as a device to extract value from creditors but to limit transfers of value to creditors.

2. Numerical simulations

Graph 1 shows the situation of the debt value when the value creation rate is between 0% and 11% and the perpetual coupon flow is between 0 and 0.11.

INSERT GRAPH 1

The debt value decreases for high debt levels, that is, high coupon flows. For A = 1, the debt increases first with the coupon level; for η = 11%, the debt value levels off at 0.79, corresponding to a coupon of 5%. Above, the debt value declines to the floor of the minimum value after bankruptcy costs, specifically 0.70. For a lower creation drift of η = 1%, the debt value still increases but reaches its maximum at a coupon of 7%, displaying a debt value of 0.77. The maximum value depends on A_b,

which is a positive function of the coupon. The condition for a negative slope is more easily met with a high drift. An increasing drift gives increasing *z* values. For coupon flows ranging from 0.01 to 0.05-0.06, debt value increases with the additional drift value. It corresponds to situations in which *dD/dz* is positive. For larger coupon rates, debt value decreases with drift, signaling that the coupon is above the C_{max} value defined by Equation (14). The graph illustrates that increasing the additional drift to a local maximum and increasing the coupon rate afterward decreases the value of the creditors' claim.

C. Analysis of equity and firms' market value

Annex 1.3 presents the sign of the derivative of equity value with regard to *z*. It is negative. We know that *z* increases with the additional growth in asset value η. This growth in asset value first benefits the debt value. We have shown that it induces a mechanism of transfer of value to creditors. The equity value is also indirectly harmed. The mechanism is the following: an increase in the asset growth rate will also increase the default threshold value, A_b. From Equation (10), it is easy to show that $\frac{dE}{dA_b}$ is negative. The economic sense is straightforward: A rise in the threshold triggering a zero equity value will result in a lower equity value.

Thus, control and private benefits will introduce a specific agency problem between (outside) shareholders and creditors. The former are directly exposed to the consequences of the incentivization of managers and to the controller's goal of enhancing the value of assets. The controller has a specific counterparty with private benefits, and the asset growth rate is partly appropriated by creditors. As a consequence, the probability of default increases, and the equity value is negatively affected. Equity value is calculated in Graph 2 using Equation (10) and assuming a value of *A*=1.

INSERT GRAPH 2

The map shows a negative value for equity, declining to null values as the coupon flow increases. The derivative $\frac{dE}{dC}$ is negative, meaning that A is above $A_b(1+z)^z$. We know that the

derivative of *E* vs. *z* is negative. As drift η enters positively in *z*, *E* is strictly decreasing with η. For instance, if the coupon is set at 0.03, the equity value declines with η from 0.48 (no additional drift) to 0.42 (η = 11%).

The agency problem is totally supported by the outside equity investors; meanwhile, they implicitly agree on a control situation and an incentivization deal to increase the growth of assets. The derivative of equity value *E(.)* with regard to *C* is alternatively positive and negative. It is positive if $A < A_b(1+z)^z$ (see Annex 1.3). The first immediate idea to restore outside shareholders' wealth is to increase/decrease the coupon paid to creditors according to the sign of the derivative. This is not easy due to the contractual nature of debt. Another way to balance the phenomenon is to increase the risk of the firm by developing asset substitution. The derivative $\frac{dE}{dz}$ is negative (see Annex 1.3), and we know from Leland's polar case that *z* and σ are inversely related. We obtain the standard result that the equity value increases with the assets' volatility. This example shows that asset substitution cannot be seen as a simple and direct way to extract value from creditors to shareholders. When a situation of control appears with private benefits appropriation, the first direct consequence is the transfer of value to the creditors; then, asset substitution is a way not only to expropriate value but to limit the transfer of value seized by creditors and detrimental to shareholders. The basic reason is the holdup by creditors without any causal contribution to the economic creation of value.

The way in which outside investors may avoid a creditors' holdup is to increase the coupon flow from a situation where $\frac{dD}{dC}$ is positive to a situation where it becomes negative and initiates a limitation of the creditor's holdup. This means increasing $\lambda = \frac{D}{A}$, possibly above $\lambda^{max} = \frac{1}{(1-\tau)}\left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z}$. Increasing the debt ratio to λ^{max} means an additional debt ΔD such that $\lambda^{max} = \frac{D+\Delta D}{A+\Delta D}$. This additional debt changes the sign of the $\frac{dD}{dC}$ derivative, which now turns negative (see Equation 15b). It gives a new debt amount, $D' = D + \Delta D$ with $\Delta D \geq \frac{\lambda^{max}{}_{A-D}}{(1-\lambda^{max})}$, and a new nominal coupon flow, *C'*, which is larger:[7]

[7] We assume that the new debt is issued at its market value.

$$C' = \left(\frac{D+\Delta D}{D}\right) C = \left(1 + \frac{\lambda^{max} A - D}{(1-\lambda^{max})D}\right) C \quad (17)$$

This condition is equivalent to setting the new leverage ratio, λ', higher than λ^{max}:

$$\lambda' > \lambda^{max} = \frac{1}{(1-\tau)} \left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z} \quad (18)$$

Then, the negative effect of the coupon flow on debt value balances the holdup transfer to creditors. The situation equilibrates when $\frac{dE}{dC}(C' - C) + \frac{dD}{dC'}(C' - C) = 0$, at least under the condition $A < A_b(1+z)^z$, which guarantees a positive $\frac{dE}{dC}$ derivative.

The limit condition to yield a positive derivative $\frac{dE}{dC}$ is that the asset value *A* is small and below the derivative turning point. This is equivalent to saying that the new leverage, λ', should be larger than $\lambda^* = \frac{D}{A_b(1+z)^z}$ (see Annex 1.3 Equation A7). The target leverage should be higher than the larger of the two values $(\lambda^*, \lambda^{max})$ to develop opposite reactions between creditors and outside shareholders vis-à-vis a change in debt level.

$$\lambda' > \max(\lambda^*, \lambda^{max})$$

The controlling shareholder will increase the bankruptcy risk by inflating the coupon flow to be paid. Ceteris paribus, this will induce an upside jump in the firm's debt leverage. The same story applies when the debt leverage jumps following a substantial share repurchase. The wealth transfer hypothesis from bondholders to stockholders has been empirically documented by Maxwell and Stephens (2003) with regard to share repurchases. The risk of firm's debt increases outstandingly after a share repurchase offer linked to the awarding of stock options to executives (Jun et al. 2009). Controlled firms will empirically experience greater bondholders losses at the announcement of a share repurchase. Proposition 4 is close to proposition 2 above.

Proposition 4. An increase in debt leverage is a way of limiting the wealth transfer from outside investors to creditors in a situation of incentivized additional value creation. The controlling

shareholder is specifically incentivized to protect outside shareholders and to manage the conflict between outside shareholders and creditors through the leverage decision.

The increase in leverage is specifically due to the absence of protection of outside shareholders who do not profit from any private benefits. The motivation of the controlling shareholder is twofold. He has incentive to protect himself and outside shareholders as a whole, by limiting the creditors' holdup. He is also incentivized by the agreement of a private benefits scheme between himself and the outside shareholders. He seeks to identify a trade-off situation between the holdup by creditors and private benefits appropriation from the point of view of outside shareholders who are aware of the situation. The protection of outside shareholders is a side effect of the control contract, where the controlling shareholder will limit the creditor's holdup by raising the debt leverage. This conclusion is the opposite of that found in He (2011), who identifies a negative relationship between leverage and incentive effort because a heavily indebted firm close to financial distress is particularly exposed to a debt overhang phenomenon. To develop an effort without being exposed to a strong creditor's holdup, the managers should lower leverage. However, in our controlling/outside shareholding context, this is not true as outside shareholders are more exposed to a creditor's holdup than is the controlling shareholder, who is directly incentivized and will make specific efforts.

D. Analysis of controller's wealth and total firm value

Private benefits are key components of the controller's wealth, w_C, in a control contract. They are simultaneously the consequence and the cause of an efficient control situation. Private benefits are the proof of successful incentivization, as we state that the appropriation rate rules the additional growth rate of assets.

Annex 1.4 shows that the amount of private benefits is positively linked to the appropriation rate, γ. The controlling shareholder's wealth covers both market equity value and private benefits. The

derivative of w_C with regard to C is positive if A is below the turning point $A^{**} = A_b \left[\frac{\alpha(1+z)}{\alpha-\frac{\eta\gamma}{r}}\right]^z$ (see Equation A10 in the Annex). This turning point compares the situation of the outside shareholders to whom the derivative becomes null at point $A^* = A_b(1+z)^z$. When the wealth derivative is negative, debt (through C) becomes disciplinary. In such a situation, more debt will weigh on the controlling shareholder's wealth. Turning point A^{**} is higher than A^*, as we suppose $\left[\frac{\alpha}{\alpha-\frac{\eta\gamma}{r}}\right]^z > 1$. Then, it follows that in the first step, when the derivative is positive, the debt helps to enrich all shareholders. However, this effect stops at the first point for outside shareholders and the derivative turns negative with regard to C. Controller's wealth is capped later at A^{**}. In other words, he benefits earlier from a disciplinary leverage. However, when ultimately his wealth's derivative undergoes a change in sign, the debt is definitely disciplinary. The minimum condition is that the controller's ownership verifies $\alpha > \frac{\eta\gamma}{r}$.[8]

INSERT GRAPH 3

Private benefits have lowered the limit of disciplinary debt for the controlling shareholder. The rationale of disciplinary debt pressure is not the same compared to a situation without private benefits. In such a case, the controlling shareholder's wealth declines smoothly with debt and is convex (see the left side of Graph 3). With private benefits, the controlling shareholder's wealth declines with debt at a steeper rate; the curb is concave and then collapses abruptly to zero when bankruptcy occurs (see the right side of Graph 3). This demonstrates that the rationale of debt changes in a private benefits scheme as they are similar to an additional claim on the firm's assets, which is "bankrupt" with a zero value when the standard debt itself defaults.

INSERT GRAPH 4

[8] This suggests that the controlling shareholder needs a non-zero percent of ownership to satisfy the condition. This contradicts the polar case of managers/global shareholder story as the former will not benefit from a two-step situation where the debt is relatively more profitable to the controller.

Graph 4 shows that, in the range of drift values, the controller's wealth increases with the drift up to the 0.06 coupon flow. Above this threshold, the debt turns more risky and the controller's wealth is negatively influenced. A rise in the drift value cannot compensate for the bankruptcy probability of loss. Then, high debt levels are disciplinary for the controlling shareholder above a given point. In Graph 4, considering the 0.07 (respectively 0.08) debt coupon case, the controller's wealth maximum value corresponds to an additional drift of 5% (respectively 2%). Conversely, when debt is low (i.e., low coupon values), the controlling shareholder's wealth is strongly increasing with the additional drift rate, demonstrating that incentivization is effective and strong. In this situation, debt helps both incentivization and appropriation.

4. The specific role of debt

A. Enhancing the disciplinary role of debt and designing a self-regulation framework

Defining the leverage threshold $\lambda^* = D/[A_b(1+z)^z]$ and the threshold $\lambda^{**} = D/\left[A_b\left[\frac{\alpha(1+z)}{\alpha-\frac{\eta\gamma}{r}}\right]^z\right]$, which correspond respectively to A^* and A^{**}, we know that $\lambda^{**} < \lambda^*$. Outside investors will benefit from debt if the debt leverage is above λ^*. The controlling shareholder benefits earlier from debt, that is, if the leverage is above λ^{**}. To enhance his wealth, the controller needs to increase leverage as much as possible to as high as λ^{max}. The latter is the largest value, corresponding to debt maximization. However, the creditors' optimum is to respect the maximum leverage, not surpass it.

- If $\lambda^* < \lambda^{max}$, a space to increase the leverage beneficially to both the controller and the outside investors exists; however, this situation will be detrimental to creditors (point A' in Graph 5);

- If $\lambda^{**} < \lambda^{max}$ and $\lambda^{*} > \lambda^{max}$, the outside shareholders will be in a negative position, as high leverage is detrimental to their wealth. However, the controlling shareholder will be interested in higher leverage (point A in Graph 5);
- If $\lambda^{**} > \lambda^{max}$, it induces $\lambda^{*} > \lambda^{max}$; any shareholder will be in a negative position, as high leverage curbs private benefits.

In a situation in which an incentivization/appropriation scheme is agreed with managers/controlling shareholders, the need to control the wealth transfer to creditors will trigger a debt leverage jump. For instance, this should occur when large stock option plans are under consideration. Private benefits contracts are implicitly opaque. Thus, jumps in leverage may signal private benefits settings. It should then result in an increase in economic returns, as at least part of the value creation stays in the firm.

INSERT GRAPH 5

For different combinations of *z* values ensuing from the parameters of the incentive contract, we identify in Graph 5 the curve λ^{max}, which is the maximum limit affordable for the creditors. Area I in Graph 5 corresponds to a reverse holdup effect in which debt is beneficial to shareholders but not to creditors, who are dangerously exposed to bankruptcy. When the leverage ratio λ^{max} is below the curve, the derivative $\frac{dD}{dC}$ is positive, meaning that the creditors' debt value increases with *C* and that the debt ratio may increase. The shareholders' holdup curves are downward oriented. Below their threshold curves, the outside shareholders will suffer from a holdup, as these situations are characterized by a negative $\frac{dE}{dC}$ derivative. Above the curve, outside shareholders' wealth increases with the size of the coupon flow. They will try to avoid a creditors' holdup by increasing the debt. The curves are set for different levels of coupon flows, 0.01, 0.03, and 0.05, (corresponding to risk-free debt values of 0.2, 0.6, and 1.0, respectively). When the debt is small (coupon flow = 0.1), point A in Graph 5 shows the situation in which both the creditors and the shareholders increase their value by decreasing the debt leverage, λ, from 0.9 to 0.7. The optimal wealth leverage is around 0.78 for the creditors. They will not

accept a rise above this. To stay below the λ^{max} limit and to develop a positive rationale of the coupon flow, outside shareholders will increase the coupon flow to 0.03 or 0.05. This will define a negotiation space in which the two parties are in a positive relationship with regard to a marginal increase in debt. The area A' debt is now profitable to shareholders relatively more than to creditors, who are approaching their limits. Therefore, shareholders will gain more in debt value reduction due to losses in the event of default than they will lose from the increase in the coupon flow. In the negotiation zone A', the marginal increase in shareholders' value is higher than the marginal increase in debt value.

When located below their curves, shareholders experience a holdup situation in which the creation of value benefits the creditors first and not them (Area II in Graph 5). The threshold curves are decreasing in z values. Remember that *z* is homogeneous to the additional value drift seized in the firm, meaning that it is related positively to the raw additional value drift, η, and negatively to the appropriation rate, γ. Both parameters may be linked together. If we set an incitivization scheme such that $\eta = a_1\gamma$, it has been shown that the derivative of *z* with regard to the appropriation rate is first positive until 50% when it becomes negative.

To increase their wealth, outside equity investors should be located in an area where the relationship between wealth and debt is positive, namely, a positive $\frac{dE}{dC}$ derivative. Then, two approaches are available. The first approach is to increase the current leverage ratio. This can be performed by increasing the coupon flow, that is, the debt size. It can also be achieved by diminishing equity, that is, share repurchases. This will lower the limit curve for shareholders. In Graph 5, the positive negotiation space, A', widens when moving down the curves from a 0.03 coupon flow to a 0.05 coupon flow. As a result, the holdup area shrinks (see Area II in Graph 5). The non-intuitive rationale for the outside investors (and the controlling shareholder) is to use more debt to avoid a debt holdup. The holdup limitation results from a better perspective of profit (i.e., high *z* values) and enhances the probability of default, harming creditors more than shareholders. This corresponds to the A' area in Graph 5. A complementary approach gives similar results. It can be achieved by moving alongside the curve and increasing *z*. Increasing z means higher additional drift net of private appropriation, and lower asset volatility, σ.

The controlling shareholder should act in the same direction. His threshold curve, λ^{**}, defining a positive derivative $\frac{dw_c}{dC}$, is pegged on the λ^* curve (see the dashed line in Graph 6). Therefore, the strategies developed by the controlling shareholders will be largely similar to the one exposed above. The rationale is to stand in an area where the holdup effect disappears and where a rise in the coupon triggers an increase in shareholders' wealth. This area, where $\frac{dD}{dC}$ and $\frac{dw_c}{dC}$ are positive, corresponds to point A' on Graph 6.

INSERT GRAPH 6

The controlling shareholder may develop three strategies. Strategy (a) is to raise the debt leverage ratio of the firm in the vertical direction (see Graph 6). This will move the leverage above the threshold. A similar way to express this is to move the limit threshold down to change the dw_c/dC derivative sign. This entails a rise in the coupon flow, *C*, due to the rise in the leverage ratio. This strategy takes on board outside shareholders along with the controller, as their interests are aligned with regard to the creditors' holdup situation. The two threshold limits are close, meaning that dw_c/dC and dE/dC are both positive. Strategy (a) manages the holdup problem with creditors for the profit of both shareholder categories. The necessary condition for a positive controlling shareholder's derivative is that $\alpha > \frac{\eta\gamma}{r}$. Equity ownership is pushed upward, and the appropriation rate is pulled downward to locate the controller in a situation to avoid the creditors' holdup and converge to an agreement with them. In that situation, debt is disciplinary, as the controlling shareholder should increase his ownership and reduce his appropriation rate. This will initiate a possible (moderate) private benefits agreement with the outside shareholder. Strategy (a) has two consequences: It links the two categories of shareholders and disciplines the private appropriation of benefits. The two categories of shareholders have aligned interests, as they want to discipline creditors by balancing the holdup with an increase in bankruptcy risk.

Strategy (b) manages only the conflict between the controller and the creditors. It consists of increasing the *z* value to a situation of shared interest to increase the coupon flow. This rise will

increase their respective wealth. Area II in Graph 6 identifies the absence of a transfer of value detrimental to the controlling shareholder. The losers are the outside investors who are in the creditors' holdup area. An increase in z alongside the horizontal axis will involve a constant leverage ratio, a decrease in asset volatility (good asset substitution), an increase in additional drift, but introduces a limit in the appropriation rate. Strategy (b) is a massive holdup to outside investors. It is a polar case as it will increase the controller's wealth only if he takes advantage of the positive dw_c/dC derivative. A balancing force will limit this because the condition $\alpha > \frac{\eta\gamma}{r}$ applies and exercises downward pressure on the appropriation rate.[9] The conflict between the controlling shareholder and outside shareholders develops a balancing force. Because the sign of $\alpha - \frac{\eta\gamma}{r}$ should remain positive, which introduces a limitation on the appropriation rate, the interests of the two categories of shareholder are not totally diverging. However, in this situation, the creditors' holdup is borne totally by the outside shareholders.

Strategies (a) and (b) are mixed to enhance the disciplinary effect of the bankruptcy risk. An increase in leverage is expected. Even following strategy (b), the controlling shareholder needs to take advantage of the positive relationship between his wealth and the coupon flow by increasing the latter, that is, by raising the leverage ratio. Along with the introduction of an incentive contract, a large set of choices can be implemented basically to control the holdup effect.

Strategy (c) is based on the negative $\frac{dw_c}{dC}$ and $\frac{dE}{dC}$ derivatives. It determines a conflicting situation with the creditors' rationale, $\frac{dD}{dC} > 0$. The shareholders will fight against the creditors' holdup by cutting the coupon flow and by decreasing the leverage, which will harm the debt value. This strategy involves deleveraging and a debt repurchase. It is not always feasible as the debt coupon flow has been historically set. The conflict between the controlling shareholder and the creditors will yield lower leverage to limit the scope of the holdup. Private benefits are a payment to the controller to decrease leverage. Outside shareholders accept private appropriation as a service to place the controller in a rationale of negative $\frac{dw}{dC}$ with a strong γ. Strategy (c) signals itself by a jump in leverage

[9] Under a proportional incentivization scheme, $= a_1\gamma$, it has been shown that appropriation above 50% turns the derivative $\frac{dz}{d\gamma}$ negative.

when a benefit plan is set up by the controllers (or managers). However, the jump is downward oriented as opposed to the upward-oriented jumps associated with strategy (a). Strategy (c) leads to an "exit" strategy of the creditors; it should be implemented before the incentivization scheme, i.e. before the holdup, otherwise it is too late.

The second derivative of the outside investors' wealth with regard to *C* is zero. This means that their wealth increases at a constant pace with C (as the first derivative is not a function of *C*; see Equation A6 in Annex 1.3). The same is true for the controller (see the first derivative equation A9 in Annex 1.4). The second derivative of creditors' wealth with regard to *C* is negative.[10] It recalls that the optimal situation is a maximum. It is interesting to note that the second derivatives of creditors and shareholders with regard to the coupon size are not the same: The increase in wealth vanishes and levels off in the creditors' case.

This opens the space for convergence and limits as illustrated in area A'. Starting from the point between the two limit curves, λ^* and λ^{max}, shareholders and creditors will be relatively better off with an increase in the coupon flow.

At the same time, the controlling shareholder's crossed derivative with α, the equity share of the controller, shows a sign that is similar to the $\frac{dE}{dC}$ derivative for outside investors and is positive (see condition A7 and Equation A11 in the Annex). This means that for debt level $\lambda > \lambda^*$, giving a positive derivative $\frac{dE}{dC}$ for outside investors, the positive relationship for the controller is enhanced with α. The controlling shareholder is encouraged to hold more shares. In coping with the debt holdup problem, he manages his wealth, but at the same time, his interest is aligned with the outside investors' interest. The two agency conflicts are addressed simultaneously.

Conversely, when the outside investors are in a negative $\frac{dE}{dC}$ situation, they bear the full holdup effect and are still in an interest-diverging situation with the controller. The crossed derivative $\frac{d^2 w_C}{dC.d\alpha}$ is negative, meaning that the positive wealth effect of debt on wealth fades with the size of equity ownership. Then, the controlling shareholder, to avoid the holdup effect of creditors, will lower his

[10] Deriving the first derivative $\frac{dD}{dC}$ (see Equation A1' in Annex 1.1) gives a negative expression.

block ownership, for instance, to 50%, just above the limit for control. We can separate the two situations. Strategy (b) will lead the controller to privilege the solution of the holdup conflict with creditors and will lower his ownership. His interest conflicts with that of the outside shareholders. He may at the same time expropriate wealth through private benefits and harm outside shareholders' wealth indirectly with increased debt and enhanced holdup by creditors. Strategy (a) is the opposite case, as the positive crossed derivative leads the controller to increase his ownership to optimize the avoidance of private benefits. In that context, his interests are aligned with those of outside shareholders.

Proposition 5. Separate equity ownership strategies by the controller are expected and linked to the disciplinary/incentive effect of debt. Strong (weak) ownership by the controller will identify a situation in which outside investors' wealth is positively (negatively) linked with debt leverage.

B. Alternative incentivization contract and the role of debt in public benefits setting

Private benefits may also be designed as a specific share of the net worth after debt repayment; as such, they will appear as a specific additional right given to a specific category of shareholders. Here, private benefits become extra profits and have a contingent claim feature. They represent a cake-sharing rule and present contingent claim features that incentivize the controlling shareholder. The acting controller can also be a group of managers ruling the firm. It must be further noted that this appropriation scheme is no longer private but public and legitimate, as the controlling shareholder stands equally with other shareholders in sharing the equity cake. However, this right does not have a priority rank within the shareholder group. In that framework, the private benefit reduces to a sharing rule within the net worth public cake. This does not change anything for external creditors, and the incentive of the controlling shareholder is to gain a more than proportional share of the cake. This modeling can be ex ante sustainable for both parties, and the shareholders as a whole group are compensated by the net worth. Whole equity remains a call option of which the valuation relies simply on the standard Merton model. It has the contingent claim feature incentivizing the controlling

shareholder, and we refer to it as an SO (for stock option-like) plan. As a consequence, these benefits are no longer private but become a public sharing rule contract that entails lower private costs borne by the controlling shareholder. The latter is still exposed to monitoring costs in his/her controlling job, but the expropriation, legal, or reputational risks fade as this additional benefit contract becomes explicit and legitimate. This alternative design may be a competitor to the private benefits framework to which we refer above; it will therefore be developed below and used as a benchmark.

As mentioned above, controlling investors or managers may well use their power to enhance their reward without extracting private benefits but by seizing some additional public profits. They reward themselves with specific additional rights on the net public equity of the firm. Still ranking as a last resort creditor after the lenders, they will be paid with a larger share of equity capital. The controlling investor is compensated by a share of capital, α', that is larger at the end of the period than his original investment, α. This compensation is similar to a stock option-like scheme. The controlling shareholder is granted zero price stock options, giving him a specific right on the net equity (with $\alpha' > \alpha$).

The controlling investor is incentivized to develop a control activity as he is specifically rewarded for it with an additional share of the equity capital, $(\alpha' - \alpha)$.[11] We refer to w_{SO} as the wealth of a controlling shareholder who will be rewarded with stock options or benefit from the restricted issue of equity at a zero price. This reward gives them a larger share of the net equity value. The controlling shareholder's total wealth is a stake, α', in the net equity with no upstream appropriation of private benefits. This is not private benefits but public compensation. In sharing net equity, the controlling investor and minor investors rank equally. The incentive mechanism is such that the inflow in the value creation drift is linked to the additional share of equity: $\eta' = \eta'(\alpha') = a_2(\alpha' - \alpha)$.

The controller is exposed to private costs. These monitoring costs, $m(.)$, are a function of the size of their appropriation parameter, γ and $(\alpha'-\alpha)$. They also depend on the total size of firm A.

In the stock option scheme, the wealth of the controlling shareholder after being granted an additional share of equity $(\alpha' - \alpha)$ is:

[11] It also covers the polar case of managers starting with zero percent equity who are incentivized through the awarding of stock options.

$$w_{SO} = \alpha' E(z',.) - m_{SO}(.) = \alpha' \left\{ A - \frac{(1-\tau)C}{r} + \left[\frac{(1-\tau)C}{r} - A_b \right] \left(\frac{A}{A_b} \right)^{-z} \right\} - m_{SO}(.) \qquad (19)$$

where $z = z(\eta',.)$ and $\eta' = a_2(\alpha' - \alpha)$. The controller is incentivized with an additional stake in equity capital.

This is different from the benefits appropriated privately by the controller:

$$w_C = \alpha \left\{ A + \frac{(1-\tau)C}{r} \left[-1 + \left(1 - \frac{z}{1+z} \right) \left(\frac{A}{A_b} \right)^{-z} \right] \right\} + \frac{a_1 \gamma^2 A}{r} - \frac{\eta \gamma A_b}{r} \left(\frac{A_b}{A} \right)^{z} - m_C(.) \qquad (20)$$

We set the two values to be equal: $w_C(\alpha, z) = w_{SO}(\alpha', z)$. These equal values have one solution, as z differs in the two compensation schemes. To build numerical simulations, we set the value equal to a given coupon flow of 0.025. For a set of parameters (see Graph 7), it gives a controlling shareholder's wealth of 0.31 in a private benefits scheme. Using the same parameters in a stock option-like scheme, we need to increase the equity stake of the controlling shareholder by granting him 7% more in capital to gain the same controlling shareholder's wealth.

INSERT GRAPH 7

Graph 7 shows the difference in values in the controller's wealth subtracting a stock option inventive scheme from a private benefits scheme. The two contracts have identical values for a coupon flow set equal to 0.025 (e.g., a risk-free debt value of 0.5). When the debt pressure is lowered below 0.025, the SO contract gains more value. On the opposite side of an increase in the coupon flow, debt holdup is relatively weaker with private benefits (i.e., more appropriative) than with stock options. Debt enhances wealth in a private benefits scheme more than with a stock option benchmark. At a given debt level, it levels off, and the debt turns relatively more disciplinary. The private benefits scheme is less exposed to the creditors' holdup, as the additional value drift is partly appropriated at the source before flowing into the firm. In a stock option-like scheme, the controlling shareholder's

wealth is based on the equity value after debt payment. Any increase in the debt value will work against his equity value. This analysis ignores the difference in private costs borne by the controlling shareholder. As private benefits are opaque, they are exposed to litigation risk. Public additional benefits plans are legal and less costly.

C. Practical and empirical implications

Our propositions are testable, mainly proposition 4. It identifies a link between leverage jumps and the setting of incentivization through private benefits. However, private benefits are implicit contracts and are not observable. If successful, they will result in higher drifts in value creation flowing into the firm, at least for the part captured by the firm. We may also expect an increase in asset substitution (proposition 3). The previous results have been drawn with no reference to the equity stake held by the controller. We only assume that a major shareholder has control or that the managers have a dominant position. Changes in the debt level without a change in ownership are potential signals of private benefits appropriation (or modification) for investors. A jump in debt and the agreement of an incentive contract will demonstrate a reaction to the holdup problem. The basic empirical implication of the above model is to identify a jump in a firm's debt leverage after a change in the incentive compensation scheme. This will occur in the situation of a controlled firm.

The identification of incentive contracts is quite difficult. We can hypothesize that incentive contracts could be proxied in the following ways:

- For managers, the awarding of a massive SO plan. The difficulty is the continuous award of SOs in a public firm, as SOs are cumulative and roll over. The identification of a massive break-up is sometimes hazardous.
- Jumps in leverage may also be tracked by repurchase decisions. If these offers are contemporaneous with new incentivization schemes, we can hypothesize a causal relationship. The aim to limit transfer of value to creditors and to repatriate value to the shareholders may explain share repurchases (Jun et al. 2009).

- The debt changes level off as bankruptcy threatens. Controllers and minor investors are then exposed to the same event of default. In a situation of high financial distress risk, debt has no specific role in private benefits appropriation compared with an SO contract. Thus, assuming that the private costs, m_C, are higher than m_{SO}, the SO contract should dominate, and the private benefits should be low. We should expect for highly levered firms that stock option-like compensation contracts will be dominant in controlled firms. This feature supposes looking at paired firms, associating controlled and non-controlled firms. Highly indebted firms should show a higher probability of setting up SO incentive contracts to appropriate an additional part of the benefits. Conversely, controlling shareholders will use private expropriation in less indebted firms. The latter will as a consequence show lower public profitability after private appropriation.
- A new control situation is an event that will introduce a break. A transfer of control resulting from an acquisition may call into question the current incentive scheme of the manager or the new controlling shareholder, and open new possibilities for value creation. As such, we expect it to trigger a debt leverage jump. If the controller is able to initiate a positive drift in value creation, he will try to avoid a transfer of value to the creditors. Another expected consequence can be substitution toward more risk. A rise in the economic risk of the firm after an M&A transaction without an increase in the debt conditions and without a rise in investors' profitability suggests appropriation by a controlling shareholder.

5. The case of target firms after an acquisition

Acquisition is an event that features a transfer of control if the acquirer owns a major stake in the capital. In our framework, he is incentivized to increase the value of the target firms, which will result in an increase in the drift of value creation. Part of this increase will be privately appropriated and may not appear in the public profit displayed to outside shareholders. Private benefits are private

information. We set a sample of controlled target firms in Europe and North America meeting the following criteria:

- Period 2000–2014
- Minimum transaction value 100 million USD
- Acquirers and targets are listed companies
- Target firms located in the USA, Canada, France, the UK, Germany, Belgium, the Netherlands, Italy, or Spain; acquirers from the same list of countries
- Financial, government, and agency sectors are excluded
- Target firm is previously non-controlled (acquirer's stake below 50%) and controlled afterwards (owned above 50%)
- Completed deals.

The Thomson Financial database provides a sample of 594 target firms. The average percentage owned by the acquirer after the transaction is 98.33%. A total of 523 firms out of 594 (i.e., 88% of the target sample) were 100% owned after the transaction. Before the transaction, the average percentage of shares already held by the acquirer was 2.03%. The set-up of a controlling position is new and introduces a break for the firms belonging to the sample. The experimentation conditions are coherent with our model. To assess the variations between "before" and "after" sub-periods, we consider the 2 calendar years (N-2 and N-1) before the transaction year, N, and the 2 following years afterwards (N+1 and N+2). As a result, we drop the transactions occurring in 2014 (36 observations), leaving 558 firms.

To calculate the changes, we identify the number of target firms still listed 2 years after the takeover and with financial data available in Thomson Financial. We only obtain approximately 120 firms out of the sample of 558 target firms identified 2 years earlier. The explanation is simple: The target firms have disappeared. Totally controlled, they were delisted and became private. They may still exist as 100% subsidiaries within a group, or they may have been merged. Consequently, we cannot pay attention to the changes in debt leverage of opaque companies within a group. Even if available, these data are meaningless. We focus on the remaining 79 to 123 firms living 2 years after

the transaction. The average ownership of the acquirer for the remaining firms is 98.70%. This leaves little room for minor investors in the market.

The conclusions that we can draw from the sample of surviving target firms after an acquisition are weak. The sample is small. However, it corresponds to companies that would have been easily squeezed out and delisted by the controller. They represent a sample of firms in which the controlling shareholder has wanted (at least for two years) to share equity with some minor investors.

We consider the variation in debt leverage. Book leverage (LEVERAGE) is the total debt over total capital (i.e., debt plus equity). We average two firm observations in each of the "before" and "after" sub-periods (N-2 and N-1, and N+1 and N+2). The leverage ratio increases non-significantly (see Table 1- Panel A). We also look at the total amount of debt in the financial statement of the target before and after the transaction. For those firms that remain present over the whole period, the average debt moved up from 6 billion USD to 14 billion USD. The variable VAR_DEBT% measures the percentage variation of total debt. The average individual debt increase is more than 610% and is statistically significant. The jump in debt is striking when we compute the variation in debt between the years N-1 and N+1 straddling the transaction. Within a 3 year window, the average rise in debt is 420%.

INSERT TABLE 1

To assess the changes in economic profitability, we first consider the target's ratio of Ebitda divided by total assets. Before and after the transaction, 70% of the firm of the sample displays positive economic profitability. The average value is negative as a minority of firms show strong negative values. The average Ebitda over assets ratio increases from – 1.47% to +0.12%. The relative change in the EBITDA_OV_ASSET variable between the N+1/N+2 sub-period and the N-1/N-2 sub-period is calculated. The variable EBITDA_OV_ASET shows an average increase of 1.6% looking at the firms that were present over the whole 5 year period. It is statistically not significant. We also look at total Ebidta in dollar value in the income statement of the target before and after the transaction. For those firms that remain present over the whole period, the average Ebitda over the subperiod N-2/N-1

is 717 million USD. It is 855 million USD after the transaction. The average Ebitda value shows a 99% increase for paired observations. The variable VAR_EBITDA% is statistically significant. The jump in profitability is also sensible when we compute the percentage variation of Ebitda within a shorter 3 year window: The rise is on average 49%%.

We calculate the simple correlation between the variation in debt leverage and the variation in economic profitability as measured by the Ebitda ratio over total assets. It is not significant (see Table 1-Panel B). The correlations between percentage variation of total debt and the percentage variation of Ebitda are also calculated over the whole 5 year window and over a restricted 3 year window. These correlations are strongly positive and significant. It supports the proposition that an event introducing a control that opens the opportunity to the controller to be incentivized will result in higher profitability and higher debt leverage. However, the empirical support to our hypothesis is alleviated as we have to take into account the following:

- that we should have considered the expected increase in profitability at the time of the transaction instead of an ex post measure;
- the existence of an endogenous relationship, as we know that ex post increases in profitability may explain ex post increases in indebtedness independently of any holdup problem.

The empirical results should be considered as promising but preliminary. A more complete analysis should be developed and should take into account the target size between the target and the acquirer as we are dealing with agency costs. Agency concerns will interfere with managerial decisions such as debt leverage only if the stake is important. The size of the target (TARG_SIZE) is measured by total assets. Thus, the holdup transfer of value to creditors will appear as an important problem. When crossing the TARGET_SIZE variable with the changes in leverage, VAR_DEBT%, we find a strongly positive correlation (+0.27; p:0.00). Jumps in leverage are more important when the holdup stake is higher.

The empirical test shows a jump in the target leverage and target profitability with the coming of a new controlling shareholder. Both changes are positively correlated together, supporting our propositions.

6. Conclusion

This paper addresses the question of the relationship between private benefits as an implicit scheme of compensation of the controlling shareholder and the choice of a debt structure with senior standard debt and equity, as the latter belongs at the same time to the controlling shareholder and to outside investors. Each of these two questions corresponds to an agency conflict that is addressed in the literature. Establishing a link between the two issues is uncommon. The relation becomes more complex with three parties. We show that the two issues are linked in a financial governance framework. We can no longer separate the issues when a holdup problem is identified and when a controlling shareholder is incentivized through private benefits. Incentivization will not profit outside investors as creditors are the first to be enriched by safer claims.

As a consequence, we predict a jump in leverage to protect outside shareholders. Our paper derives some testable implications and proposes an empirical test. The traditional disciplinary role of debt is analyzed as a limitation on the free cash flow of the firm. Indebtedness limits the discretionary misuse of resources. A slightly more sophisticated view is that debt increases the probability of bankruptcy and as such limits the time scope of entrenchment behavior and cash flow appropriation or diversion. We show that debt is also *per se* an appropriation device for creditors. This will trigger a set of reactions as the shareholders will try to limit the transfer of value to the creditors. Several possibilities are explored, among which a non-intuitive solution is demonstrated: Shareholders will increase the debt leverage to increase the risk of default and lower the debt value. The controlling shareholder may also target higher equity ownership or a lower appropriation rate. He can also maximize the value creation drift, which is beneficial (a) to the controller himself and (b) to the creditors. The shareholders are the losers in the holdup area. However, we show that, with regard to the creditors' holdup problem, the two categories of shareholders may have aligned interests. Debt is an appropriation device for creditors in an incentive context. A specific agency conflict appears. The disciplinary tool is no longer disciplinary and creditors also need to be disciplined.

References

Aghion P., Bolton P. “An Incomplete Contract Approach to Financial Contracting”. *Review of Financial Studies* 59 (1992): 473-494

Albuquerque, R. and Schroth, E. “Quantifying Private Benefits of Control from a Structural Model of Block Trades”. *Journal of Financial Economics* 96(1) (2010): 33-55

Almeida H., Wolfenzon D. “A Theory of Pyramidal Ownership and Family Business Groups”. *Journal of Finance* 61(6) (2006): 2637-2680

At C., Chappe N., Morand P.H., Thomas L. « Rémunération optimale des dirigeants : Faut-il interdire les bénéfices privés ? », *Revue d'Economie Politique*, 116(6) (2006) : 831-846.

Attaoui S., Poncet P. “Capital Structure and Debt Priority”, *Financial Management* 42(4) (2013): 737-775

Barclay M., Holderness C. “Private Benefits from Control of Public Corporations”. *Journal of Financial Economics* 25(2) (1989): 371-395

Barsotti F., Mancino M.E., Pontier M. « The Role of a Firm’s net Cash Payouts in Leland (1994) Model” *Economic notes by Monte dei Paschi di Sienna* 41(3) (2012):115-144

Bebchuk L., Neeman Z. “Investor Protection and Interest Group Politics” *Review of Financial Studies* 23 (2010): 1089-1119

Belkhir M., Boubaker S., Derouiche I. “Control-ownership Wedge, Board of Directors, and the Value of Excess Cash” *Economic Modelling* 39 (2014): 110-122

Berglöf, E., Von Thadden E.L. “Short-term versus Long-term Interests: Capital Structure with Multiple Investors,” *Quarterly Journal of Economics* 109 (1994): 1055-1084.

Bhattacharya U., Daouk H., Welker, M. “The World Price of Earning Opacity”. Accounting Review 78 (2003): 641-678

Bigus J. “Bankruptcy Law, Asset Substitution Problem, and Creditor Conflicts”. *International Review of Law and Economics* 22(2) (2002): 109-132

Black F., Cox J. “Corporate Securities: Some Effects of Bond Indenture Provisions”. *Journal of Finance* 31 (1976): 351-367

Blazy R., Deffains B., Umbhauer G., Weil L. “Severe or Gentle Bankruptcy Law: Which Impact on Investing and Financing Decisions?”, *Economic Modelling* 34 (2013): 129-144

Bolton P., Scharfstein D. “A theory of Predation Based on Agency Problem in Financial Contracting”, *American Economic Review* 80 (1990):94-106

Brailsford T. J., Barry O.L., Pua S .L.H. “On the Relation between Ownership Structure and Capital Structure. *Accounting and Finance* 42 (2002): 1-26

Buchuk D., Larrain B., Munoz F., Urzua I. “The internal Capital Market of Business Groups: Evidence from Intra-group Loans” *Journal of Financial Economics* 112 (2014); 190-212

Burkart M., Gromb D., Mueller H., Panunzi F. “Legal Investor Protection and Takeovers”. *Journal of Finance* 69(3) (2014):1129-1165

Claessens S., Djankov S., Fan J., Lang L. “Disentangling the Incentive and Entrenchment Effects of Large Shareholdings”. *Journal of Finance* 57(6) (2002): 2741–2771

Croci E., Doukas J., Gonenc H. “Family Control and Financing Decision”. *European Financial Management* 17 (2010):860-897

DeMarzo P., Fishman M. “Optimal long-term financial contracting”. (2007) *Review of Financial Studies* 20(5) (2007): 2079-2128

DeMarzo P., Sannikov Y. “Optimal Security Design and Dynamic Capital Structure in a Continuous-time Agency Aodel,” *Journal of Finance* 61 (2006): 2681-2724.

Dewatripont M., Tirole J. “A Theory of Debt and Equity: Diversity of Securities and Manager–Shareholder Congruence” *Quarterly Journal of Economics*, 109 (1994): 1027-1054Dyck A.,

Zingales L. "Private Benefits of Control: An International Comparison". Journal of Finance 59 (2004): 537-600

Ellul, A., Guntay L., Lel U.. "Blockholders, Debt Agency Costs and Legal Protection". FRB International Finance Discussion Paper No. 908. Available at SSRN: http://ssrn.com/abstract=68737 (2009)

Faccio M., Lang L., "The Ultimate Ownership of Western European Corporations" *Journal of Financial. Economics* 65 (2002): 365–395

Faccio, M., Lang, H.P.L., Young, L.S. "Debt and Expropriation" EFMA 2001 Lugano Meetings, http://ssrn.com/abstract=23972 (2003)

Faccio M., Lang L., Young, L.S. "Pyramiding vs. Leverage in Corporate Groups: International Evidence" *Journal of International Business Studies* 41 (2010): 88-104

Gale D., Hellwig M. "Incentive-compatible Debt Contracts: The One-period Problem" *Review of Economic Studies* 52 (1985): 647-663

Garvey, G. T., Mawani, A. "Risk-taking Incentives of Executive Stock Options and the Asset Substitution Problem". *Accounting & Finance*, 45 (2005): 3-23

Gibbons R. "Relational Contracts and the Theory of the Firm". *Quarterly Journal of Economics*, 117(2002):39-83

Goldstein R., Ju N., Leland H. "An Ebit-based model of Dynamic Capital Structure". *Journal of Business*, 74(4) (2001): 483-512

Grossman S., Hart O. "Corporate Financial Structure and Managerial Incentives". In *The Economics of Information and Uncertainty*, edited by J.J. McCall, 123-155. Chicago: University of Chicago press, 1982

Harris M., Raviv A. "Corporate Control Contests and Capital Structure. *Journal of Financial Economics* 20 (1988): 55-86

Harris M., Raviv A. "Capital Structure and the Informational Role of Debt". *Journal of Finance 45 (1990): 321-350*

He Z. "A Model of Dynamic Compensation and Capital Structure," *Journal of Financial Economics* 100 (2011): 351-366.

Holderness C.G., Krosner R., Sheehan D. "Were the Good Old Days that Good? Changes in Managerial Stock Ownership Since the Great Depression". *Journal of Finance* 54 (1999): 435-469

Holderness C.G. "The Myth of Diffuse Ownership in the United Sates". *Review of Financial Studies* 22 (2009): 1377-1408.

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

Jensen M., Meckling W. "Theory of the Firm: Managerial Behaviour, Agency Costs, and Ownership Structure". *Journal of Financial Economics* 3 (1976): 305-60

Jensen G., Solberg D. and Zorn T. "Simultaneous Determination of Insider Ownership, Debt, and Dividend Policies". *Journal of Financial and Quantitative Analysis* 27 (1992): 247-263

John K., Kedia S. "Design of Corporate Governance: Role of Ownership Structure, Takeovers and Bank Debt", working paper, NYU, www.ssrn.com, (2006)

Jun S., Jung M., Walking R. "Share repurchase, executive options and wealth changes to stockholders and bondholders", *Journal of Corporate Finance* 15 (2009): 212-229

Kang J., Kim J. "Private Benefits of Control and Firm Leverage: An Analysis of Korean Firms". *Review of Quantitative Finance and Accounting* 27 (2006): 439-463

La Bruslerie, H. de "Does Debt Curb Controlling Shareholders' Private Benefits? Modelling in a Contingent Claim Framework". *Economic Modelling* 58 (2016): 263-282

La Porta R., Lopez-de-Silanes F., Shleifer A., and Vishny R. "Legal Determinants of External Finance". *Journal of Finance* 52 (1997): 1131-1150

La Porta R., Lopez-de-Silanes F., Shleifer A., and Vishny R. "Law and Finance". *Journal of Political Economy* 106 (1998): 1113-1150

La Porta R., Lopez-de-Silanes F., Shleifer A, and Vishny R. "Investor Protection and Corporate Valuation". *Journal of Finance* 57 (2002): 1147-1170

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

Leland H. "Corporate Debt Value, Bond Covenants, and Optimal Capital Structure". *Journal of Finance* 49(4) (1994): 1213-1252

Leuz C., Nanda D., Wysocki P. "Earnings Management and Investor Protection: An International Comparison". *Journal of Financial Economics* 69(3) (2003): 505-527

Liu H., Miao, J. "Managerial Preferences, Corporate Governance and Financial Structure", working paper, www.ssrn.com (2006)

Liu Q., Tian G. "Controlling Shareholder, Expropriation and Firm's Leverage Decision: Evidence from Chinese Non-tradable Share Reform" *Journal of Corporate Finance* 18 (2012): 782-803

Maxwell W., Stephens C., "The Wealth Effects of Repurchases on Bondholders", *Journal of Finance* 58 (2003): 895-919

Merton R. "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates". *Journal of Finance* 29(2) (1974): 449-470

Mikkelson W., Patch M. "Manager's Voting Rights and Corporate Control". *Journal of Financial Economics* 25 (1989): 263-290

Modigliani F., Perotti, E. "Security Versus Bank Finance: Legal enforcement and investors' protection", *International Review of Finance* 1(2) (2000):81-96

Moraux F., Navatte P. "Strategic Management of Private Benefits in a Contingent Claim Framework", *Bankers, Markets and Investors*, n°122 (2013): 48-56,

Morellec E. “Can Managerial Discretion Explain Observed Leverage Ratios?” *Review of Financial Studies* 17 (2004): 257-294.

Morellec E., Nikolov B., Schurhoff N. “Corporate Governance and Capital Structure Dynamics” *Journal of Finance* 67 (2012), 803-848

Myers S.C. “The Determinants of Corporate Borrowing,” *Journal of Financial Economics*, 5 (1977): 147-175.

Myers S.C., Majluf N.S. “Corporate Financing and Investment Decisions when Firms Have Information that Investors Do Not Have”. *Journal of Financial Economics* 20 (1984): 187-221.

Nielsen A. “Corporate Governance, Leverage and Dividend Policy”, EFA 2006 Zurich Meetings. Available at SSRN: http://ssrn.com/abstract=906339 (2006)

Paligorova T., Xu Z. “Complex Ownership and Capital Structure” *Journal of Corporate Finance* 18 (2012): 701-716

Qian M., Yeung Y. “Bank Financing and Corporate Governance” *Journal of Corporate Finance* 32 (2015): 258-270

Stulz R. “Managerial Control of Voting Rights: Financing Policies and the Market for Corporate Control”. *Journal of Financial Economics* 20 (1988): 25-54

Tarantino E. “Bankruptcy Law and Corporate Investment Decisions”. *Journal of Banking and Finance* 37(7) (2013): 2490-2500

Uhrig-Hombourg M. “Cash Flow Shortage as an Endogenous Bankruptcy Reason”. *Journal of Banking and Finance*, 29 (2005): 1509–1534

Young M.N., Peng N.W., Ahlstrom D., Bruton G.D., Jiang Y. “Corporate Governance in Emerging Economies: A review of the Principal-Principal Perspectives”. *Journal of Management Studies* 45 (2008); 197-220

Zhang G. “Ownership Concentration, Risk Aversion and the Effect of Financial Structure on Investment Decisions”. *European Economic Review* 42 (1998): 1751-1778

Appendix

Annex 1.1 Derivative of debt with regard to the coupon flow $\frac{dD}{dC}$

We rewrite *D(A)* (Equation (6) using Equation (11) which identifies A_b:

$$D(A) = \frac{C}{r} + \left[(1-l)\left(\frac{z}{1+z}\frac{(1-\tau)C}{r}\right) - \frac{C}{r}\right]\left(\frac{z}{1+z}\frac{(1-\tau)C}{rA}\right)^z$$

Rearranging

$$D(A) = \frac{C}{r} - \frac{C}{r}\left(\frac{C}{r}\right)^z\left[\frac{1+z(\tau+l(1-\tau))}{1+z}\right]\left(\frac{z}{1+z}\frac{(1-\tau)}{A}\right)^z \quad \text{(A1)}$$

The first order condition is:

$$\frac{dD}{dC} = sgn\left\{1 - \left(\frac{C}{r}\right)^z[1+z(\tau+l(1-\tau))]\left(\frac{z}{1+z}\frac{(1-\tau)}{A}\right)^z\right\}=0 \quad \text{(A1')}$$

Manipulation gives:

$$C^{max} = \frac{rA(1+z)}{z(1-\tau)}\left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z} \quad \text{(A2)}$$

A maximum affordable coupon exists maximizing the debt value is identified. Replacing (A2) in Equation (11) in the text gives the highest possible default threshold A_b^{max}. We can plug into Equation (6) the values C^{max} and A_b^{max} to get the maximum value of debt $D^{max}(C^{max}, A_b^{max})$:

$$D^{max} = \frac{C^{max}}{r}\left[1 - \left[\frac{1+z(\tau+l(1-\tau))}{1+z}\right]\left(\frac{A_b^{max}}{A}\right)^z\right]$$

with $A_b^{max} = \frac{z}{1+z}\frac{(1-\tau)C^{max}}{r}$.

Using (A2) gives:

$$D^{max}$$

$$= \frac{A(1+z)}{z(1-\tau)}\left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z}$$

$$- \frac{A(1+z)}{z(1-\tau)}\left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z}\left(\left(\frac{A(1+z)}{z(1-\tau)}\right)^z\left[\frac{1}{1+z(\tau+l(1-\tau))}\right]\right)\left[\frac{1+z(\tau+l(1-\tau))}{1+z}\right]\left(\frac{z}{1+z}\frac{(1-\tau)}{A}\right)^z$$

It simplifies to:

$$D^{max} = \frac{A}{(1-\tau)}\left[\frac{1}{1+z(\tau+l(1-\tau))}\right]^{1/z} \quad \text{(A3)}$$

Annex 1.2. Derivative $\frac{dD}{dz}$

We first recall the sign of the partial derivatives of $z = z(\eta, \gamma, \sigma^2)$: $\frac{dz}{d\eta} > 0$, conversely z decreases with the appropriation ratio $\frac{dz}{d\gamma} < 0$.

The derivative $\frac{dA_b}{dz} = sgn\frac{1}{(1+z)^2} > 0$. The risk neutral probability of default $\left(\frac{A_b}{A}\right)^z$ increases with *z*.

Starting from (A1):

$$\frac{dD(z)}{dz} = sgn\frac{d\left[-\frac{C}{r}f(z)\right]}{dz} \text{ with } f(z) = \left[\frac{1+z(\tau+l(1-\tau))}{1+z}\right]\left(\frac{z}{1+z}\frac{(1-\tau)}{A}\frac{C}{r}\right)^z \quad \text{(A4)}$$

We consider *h'(z)* the log-derivative of :

$$h(z) = \log\big(f(z)\big) = \log\Big(1 + z\big(\tau + l(1-\tau)\big)\Big) - \log(1+z) + z\log\left(\frac{A_b}{A}\right)$$

The derivative *h'(z)* has the sign of:

$$h'(z) = \frac{\big(\tau + l(1-\tau)\big) - 1}{\Big(1 + z\big(\tau + l(1-\tau)\big)\Big)(1+z)} + \log(\frac{A_b}{A})$$

Recalling the negative sign of $(-\frac{C}{r})$ in Equation (A4), the derivative of debt versus *z* is negative when

$$A_b exp\left(\frac{(\tau+l(1-\tau))-1}{\big(1+z(\tau+l(1-\tau))\big)(1+z)}\right) \geq A \quad \text{(A5)}$$

Annex 1.3 Outside shareholders

We consider Eq (10) in the text and replace A_b with Equation (11) in the text.

$\frac{dE}{dz} = sgn\frac{d[f(z)]}{dz}$ with $f(z) = \left[\frac{(1-\tau)C}{r} - \frac{z}{1+z}(1-\tau)\frac{C}{r}\right]\left(\frac{z}{1+z}\frac{(1-\tau)}{A}\frac{C}{r}\right)^z$

It has the same sign as: $f(z) = \left[\frac{1}{1+z}\right]\left(\frac{z}{1+z}\frac{(1-\tau)}{A}\frac{C}{r}\right)^z$

We consider *h'(z)* the log-derivative of

$$h(z) = \log\big(f(z)\big) = \log\left(\frac{1}{1+z}\right) + z\log\left(\frac{A_b}{A}\right)$$

$$h'(z) = -\frac{1}{1+z} + \log\left(\frac{A_b}{A}\right)$$

As $A_b < A$, the last term is negative and *h'(z)* also is. The derivative of equity value is negative with regard to *z*.

The derivative of equity versus *C* is given by Equation (10) in the text. Recalling that $A_b < A$:

$\frac{dE}{dC} = sgn\big(f(C)\big)$ with $f(C) = -\frac{(1-\tau)C}{r} + \left[\frac{(1-\tau)C}{r} - \frac{z}{1+z}(1-\tau)\frac{C}{r}\right]\left(\frac{A}{A_b}\right)^{-z}$

$$f(C) = \frac{(1-\tau)C}{r}\left[-1 + \left(1 - \frac{z}{1+z}\right)\left(\frac{A}{A_b}\right)^{-z}\right] \quad \text{(A6)}$$

The sign of the derivative is given by:

$$sgn(f'(C)) = \left[-1 + \left(\frac{1}{1+z}\right)\left(\frac{A}{A_b}\right)^{-z}\right]$$

This expression is positive if: $\left(\frac{A_b}{A}\right)^{z} > 1 + z$

The derivative $\frac{dE}{dC}$ is positive if the following condition is satisfied:

$$A < A_b(1+z)^z \quad \text{(A7)}$$

Annex 1.4 Controlling shareholder

Starting from Eq. (12) in the text and integrating the incentivization relationship $\eta = a_1\gamma$

$$PB(A) = \frac{a_1\gamma^2 A}{r} - \frac{a_1\gamma^2 A_b}{r}\left(\frac{A_b}{A}\right)^{z} = \frac{a_1\gamma^2}{r}\left[A - A_b\left(\frac{A_b}{A}\right)^{z}\right]$$

The derivative is :

$$\frac{dPB}{d\gamma} = \frac{2a_1\gamma}{r}\left[A - A_b\left(\frac{A_b}{A}\right)^{z}\right] > 0 \quad \text{(A8)}$$

The term between brackets in Eq. A7 is positive as $A > A_b$

Equation (13) in the text identifies the controller's wealth

$\frac{dw_c}{dC} = \frac{d[\alpha E + PB]}{dC} = sgn\frac{df(C)}{dC}$

with $f(C) = \alpha\left\{\frac{(1-\tau)C}{r}\left[-1 + \left(1 - \frac{z}{1+z}\right)\left(\frac{A}{A_b}\right)^{-z}\right]\right\} - \frac{\eta\gamma A_b}{r}\left(\frac{A_b}{A}\right)^{z}$

$$f(C) = \alpha\left\{\frac{(1-\tau)C}{r}\left[-1+\left(1-\frac{z}{1+z}\right)\left(\frac{A}{A_b}\right)^{-z}\right]\right\} - \frac{\eta\gamma}{r}\left(\frac{z}{1+z}(1-\tau)\frac{C}{r}\right)\left(\frac{A_b}{A}\right)^{z}$$

The derivative is:

$$f'(C) = sgn\left\{\alpha\left\{\left[-1+\left(\frac{1}{1+z}\right)\left(\frac{A}{A_b}\right)^{-z}\right]\right\} - \frac{\eta\gamma}{r}\left(\frac{z}{1+z}\right)\left(\frac{A_b}{A}\right)^{z}\right\}$$

$$f'(C) = sgn\left\{-\alpha + \left[\alpha\left(\frac{1}{1+z}\right) - \frac{\eta\gamma}{r}\left(\frac{z}{1+z}\right)\right]\left(\frac{A_b}{A}\right)^{z}\right\} \quad \text{(A9)}$$

The derivative $\frac{dw_c}{dC}$ is positive if:

$$\left(\frac{A_b}{A}\right)^{z} > \frac{\alpha}{\left[\alpha\left(\frac{1}{1+z}\right) - \frac{\eta\gamma}{r}\left(\frac{z}{1+z}\right)\right]}$$

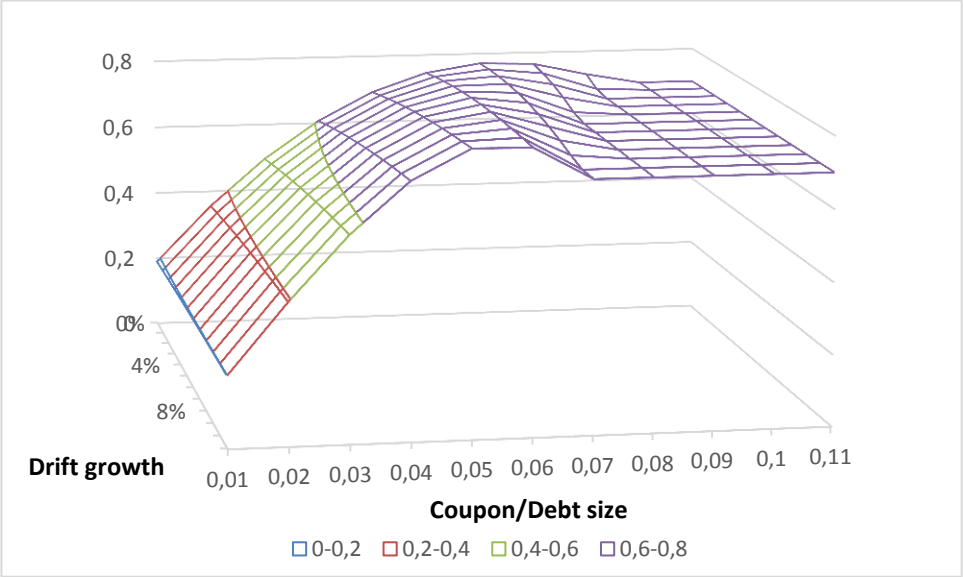
$$A < A_b\left[\frac{\alpha(1+z)}{\alpha - \frac{\eta\gamma}{r}}\right]^{z} \quad \text{(A10)}$$

The crossed derivative with regard to α obtains from (A9). It refers to the leverage threshold for outside investors set by Equation (A7).

$$\frac{d^2 w_C}{dC.d\alpha} = sgn\left\{-1+\left(\frac{1}{1+z}\right)\left(\frac{A_b}{A}\right)^{z}\right\} \quad \text{(A11)}$$

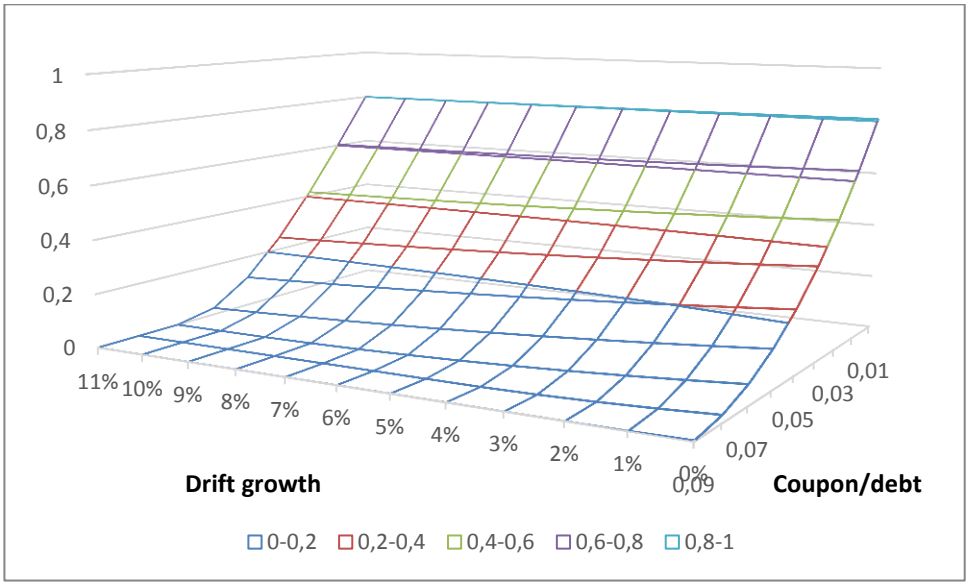
If $\left(\frac{A_b}{A}\right)^{z} > 1+z$ the cross derivative is positive. This is condition (A7) making $\frac{dE}{dC}$ is positive.

It means that for debt level $\lambda > \lambda^*$ giving a positive derivative $\frac{dE}{dC}$ for outside investors, the positive relationship is enhanced with α. The controlling shareholder is encouraged to hold more shares. In coping with the debt holdup problem he manages his wealth but in the same time his interest is aligned with the outside investors' interest.



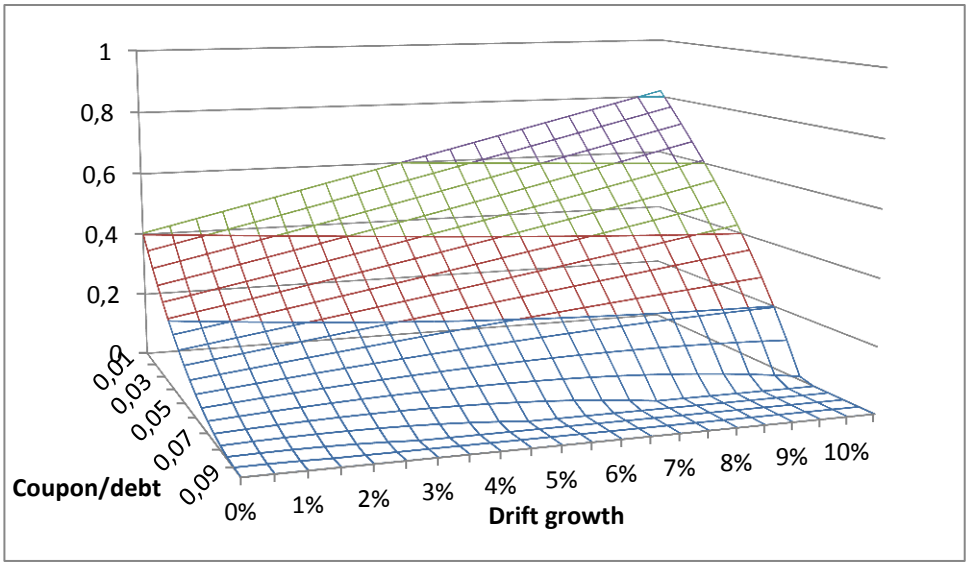
Graph 1 Debt Value

Coupon flow varying from 0.01 to 0.11, drift growth rate is additional drift η varying from 0% to 11%, asset A=1, risk free rate r =5%, volatility of the firm's assets σ =30%, corporate tax rate τ=0%, bankruptcy cost l=30%, appropriation rate γ=0.1



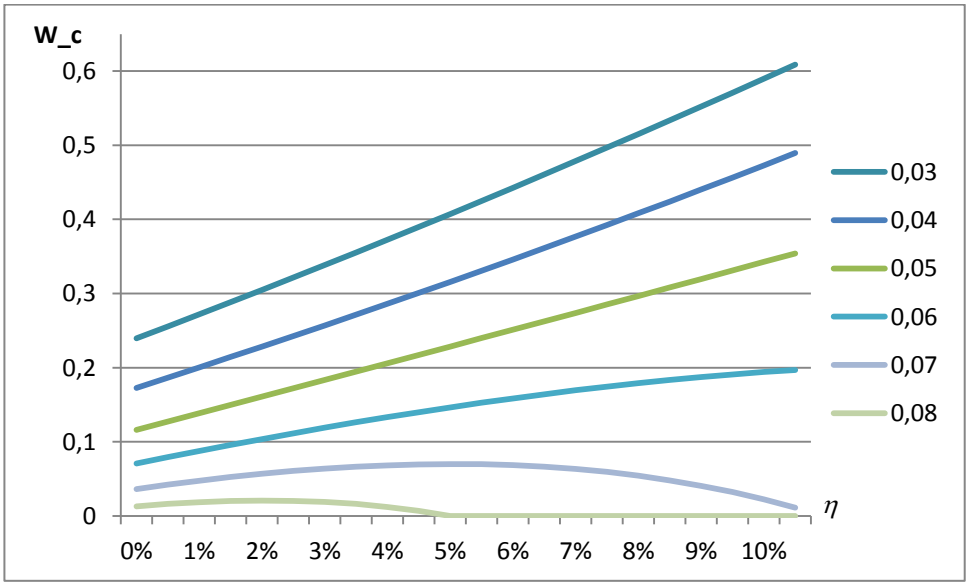
Graph 2 Equity value

Coupon flow varying from 0.01 to 0.11, growth rate is additional drift η varying from 0% to 11%, asset A=1, risk free rate r =5%, volatility of the firm's assets σ =30%, corporate tax rate τ=0%, bankruptcy cost l=30%, appropriation rate γ=0.1



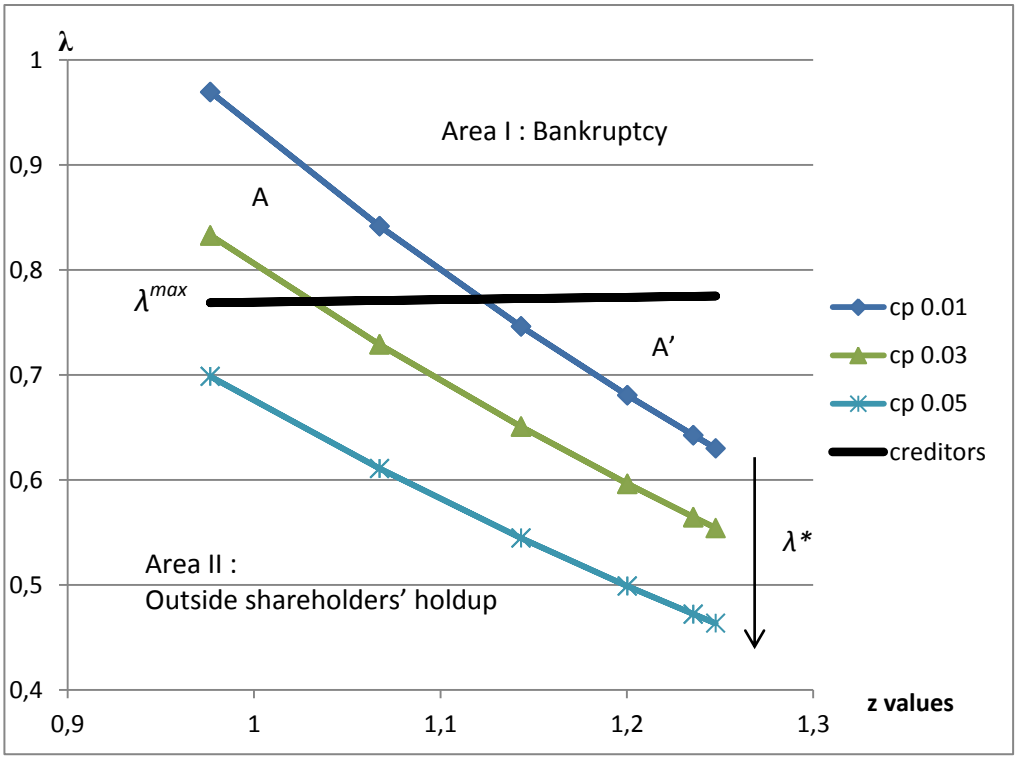
Graph 3 Controlling shareholder's wealth

Coupon flow varying from 1% to 11%; growth rate is additional drift η varying from 0% to 11%; asset A=1; risk free rate r =5%; volatility of the firm's assets σ =30%; corporate tax rate τ=0%; bankruptcy cost l=30%; appropriation rate γ=0.1; ownership α=50%



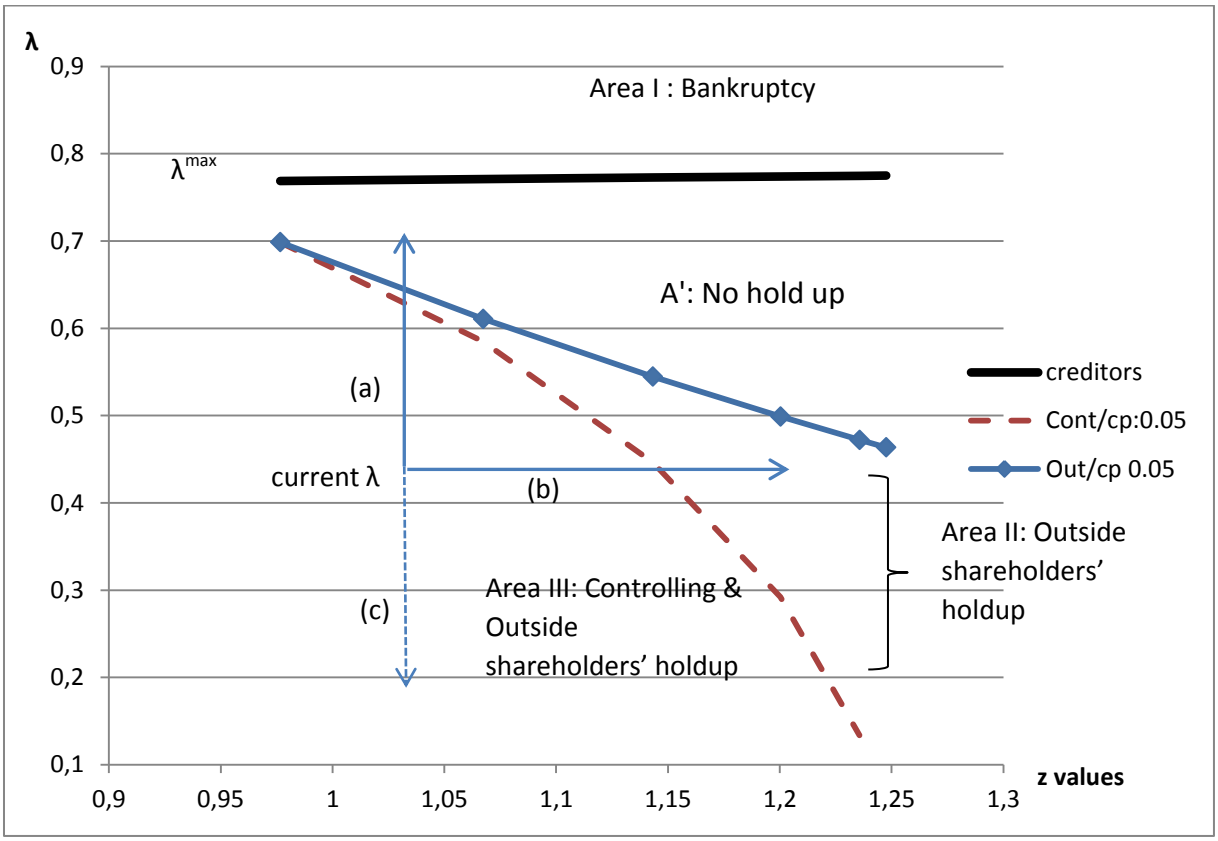
Graph 4 Controlling shareholder wealth curves for different coupon levels

Curves correspond to coupon flow from 0.03 to 0.08, horizontal axe is additional drift η varying from 0% to 11%; assets A=1, risk free rate r=5%, volatility of the firm's assets σ =30%, corporate tax rate τ =0%, bankruptcy cost l= 30%, appropriation rate γ=0.2, ownership α=50%



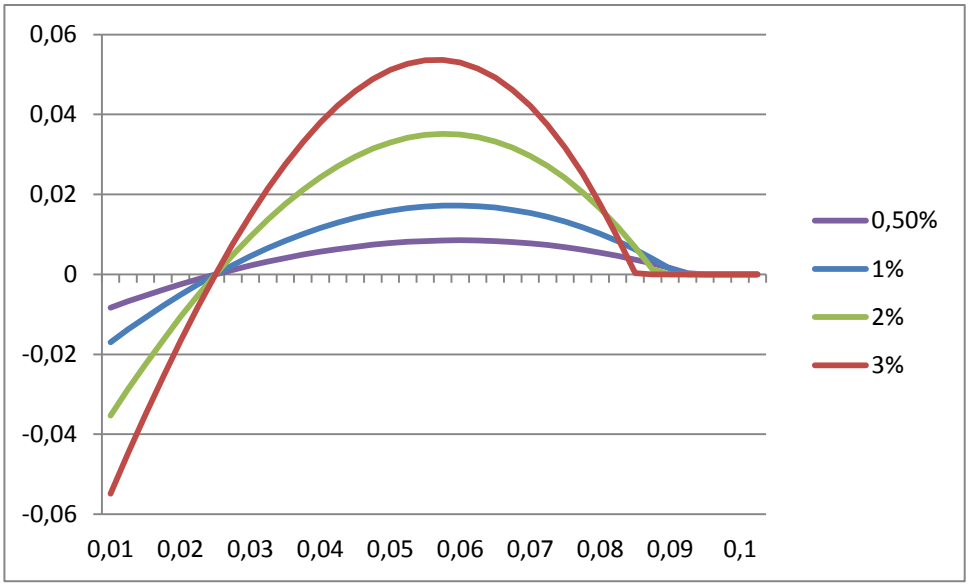
Graph 5 Creditors' optimal wealth curve and outside shareholders' holdup curves

(Above the creditors λ^{max} optimal curve, the derivative of the creditors' debt value versus the paid coupon rate is negative; λ^* are threshold curves above which the outside shareholders' wealth derivative with regard to the coupon rate is positive; cp: coupon flow 0.01 to 0.05; horizontal axe are z values determined with the following set of parameters: assets A=1, risk free rate r=5%, volatility of the firm's assets σ =32%, corporate tax rate τ =0%, bankruptcy cost l= 30%, appropriation rate γ varying from 0% to 100%, coefficient a_1=0.10, additional drift $\eta = a_1 \gamma$, ownership α=0.50; vertical axe are the values of the leverage ratio $\lambda = D/A$ with A firm's asset value set to 1; D is debt value according to Equation (6) in the text)



Graph 6 Limit thresholds for positive wealth derivatives versus the coupon rate- Controlling and outside shareholders

(plain line: outside shareholders' threshold above which the wealth derivative is positive; dashed line: controlling shareholder's threshold above which the wealth derivative is positive; above the creditors λ^{max} optimal curve, the derivative of the creditors' debt value versus the paid coupon rate is negatives; λ^* are threshold curves above which the outside shareholders' wealth derivative with regard to the coupon rate is positive; cp: coupon flow is 0.05; horizontal axe are z values determined with the following set of parameters: assets A=1, risk free rate r: 5%, volatility of the firm's assets σ =32%, corporate tax rate τ =0%, bankruptcy cost l= 30%, appropriation rate γ varying from 0% to 100%, coefficient a_1=0.10, additional drift $\eta = a_1 \gamma$, ownership α=50%; vertical axe are the values of the leverage ratio $\lambda = D/A$ with A firm's asset value set to 1; D is debt value according to Equation (6) in the text)



Graph 7 Difference in the controlling shareholder wealth in PB and SO compensation schemes

PB: private benefits; SO: stock options; vertical axe: difference w_{PB} - w_{SO}, horizontal axe: coupon flows varying from 0.01 to 0.10, additional drift η taking the values 0.5%, 1%, 2% and 3%; asset A=1, ownership α= 50%, PB scheme: appropriation rate γ: 0.2; incentive values of the SO contract α' is set at 53.5%, 57,0%, 64,3%, 71.7% compared with an initial equity stake α=50%, respectively for each of the η values 0.5%, 1%, 2% and 3%; risk free rate r=5%, volatility of the firm's assets σ= 30%, corporate tax rate τ=0%, bankruptcy cost l=30%, no monitoring costs.

Panel A					
	Before M&A	Before (only firm present After)	After M&A	Variation	
LEVERAGE	0.4451 N:234	0.5719 N:79	0.5783 N:79	+0.0063 N:79	p:0.47
VAR_DEBT%	3849.1 N:304	6499.7 N:122	14160.5 N:122	+613.2% N:122	p:0.00***
EBITDA_OV_ASSET	-0.5019 N:152	-1.4730 N:121	0.1253 N:121	+1.5983% N:121	p:0.11
VAR_EBITDA%	719.7 N:305	717.1 N:123	854.8 N:123	+99.3% N:123	p:0.00***
Panel B					
				Correlation	t-test
Correlation (LEVERAGE,EBITDA OV_ASSET)				-0.04	0.46
Correlation (VAR_DEBT%,VAR_EBITDA%)				0.30	2.98***
Correlation (VAR_DEBT%,VAR_EBITDA%) (+/-1year)				0.35	3.62***

Table 1 - Targets firms - Variation in debt and economic profitability over the M&A transactions

(Targets firms after a completed M&A occurring during the calendar year N; US and European firms; period 2000- 2014; basic sample: 558 firms; variables are averaged over the "Before" subperiod N-2 and N-1, i.e. two calendar years precedent the transaction date; "After" subperiod: variables are averaged over the subperiod after N+1 and N+2; LEVERAGE : Total debt over total invested capital in book value; EBITDA_OV_ASSET: ratio of firm's Ebitda divided by total assets; VAR_DEBT%: variation in percentage of target's total debt in million USD over the before subperiod and the after subperiod, total debt in million USD; VAR_EBITDA%: variation in percentage of EBITDA over the "before" and the "after" subperiod, Ebitda in million USD; VAR_EBITDA(+/-1year): variation of EBITDA between the calendar year N-1 and N+1 around the transaction)