Debt, private benefits, and corporate governance: An analysis in an option valuation framework

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Abstract

Debt is not frequently analyzed in relation to the conflict between controlling and outside shareholders. At the same time, debt helps to manage the type II corporate agency conflicts because it is easier for controlling shareholders to modify the leverage ratio than to modify their share of capital. A simple model is used to show that debt appears to be a key governance variable because it can moderate private benefits or, conversely, may aid diversion. It is argued in this paper that a self-regulation mechanism may develop even in the situation of control by a dominant shareholder. The joint questions of ownership, private benefits, and debt levels are linked. At low levels of debt, debt is relatively less disciplinary compared with a no private benefit case. When debt exceeds a certain threshold point, it becomes strongly disciplinary. Thus, a self-regulation mechanism develops where the controlling shareholder is incentivized to hold a larger equity stake when he/she wants to increase his/her private appropriation rate.

JEL: G3/ G32/G34

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INTRODUCTION

Recent empirical studies in corporate governance show the prevalence of firms with a dominant shareholder (La Porta et al., 1997, 1998, 1999, 2002; Faccio et al., 2002, 2003). This situation is quite common in Europe. Even in the U.S. 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.

This situation can potentially impact a firm’s financing decisions, particularly choices regarding leverage. However, our understanding of the relationship between dominant shareholder ownership and firm debt levels is somewhat limited. The capital structure literature has largely addressed the relationship between manager’s ownership and debt levels for firms with diffused ownership. Another line of research has investigated how the separation of cash flow rights and control rights affects capital structure. Our motivation is different; we explore the impact of the outside shareholders’ expropriation risk on debt levels. Debt may be seen as an expropriation device similar to control enhancement mechanisms. Debt as in Jensen’s (1986) framework may also be considered as a disciplinary tool. We develop a simple theoretical relation between controlling shareholders’ ownership, private benefits, and corporate debt levels. This paper highlights a self-regulated relationship between debt levels and controlling shareholders’ capital. On the one hand, the controlling shareholder is incentivized to increase
debt in order to dominate more of the firms’ resources. On the other hand, high levels of ownership of cash flow rights may lead the controlling shareholders to moderate leverage to reduce the risk of bankruptcy. Capital structure decisions depend on the trade-off between the non-dilution entrenchment needs of controlling shareholders and their goal of reducing firm risk. Similarly 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, and the second is the choice of debt structure. Both are linked in a financial governance framework.

Our study contributes to the extant literature on the relationship between ownership, 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). 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. Such an approach is not common in the literature. In the context of dominant control ownership, we show that the debt level decision is of utmost importance and this decision interacts with ownership stake leverage. We determine a threshold point debt level below which debt is moderately disciplinary and relatively helps private appropriation. Above that, level debt *per se* applies an enhanced disciplinary pressure on the controlling shareholder. A self-regulation mechanism is identified which constrains the appropriation of private benefits as the controlling shareholder is incentivized to hold a larger stake of equity capital.

The remainder of this paper is organized as follows. Section 1 reviews the literature related to the topic. Section 2 presents the hypotheses and proposes a theoretical model and
determines the controlling shareholder’s wealth. Section 3 analyzes the effect of debt on the wealth of the controlling shareholder and identifies a disciplinary role. A conclusion follows.

1. **Review of the literature**

Links between corporate governance and debt were first identified by Jensen and Meckling (1976). Capital structure is not solely explained by shareholders’ value maximization. A first approach analyzes debt in the traditional agency conflict between managers and shareholders in which the managers are willing to entrench. Debt increases when the pressure of controlling or majority shareholders develops. The conclusions are twofold. On the one hand, Stulz (1988) and Harris and Raviv (1988) have suggested that debt is positively related to managers’ equity ownership. Hence, managers or controlling shareholders may use debt to inflate their voting power and reduce the discipline of the market for corporate control. On the other hand, some empirical studies confirm that the managers’ equity ownership negatively affects the firm’s debt level (Jensen, Solberg and Zorn, 1992). Indeed, when managers hold a large stake of the firm’s capital, they become less diversified, which may cause them to reduce debt levels in order to limit the default risk. These diverging results have shifted the focus toward the possibility of a nonlinear relationship between ownership structure and indebtedness. Mikkelsen and Partch (1989) found a negative relationship between inside ownership and leverage. Holderness et al. (1999) found no relationship and showed that managerial stock ownership does not increase with leverage ratio. Brailsford, Oliver, and Pua (2002) proposed an empirical model that highlights a nonlinear relation between the percentage of capital held by managers and debt levels.
Controlling ownership enlarges the above analyses which focus mainly on agency conflicts with managers. Private benefits are a key variable. They are at the same time the symptom, the goal, and the regulating variable of the conflict between controlling shareholder and outside investors. Private benefits introduce a long-term perspective and an implicit agency relationship develops through time. Their 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) have provided evidence of private benefits when trades of blocks are set at a premium compared with market price. The characteristics of private benefits appropriation have been empirically studied by Leuz et al. (2002) and Liu et al. (2002). In an international comparison, Bhattacharya et al. (2002, 2003) were also led to the conclusion of the existence of private benefits for controlling shareholders. The empirical relation between private benefits and leverage has been analyzed in relatively few papers (except Kang and Kim, 2006)

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 managers-shareholders conflict, debt is seen as a disciplinary device limiting 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 controlling shareholders and to expropriate further outside shareholders. The role of debt in the conflict between controlling and outside shareholders will involve 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
will interfere with the process of appropriating private earnings. As mentioned, the literature on the role of debt on private benefits is not extremely large. 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 default of payment transfers the control from the borrower to the lender (Grossman and Hart, 1982 or 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, Heinrich, 2000). Debt enhances the economic power of the controlling shareholders without modifying the structure of ownership (Ellul, 2008). This has been particularly highlighted in European family firms (Croci et al, 2010). Considering U.S. 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), Filatotchev et al. (2001), and Almeida and Wolfenzon (2005) have addressed the problem of debt levels within the context of the controlling-outside shareholders’ conflict and information asymmetry. In addition, relationships between precision in accounting and debt levels have been analyzed by Feltham et al. (2007). In a continuous-time setting, Liu and Miao (2006) examined the controlling shareholders’ optimal choice of capital structure. The interaction between debt and ownership structure has been analyzed in a global governance framework by John and Khedia (2006).

The goal of the model standing from the controlling shareholder’s point of view is to see whether debt modifies the equilibrium terms of his/her control contract with outside investors. We assume that such a contract exists first.
2. The model

We refer to the option theory of the firm as introduced by Merton (1974). Creditors, controlling shareholder and outside investors have claims on the firm’s assets. At time t=0 the firm has economic assets $A_0$. The market is complete and these assets are tradable. Their value follows a geometric Brownian motion:

$$\frac{dA}{A} = \mu dt + \sigma dz$$  \hspace{1cm} (1)

At inception, the firm comprises equity $E$ and debt $D$ belonging respectively to shareholders and lenders.

$$A_0 = E_0 + D_0$$  \hspace{1cm} (2)

Some shareholders will divert private benefits. Globally considered from the lender’s point of view, these benefits are appropriated by the shareholders because of contractual relationship between a controlling shareholder and other minority investors. These private benefits rank after the debts payment.

We introduce a future date $T$. The future (accrued) debt value is:

$$D_T = D_0 e^{r_s T}$$  \hspace{1cm} (3)

$r_s$ : interest rate of the risky debt

$r$ : risk free rate ($r_s > r$)

The future private benefits $B_T$ are diverted by the (controlling) shareholder after debt payment. Creditor’s debt is a senior debt and private benefits are similar to a junior debt\(^1\). Equity

\(^1\) The seniority of debt compared with private benefits is not an obvious one period game with a unique T ending date. However, in multi period game, if the controlling shareholder expropriates lenders by seizing first the assets of the firm, lenders will anticipate it and by forward induction they will integrate the costs of such a behavior. An agency conflict between the controlling shareholder and lenders may develop. The present paper will only consider the agency conflict between controlling shareholder and outside investors. Therefore, we ignore moral hazard with lenders. It is common knowledge that creditors have first rank on the firm’s assets. The controlling shareholder will
holders are last resort creditors. The economic value of the assets gives the equity value at time $T$:  

$$A_T = E_T + B_T + D_T$$  \hspace{1cm} (4)\]

Implicitly, lenders and minor investors will accept this situation. We assume that an implicit contract is ex ante agreed between minor investors and the controlling investor. Equation (4) is termed in economic value. The accounting balance sheet shows other values. One term of this implicit contract is that the drift in creation of value is a positive function of the private benefits appropriated by the controlling shareholder:

$$\mu = \mu(B_T) \text{ with } \frac{d\mu}{dB_T} > 0$$  \hspace{1cm} (5)\]

Modeling claims in an option framework implies the no-arbitrage condition to hold in a complete market where asset $A$ is tradable. So a risk neutral valuation may develop and the reference to $\mu(.)$ will disappear in the valuation. As a consequence, we do not need to make explicit this function. We know that such a function exists and allows an implicit contract of private benefits between minor and controlling shareholders. The former know that the controlling investor is incentivized by private benefits and that these benefits increase with the economic value of the firm.

How are private benefits calculated? Private benefits are levied by the controlling investors before displaying public profit. The controlling shareholder will divert considering the

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2 As a consequence of the time $T$ equality between assets and liabilities, $A_T$ is observable and has public value. The owners of $D_T$ and $E_T$ (among them minor investors) knowing $A_T$ will identify accumulated value of private benefits...that are no more private.
economic value available after the lender’s reimbursement. The private benefits rank first before the minor investors’ payment. A model of sharing private benefits will link them the total future economic value \( A_T \) because the incentive to create future value operates through the slope of the drift in \( dA/A \). Private benefits are a proportion of the future value \( A_T \):

\[
B_T = bA_T \quad \text{with} \quad 0 < b < 1 
\]  

(6)

Equation (6) applies only if the uncertain value of economic asset is high enough to pay the debt amount \( B_T \). Given this condition:

\[
A_T > B_T + D_T \iff A_T > \frac{1}{(1-b)} D_T 
\]

(6’)

Hence, the equity value to any shareholders is \((1-b)A_T - D_T\). If the condition (6’) is not satisfied, the economic value is not enough to get the agreed amount, \( bA_T \), then the controlling shareholder rank before the public investors (including himself) and gets \( A_T - D_T \). The Table 1 presents the pay-offs at time T. Private benefits are similar to some hybrid financing. It has some equity feature when the controlling shareholder gets the whole net worth. It has some participative creditor characteristics when a proportional tax is levied.

<table>
<thead>
<tr>
<th>Future Value of ( A_T )</th>
<th>( A_T &lt; D_T )</th>
<th>( D_T &lt; A_T &lt; \frac{1}{(1-b)} D_T )</th>
<th>( A_T &gt; \frac{1}{(1-b)} D_T )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public shareholders</td>
<td>0</td>
<td>0</td>
<td>((1 - b)A_T - D_T)</td>
</tr>
<tr>
<td>Private benefits</td>
<td>0</td>
<td>( A_T - D_T )</td>
<td>( bA_T )</td>
</tr>
<tr>
<td>Lenders</td>
<td>( A_T )</td>
<td>( D_T )</td>
<td>( D_T )</td>
</tr>
<tr>
<td>Total Economic Value</td>
<td>( A_T )</td>
<td>( A_T )</td>
<td>( A_T )</td>
</tr>
</tbody>
</table>
Table 1 Pay-offs with private benefits at time T

Other alternative modeling of private benefits may be designed. However, they will not be ex ante acceptable by the parties.

- If private benefits constitute a future debt which ranks below standard debt and accrues at a specific interest rate \( r_j \), we get \( B_T = A_0 b e^{r_j T} \). This future debt has certain future value and is a pure junior type debt which has no incentive feature. The amount is independent from \( A_T \) and as such does not depend on the drift in value creation. Here, this amount is certain because we have finite horizon \( T \).

- If private benefits are a specific share of the net worth after debt repayment, they will appear to be a specific right given to a specific category of shareholders. However, this right does not have priority rank within the shareholder group. In such an approach we have \( B_T = b(A_T - D_T) \) only if \( A_T > D_T \), and is zero elsewhere. In that framework private benefit reduces to a sharing rule within the net worth cake. It does not change anything for external creditors and the incentive of the controlling shareholder is to get a more than proportional share of the cake. This modeling can be ex ante sustainable for both parties and shareholders as a whole group are compensated by the net worth. Equity considered globally is a call option whose valuation relies simply on the standard Merton model. However, this modeling is poor for final values of \( AT \) lower than \( D_T \), which gives a zero wealth value for any shareholder. In the same range, diverting private benefit will be set at \( b A_T \) and stay positive. Therefore, to be considered equally, this sharing rule should lead to an ex post appropriation rate \( b' > b \). A further remark to add is
that this appropriation scheme is no longer private but public as the controlling
shareholder stands equally with other shareholders to share the equity cake.

2.1-Equity and debt valuations

We use the Merton (1974) option valuation model to obtain the equity value. This model
can be adapted to suit junior claims (Deffains-Crapsky, 1998). Following Table 1, the equity
value is a call option on a percentage \((1-b)\) of the firm’s assets with an exercise price \(D_T\).

\[
E_0 = (1 - b)A_0\mathcal{N}(\hat{d}_1) - D_T e^{-rT}\mathcal{N}(\hat{d}_2)
\]

(7)

\[
\hat{d}_1 = \frac{\ln \left( \frac{A_0 (1-b)}{D_T} + \frac{1}{2} \sigma^2 \right) + rT}{\sigma \sqrt{T}} \text{ and } \hat{d}_2 = \hat{d}_1 - \sigma \sqrt{T}
\]

Classically, the risky debt \(D_0\) has a value equal to the nominal value of a non-risky debt \(D_T\) minus
the price of a put option. The exercise price is \(D_T\).

\[
D_0 = [D_T e^{-rT}\mathcal{N}(d_2) + A_0\mathcal{N}(-d_1)]
\]

(8)

\[
d_1 = \frac{\ln \left( D_T + \frac{1}{2} \sigma^2 \right) + rT}{\sigma \sqrt{T}} \text{ and } d_2 = d_1 - \sigma \sqrt{T}
\]

\(\mathcal{N}(d_2)\) in Equation (8) is the probability of a non-default by the firm. The term \(\mathcal{N}(\hat{d}_2)\) in
Equation (7) is the risk neutral probability for the shareholders to exercise the call option. As
\(\hat{d}_1 < d_1\) and \(\hat{d}_2 < d_2\), we know that \(\mathcal{N}(\hat{d}_2) < \mathcal{N}(d_2)\). The probability of a non-default is higher
than the probability of a positive equity value for the shareholders. The difference \(\mathcal{N}(d_2) - \mathcal{N}(\hat{d}_2)\) is the probability for the controlling shareholder to be paid only through private benefits.

2.2-Private benefits valuation
The present value of private benefits $B_0$ is equivalent to a call option to buy the asset exercisable at $D_T$ and selling of a call for an amount $(1 - b)A_0$ exercisable at $D_T$. This yields:

$$B_0 = [A_0 \mathcal{N}(d_1) - D_T e^{-rT} \mathcal{N}(d_2)] - [(1 - b)A_0 \mathcal{N}(\hat{d}_1) - D_T e^{-rT} \mathcal{N}(\hat{d}_2)]$$

$$B_0 = A_0 [\mathcal{N}(d_1) - (1 - b)\mathcal{N}(\hat{d}_1)] - D_T e^{-rT} [\mathcal{N}(d_2) - \mathcal{N}(\hat{d}_2)] \quad (9)$$

We see that the private benefits have a present value at time 0. It is identified by the shareholders. They know $A_0$. So we have $A_0 = E_0 + B_0 + D_0$ as an equality of economic values. $E_0$ and $D_0$ are claims which can be traded. $B_0$ is not tradable as it is implicit.

**Analysis of the derivatives**

Calling $\mathcal{N}'(.)$ the derivative of $\mathcal{N}(.)$, we know that:

$$A_0 \mathcal{N}'(d_1) = D_T e^{-rT} \mathcal{N}'(d_2)$$

$$(1 - b)A_0 \mathcal{N}'(\hat{d}_1) = D_T e^{-rT} \mathcal{N}'(\hat{d}_2)$$

**Derivative versus A**

The derivative of private benefits versus the value of the economic assets is:

$$\frac{\partial B_0}{\partial A_0} = [\mathcal{N}(d_1) - (1 - b)\mathcal{N}(\hat{d}_1)] + \frac{A_0}{A_0 \sigma \sqrt{T}} [\mathcal{N}'(d_1) - (1 - b)\mathcal{N}'(\hat{d}_1)] - \frac{D_T e^{-rT}}{A_0 \sigma \sqrt{T}} [\mathcal{N}'(d_2) - \mathcal{N}'(\hat{d}_2)] = [\mathcal{N}(d_1) - (1 - b)\mathcal{N}(\hat{d}_1)] > 0 \quad (10)$$

We recall that $\mathcal{N}(d_1) > \mathcal{N}(\hat{d}_1)$. The derivative of private benefits is strictly increasing with the value of the firm’s assets. This is common sense as they are levied as a proportion of these assets.

$$\frac{\partial^2 B_0}{\partial A_0^2} = \frac{1}{\sqrt{2\pi} A_0 \sigma \sqrt{T}} \left[e^{-\frac{1}{2}d_1^2} - (1 - b)e^{-\frac{1}{2}\hat{d}_1^2}\right] \quad (11)$$
We recall that $\hat{d}_1 = d_1 + \frac{\ln(1-b)}{\sigma \sqrt{T}}$. The sign of the bracket in Equation (11) is undetermined. There is an inflexion point if the second derivative cancels and satisfies:

$$\frac{1}{2} d_1^2 = \ln(1 - b) - \frac{1}{2} \hat{d}_1^2$$

The condition $d_1^2 = \hat{d}_1^2 - 2 \ln(1 - b)$ defines the inflexion point. Using the values for $d_1, \hat{d}_1$, we get:

$$\left[ \frac{\ln \frac{A_0}{D_T} + (r + \frac{1}{2} \sigma^2) T}{\sigma \sqrt{T}} \right]^2 = \left[ \frac{\ln \frac{A_0}{D_T} + (r + \frac{1}{2} \sigma^2) T}{\sigma \sqrt{T}} \right]^2 - 2 \ln(1 - b)$$

Simplifying:

$$[\ln(1 - b)]^2 + 2 \ln(1 - b) \left[ \ln \frac{A_0}{D_T} + (r + \frac{1}{2} \sigma^2) T \right] - 2 \ln(1 - b) \sigma^2 T = 0$$

We get an inflexion value $A^*$ such that:

$$A^* = D_T \exp \left[ -\frac{1}{2} \ln(1 - b) - \left( r - \frac{1}{2} \sigma^2 \right) T \right]$$

(12)

If $\left[ -\frac{1}{2} \ln(1 - b) - \left( r - \frac{1}{2} \sigma^2 \right) T \right] > 0$ then $A^* > D_T$. The inflexion point $A^*$ is below or above $D_T$ according to $\sigma$ and $b$. The increase of $B_T$ with $A$ is not continuously uniform. Private benefits are not similar to a simple call on asset. We have $\frac{dA^*}{db} = -\frac{1}{2} \left( -\frac{1}{1-b} \right) \exp[.] > 0$. The higher is $b$, the higher is the inflexion point and the private benefits become more a simple call on assets.
Figure 1 Private benefits and firm’s asset value

Derivatives versus debt

The derivative of private benefits versus the debt value:

\[
\frac{\partial B_0}{\partial D_T} = -e^{-rT} \left[ \mathcal{N}(d_2) - \mathcal{N}(\hat{d}_2) \right] + \frac{\Lambda_0}{\sigma \sqrt{T}} \left( -\frac{1}{D_T} \right) \left[ \mathcal{N}'(d_1) - (1 - b) \mathcal{N}'(\hat{d}_1) \right]
\]

\[
-\frac{D_T e^{-rT}}{\sigma \sqrt{T}} \left( -\frac{1}{D_T} \right) \left[ \mathcal{N}'(d_2) - \mathcal{N}'(\hat{d}_2) \right]
\]

\[
\frac{\partial B_0}{\partial D_T} = -e^{-rT} \left[ \mathcal{N}(d_2) - \mathcal{N}(\hat{d}_2) \right] < 0
\]

(13)

which is negative because \( \mathcal{N}(d_2) > \mathcal{N}(\hat{d}_2) \). Private benefits are decreasing with debt in absolute value

\[
\frac{\partial^2 B_0}{\partial D_T^2} = \frac{1}{\sqrt{2\pi} \sigma \sqrt{T}} \left( -\frac{1}{D_T} \right) \left[ e^{-\frac{1}{2}d_2^2} - e^{-\frac{1}{2}d_2^2} \right]
\]

(14)
The previous expression has undetermined sign. There is an inflexion if \( d_2 = \hat{d}_2 \), which is a trivial case corresponding to \( b=0 \), i.e. no private benefits. The other no trivial solution is \( d_2 = -\hat{d}_2 \).

\[
\frac{\ln \frac{A_0}{B_T} + (r - \frac{1}{2} \sigma^2)T}{\sigma \sqrt{T}} = - \left[ \frac{\ln A_0 + \ln (1-b) + (r - \frac{1}{2} \sigma^2)T}{\sigma \sqrt{T}} \right]
\]

\[
\ln D_T = \ln A_0 + \frac{1}{2} \ln (1 - b) - \left( r - \frac{1}{2} \sigma^2 \right) T
\]

An inflexion point \( D^* \) exists such that:

\[
D^* = A_0 \exp \left[ \frac{1}{2} \ln (1 - b) - \left( r - \frac{1}{2} \sigma^2 \right) T \right]
\]  \( \quad (15) \)

This level \( D^* \) is above or below \( A_0 \) according to the parameters. It defines an inflexion point where the private benefits decrease faster. The starting point for a null debt is a private benefit equal to \( b.A_0 \)
As analyzed in Equation (13), a rise in debt will lower private benefits. They become out of the money. Figure 3 presents the curves of private benefits when debt moves from 10 to 150 for different level of appropriation rate $b$. The decreasing slope is higher for high appropriation rate as the curve starts from higher values $b.A_0$, and it converges asymptotically toward zero.
Figure 3 Private benefits and debt

(Debt $D_T$ ranging from 10 to 150; appropriation rate $b$ from 0.0 to 0.3; $A_0$:100; $T$:5; $\sigma$:0.2)

The opposite derivatives $\frac{\partial B_0}{\partial A_0} > 0$ et $\frac{\partial B_0}{\partial D} < 0$ demonstrate that we need to consider the derivative with regard to the leverage ratio $\lambda = \frac{D}{A}$.

\[
\frac{\partial B_0}{\partial (D/A)} = \frac{\partial B_0}{\partial \lambda} = \frac{1}{\sigma \sqrt{T}} \left( -\frac{1}{\lambda} \right) \left[ N'(d_1) - (1 - b)N'(\hat{d}_1) \right] - e^{-rT} \left[ N(d_2) - N(\hat{d}_2) \right] - \\
\lambda \frac{e^{-rT}}{\sigma \sqrt{T}} \left( -\frac{1}{\lambda} \right) \left[ N'(d_2) - N'(\hat{d}_2) \right]
\]

(16)

The first and the third terms between brackets simplify.

\[
sgn \frac{\partial B_0}{\partial \lambda} = sgn \left[ -e^{-rT} \left[ N(d_2) - N(\hat{d}_2) \right] \right] < 0
\]

(17)
The derivative of the leverage ratio is similar to Equation (13), which was derived using debt. Thus, we will continue to consider the derivative with regard to debt as the leverage ratio is redundant. The second derivative of private benefits with regard to the leverage ratio is:

$$\frac{\partial^2 B_0}{\partial \lambda^2} = \frac{1}{\sqrt{2\pi} \sigma \sqrt{T}} \left( -\frac{1}{\lambda} \right) \left[ e^{-\frac{1}{2} \frac{\hat{d}_2^2}{\sigma^2}} - e^{-\frac{1}{2} \frac{\hat{d}_1^2}{\sigma^2}} \right] \times (-e^{-rT})$$

The sign of the previous expression is undetermined. An inflexion point exists and is similar to the solution of equation (15).

$$\lambda^* = \sqrt{(1-b)} \cdot \exp \left[ -\left( r - \frac{1}{2} \sigma^2 \right) T \right]$$

(15*)

**Derivatives versus b**

We calculate the derivative of $B_T$ versus $(1-b)$, the share of assets paid to shareholders (if higher than $D_T$).

$$\frac{\partial B_0}{\partial (1-b)} = -A_0 \mathcal{N}(\hat{d}_1) - A_0 \frac{1}{\sqrt{\pi} (1-b)} \mathcal{N}'(\hat{d}_1) + D_T e^{-rT} \frac{1}{\sigma \sqrt{T}} \frac{1}{1-b} \mathcal{N}'(\hat{d}_2)$$

$$= -A_0 \mathcal{N}(\hat{d}_1) - \left[ -\frac{D_T e^{-rT}}{(1-b)} \mathcal{N}'(\hat{d}_2) - \frac{D_T e^{-rT}}{(1-b)} \mathcal{N}'(\hat{d}_2) \right] \frac{1}{\sigma \sqrt{T}}$$

$$\frac{\partial B_0}{\partial (1-b)} = -A_0 \mathcal{N}(\hat{d}_1) < 0$$

(19)

Private benefits are an increasing function of the appropriation rate. The second derivative is negative.

$$\frac{\partial^2 B_0}{\partial (1-b)^2} = -A_0 \frac{1}{\sqrt{2\pi} \sigma \sqrt{T}} \left( \frac{1}{(1-b)} \right) \left[ e^{-\frac{1}{2} \frac{\hat{d}_2^2}{\sigma^2}} \right] < 0$$

(20)

As the previous formula is negative, private benefits will increase at a decreasing pace. The cross derivative is:
The positive relation (19) between private benefits and rate of appropriation $b$ is magnified by indebtedness $\lambda$. Debt is an appropriation tool as it helps to extract private benefits.

2.3-Situation of the controlling shareholder

The controlling shareholder is invested in corporate equity and holds control. The minimum share limit to exercise control and as a consequence divert some private benefits is supposed to be 50%. He maximizes his wealth. The controlling shareholder’s wealth covers private benefits and a proportion $\alpha$ of the equity capital (see Equations 6 and 7).

$\alpha$: share of capital held by the controlling shareholder (>50%)

$W_B$: wealth of the controlling shareholder

$$W_B = \alpha E_0 + B_0 = \alpha[(1 - b)A_0 N(\hat{d}_1) - D_T e^{-rT} N(\hat{d}_2)] + A_0 [N(d_1) - (1 - b)N(\hat{d}_1)] - D_T e^{-rT}[N(d_2) - N(\hat{d}_2)]$$

We call $C_{clean} = (1 - b)A_0 N(d_1) - D_T e^{-rT} N(d_2)$, the value of a call option for 100% of the equity value in a case with no private benefits and with an exercise price $D_T$:

$$W_B = C_{clean} - (1 - \alpha)[(1 - b)A_0 N(\hat{d}_1) - D_T e^{-rT} N(\hat{d}_2)]$$

The second term of the RHS of Equation (23) is the equity value with private benefits (Equation 5). The controlling shareholder is long a pure “clean” call on the whole firm, but he/she has shorted a proportion $(1 - \alpha)$ of a call option on the proportion $(1 - b)$ firm’s equity. When looking at
his/her wealth $W_b$, we see that the controlling investor has a ratio call spread position: he is long a call on the whole asset and short a call with a higher exercise price $\frac{1}{(1-b)} D_T$ for a share $(1- \alpha)(1-b)$ of the firm’s assets. From Equation (23):

$$\frac{\partial W_B}{\partial \alpha} = (1 - b) \left[ A_0 N\left(\hat{d}_1\right) - D_T \frac{1}{1-b} e^{-rT} N\left(\hat{d}_2\right) \right] > 0$$

$$\frac{\partial W_B}{\partial (1-b)} = -(1 - \alpha) A_0 N\left(\hat{d}_1\right) < 0$$

The controlling shareholder’s wealth is increasing with his/her ownership stake $\alpha$ and with his/her appropriation rate of private benefits. This is common sense. The derivative of the controlling shareholder’s wealth versus debt is:

$$\frac{\partial W_B}{\partial D} = \frac{\partial C_{\text{clean}}}{\partial D} - (1 - \alpha)(1 - b) \left[ -\frac{1}{1-b} e^{-rT} N\left(\hat{d}_2\right) \right]$$

$$-(1 - \alpha)(1 - b) \left[ A_0 \left( -\frac{1}{D_T} \right) \frac{1}{\sqrt{\pi T}} N'(\hat{\delta}_1) \right]$$

$$-(1 - \alpha)(1 - b) \left[ -D_T \frac{1}{1-b} e^{-rT} \left( -\frac{1}{D_T} \right) \frac{1}{\sqrt{\pi T}} N'(\hat{d}_2) \right]$$

The two last terms in the RHS cancel. We get:

$$\frac{\partial W_B}{\partial D_T} = -e^{-rT} [N(d_2)] - (1 - \alpha)[-e^{-rT} N(\hat{d}_2)] = -e^{-rT} [N(d_2) - (1 - \alpha) N(\hat{d}_2)] < 0$$

The sign of the derivative $\frac{\partial W_B}{\partial D_T}$ is negative because $N(d_2) > N(\hat{d}_2)$. Using the implicit function theorem we know:

$$\text{sgn} \frac{\partial b}{\partial D_T} = \text{sgn} \left( -\frac{\partial W_B}{\partial D_T} \right) = \text{sgn} \left( \frac{\partial W_B}{\partial (1-b)} \right) > 0$$
Looking at Equations (25) and (27), we draw the conclusion that the sign of $\frac{\partial b}{\partial D_T}$ is positive.

We compare the controlling shareholder’s wealth with a situation where he does not appropriate private benefits before rewarding equity capital. In such a case, he will simply get a proportion of the equity value. This equity is a simple call option on the firm assets.

We can imagine two alternate benchmarks to the private benefit design we referred to above:

- One is a passive controlling who owns the same share $\alpha$ of equity capital, but refuses to appropriate private benefits. This “fair” investor is not exercising his control power. Obviously, his wealth is dominated by the controlling investor who appropriates private benefits as a participative junior debt.

- A controlling investor who will use his power to enhance his reward without extracting private benefits. Still ranking as a last resort creditor after the lenders, he/she will be paid by a larger share of equity capital. He is compensated by a share of capital $\alpha'$, which is larger at the end of the period than his original investment $\alpha$. This controlling investor is incentivized to develop a control activity as he is specifically rewarded for it by an additional share of equity capital $(\alpha' - \alpha)$. We refer to $W_{SO}$ as the wealth of a controlling shareholder who will use stock-option to reward himself or will benefit from restricted issue of equity at zero price. This reward gives him/her a more than proportional share of the net equity value; it is not private benefits but public compensation.

$$W_{SO} = \alpha'(C_{clean})$$  \hspace{1cm} (28)
We refer to these controlling schemes as benchmark to assess the role of debt in the private benefits appropriation. We compare the controlling shareholder’s wealth with a situation where he does not appropriate directly benefits. For initially given values of $D_T$ and $A_0$, the controlling shareholder is neutral between these two investment models if his wealth is the same:

$$W_B = W_{SO} \Rightarrow \alpha' = 1 - (1 - \alpha) \frac{(1-b)A_0N(d_1) - D_T e^{-rT}N(d_2)}{C_{\text{clean}}} \quad (29)$$

It means that the controlling investor is indifferent between seizing private benefits at a rate $b$ and holding a share of equity $\alpha'$ larger than $\alpha$. The increased ownership is an appropriation contract such that, starting with a stake $\alpha$ of equity capital, he gets a higher share of the final value. For instance, the reward is an extra issue of new shares at zero cost, which dilutes the minor investors.

We look at the last term of the RHS of Equation (27). The denominator is a standard call option on the asset with an exercise price $D_T$. The numerator is a call option with an exercise price $D_T$ on a proportion $(1-b)$ of the firm’s assets. It has lower value than $C_{\text{clean}}$. The ratio of these two options is lower than 1. The last term of the RHS has an upper bound $(1-\alpha)$ as the call option in a situation of appropriation is shorted for a proportion $(1- \alpha)$. As a consequence, $\alpha'$ is larger than $\alpha$. To get the same wealth, a controlling investor needs to invest more in equity capital if he decides not to appropriate private benefits. Conversely, if he diverts some private benefits, he can invest a lower share of equity capital. However, this rationale assumes that private benefits will not entail any specific costs.
Figure 3 Schemes of compensation of the controlling investor

(Plain line: controlling shareholder with an $\alpha$ equity stake and a $b$ appropriation rate; dashed line: controlling shareholder compensated with an increased $\alpha'$ share of capital; dotted line: standard investor with an $\alpha$ equity holding)

Figure 3 identifies the final wealth possibilities for the controlling shareholder at time $T$: (a) passive controlling investor holding a share $\alpha$ of equity capital; (b) controlling shareholder appropriating directly private benefits before equity capital rewarding; (c) controlling shareholder rewarded by an increased share of the equity capital $\alpha'$. The passive $\alpha$ shareholder (a) is strictly dominated. He does not use his controlling position to exercise power. This may be a situation where the implicit costs and threats of using control power are so huge that he is deterred from using his power to expropriate outside investors. The situation (b) with priority expropriated private benefits (after debt repayment) show periods where it gives better value compared with a controlling shareholder using $W_{SO}$. For a given $A_0$ value, a situation where the two wealth are
similar is identified and allows to calculate the number of share \( \alpha' \) in the compensation scheme (b) using Equation (27). Above this point, \( W_{SO} \) is superior compared with \( W_B \). In Figure 3, if we consider a stock ownership (\( \alpha=50\% \)) and private benefits, the situation is rapidly improving. Private benefits added to stock ownership will always dominate a direct pure ownership of 50%.

![Figure 4 Controlling shareholder’s wealth and firm’s asset value](image)

(A\(_0\) ranging from 30 to 100; appropriation rate \( b \) from 0.0 to 0.3; \( D_T:100; T:5; \sigma:0.2 \); inflexion points are between 88 and 102)

3. **The role of debt in the compensation scheme of the controlling shareholder**

3.1-Derivative of controlling shareholder’s wealth versus debt
The derivative of $W_B$ versus debt value is similar to Equation (13), but it adds a percentage of $\alpha$ of the pure call on equity held for alpha, i.e. $-\alpha e^{-\gamma T} N\left(\hat{d}_2\right)$. We get:

$$\frac{\partial W_B}{\partial D_T} = -e^{-\gamma T} \left[ N(d_2) - (1-\alpha)N\left(\hat{d}_2\right) \right] < 0$$  (30)

This derivative is more strongly negative than Equation (13) because $(1-\alpha)$ is lower than one and $N(d_2) > N(\hat{d}_2)$. The second derivative is:

$$\frac{\partial^2 W_B}{\partial D_T^2} = \frac{1}{\sqrt{2\pi} \sigma \sqrt{T}} \left( -\frac{1}{D_T} \right) \left[ e^{-\frac{1}{2}d_2^2} - (1-\alpha)e^{-\frac{1}{2}\hat{d}_2^2} \right]$$  (31)

If the second derivative cancels, it shows a nontrivial solution for an inflexion point. The inflexion point is given by:

$$-\frac{1}{2} d_2^2 = \ln(1-\alpha) - \frac{1}{2} \hat{d}_2^2$$

which is equivalent to:

$$\left[ \frac{\ln A_0 + (r-\frac{1}{2}\sigma^2)T}{\sigma \sqrt{T}} \right]^2 = \left[ \frac{\ln A_0 + (r-\frac{1}{2}\sigma^2)T}{\sigma \sqrt{T}} \right] - 2\ln(1-\alpha)$$

$$\left[ \ln(1-b) \right]^2 + 2 \ln(1-b) \left[ \ln \frac{A_0}{D_T} + \left( r - \frac{1}{2} \sigma^2 \right) T \right] - 2 \ln(1-\alpha) \sigma^2 T = 0$$

We get the debt value $D_T^*$ corresponding to the inflexion value in the negative relation between the controlling shareholders’ wealth and debt:

$$D_T^* = A_0 e^{\exp\left[ \ln(1-b) + \left( r - \frac{1}{2} \sigma^2 \right) \frac{T}{\ln(1-b)} - \frac{\ln(1-\alpha)}{\ln(1-b)} \sigma^2 T \right]}$$  (32)

When debt is below $D_T^*$, the slope between $\frac{\partial W_B}{\partial D_T}$ is moderately decreasing, when debt is above $D_T^*$ the slope is steeper and more negative. It means that in a first step the effect of debt is moderate and penalizes mildly the controlling shareholder’s wealth. Above $D_T^*$ debt is
increasingly disciplinary as it hurts more the controlling shareholder’s wealth. However, to compare the disciplinary effect of debt, the existence of an inflexion point only allows us to assess that the disciplinary effect is weaker below $D_T^*$ and stronger above. If we want to assess the disciplinary effect of debt *per se* in a context of private benefits, we need to compare it with a benchmark situation where a controlling shareholder exercises control, but simply holds a share $\alpha'$ of the equity capital. We can also compare it with a situation where no control is exercised and the majority shareholder stays passive.

This restraining effect of indebtedness is first compared with the moderating effect of debt in a situation of wealth $W_{SO}$ without diverting private benefits. 

\[
\frac{\partial W_{SO}}{\partial D} = \alpha' \frac{\partial C_{clean}}{\partial D} = -\alpha' e^{-rT} [\mathcal{N}(d_2)] < 0 \quad (3)
\]

We compare the moderating effect of debt in the two situations with and without private benefits by subtracting the derivatives in order to see which is stronger.

\[
|\Delta| = \left| \frac{\partial W_B}{\partial D} \right| - \left| \frac{\partial W_{SO}}{\partial D} \right|
\]

\[
|\Delta| = (1 - \alpha') [\mathcal{N}(d_2)] - (1 - \alpha) [\mathcal{N}(\hat{d}_2)]
\]

\[
|\Delta| = \left[ \frac{(1-b)A_0N(\hat{a}_1) - D_T e^{-rT} N(\hat{d}_2)}{e_{clean}} \right] [\mathcal{N}(d_2)] - [\mathcal{N}(\hat{d}_2)] \quad (33)
\]

The sign of $|\Delta|$ is undetermined. It is null if $b=0$, which is trivial. When computing $\frac{\partial |\Delta|}{\partial (1-b)}$ or $\frac{\partial |\Delta|}{\partial B}$, we also have undetermined signs.

---

3 Here, $\alpha'$ is not modified as it is set for a given initial set of parameters $A_0$, $D_T$
Figure 5 Controlling shareholder’s wealth, private benefits, and debt

(Plain line: controlling shareholder with an \(\alpha\) equity stake and a \(b\) appropriation rate; dashed line: controlling shareholder compensated with an increased \(\alpha'\) share of capital; dotted line: standard investor with an \(\alpha\) equity holding; \(D^*\): inflexion point of the private benefits appropriation; \(W_{SO}\), \(W_B\), \(W_{NO}\) in the y-axis are wealth for a situation where \(D_T\) is null)

In Figure 5 the three wealth curves converge asymptotically toward zero as debt increases. They start at different levels when debt is null, respectively \(\alpha' A\), \(bA + \alpha A\), and \(\alpha A\). Compared with a situation with no control and no private appropriations, the slope of the \(W_{NO}\) curve is lower at any point compared with the slope of \(W_{SO}\). This is purely normal as the share of capital has increased so the disciplinary effect increases uniformly by a coefficient \(\alpha' / \alpha\), which is above one.

When diverting prior private benefits, the controlling shareholder experiences a lower disciplinary effect than a standard shareholder. The \(W_B\) curve stands above the \(W_{NO}\) curve and shows an inflexion point at \(D_T^*\). It means that debt will relatively favor control and appropriation.
in a first step. Above a given value $D_T^*$, indebtedness turns more strongly disciplinary and hurts private benefits.

Considering the realistic case where control exists, it may lead to additional (public) benefits to the major shareholder that should be compared with private benefits. We know that the two curves $W_{SO}$ and $W_B$ cross at a given point set to compare equally these two schemes of compensation (see Equation (27)). The disciplinary role of debt is analyzed looking at the relative slopes of wealth versus debt. As $W_B$ starts from below and has an inflexion point, the derivative of wealth is negatively less sloped until $D_T^*$. Then after it has a steeper slope.

Aside from the traditional disciplinary effect of debt known since Jensen (1986), debt introduces a specific disciplinary effect in a situation of control. In a private appropriation of benefits scheme, debt is *per se* disciplinary above a threshold $D_T^*$. Below this value debt helps in appropriating private benefits as it moderately hurts the controlling shareholder’s wealth.

Figure 6 illustrate the negative slope of the controlling shareholder’s wealth with debt. The latter has 50% ownership plus private benefits appropriation rate of 5% and 25% of the firm’s assets. For a starting situation where debt is 50, his wealth is respectively 33.08 and 42.83. To remain a pure shareholder the controller must be given an incentive of 4% of equity capital and owns 54% of the equity at the end at time T. The equity value in a no private benefits scheme is 61.23. If $b$ is 25%, he should be given an incentive of 20% of capital, i.e. he ends with a 70% stake. The two curves cross at $D_T^*$=50.
Figure 6 Controlling shareholder’s wealth, private benefits, and debt

(Debt $D_T$ ranging from 10 to 200; $A_0$:100; $T$:5; $\sigma$:0.2; 50% stock ownership plus private benefits; appropriation rates of 5% and 25% of the firm’s assets; $\alpha'$ are equivalent ownership stake of 54 and 70% for respectively the 5 and the 25% appropriation rates; plain lines are wealth including private benefits appropriation; dashed lines are wealth for a controlling shareholder with an increased $\alpha'$ share of capital).

In Figure 6 the controlling shareholder’s wealth decrease is not symmetrical comparing with and without private benefits. If debt increases in a first step the controlling shareholder loses more with direct shares. Private benefits give less convexity as private benefits are an insurance policy to be positioned in higher rank claim. If debt lowers the value of a privileged direct claim on equity increases more. The difference in slope is higher with the weight of private benefits in the controlling shareholder’s wealth. When $b$ is small, the two curves overlaps as it is for $b=6\%$. 
Figure 7 shows the difference in the derivative of wealth versus debt corresponding to Equation (33). The difference is negative at the beginning with a slope of the no private benefits scheme more negative than the slope of the private benefits. At some point the two schemes become equally pressured by debt. Then, the disciplinary effect of private benefits is stronger. The point $D_T^*$ above which the disciplinary effect of debt becomes stronger is not the same. In Figure 7 the difference between the two first derivatives is zero when debt is 108.37 for $b=5\%$; it is null when debt is 99.89 for $b=25\%$. It illustrates that the turning point in the disciplinary effect
The gap between the disciplinary effect of debt (above zero values) and the lessened disciplinary effect of debt (negatives values) is sensible and is larger when the appropriation rate is high.

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

The design of a disciplinary setting focuses on the level $D_T^*$. To moderate expropriation the level of $D_T^*$ should be set as low as possible. We analyze the parameters that could influence the inflexion point above which debt turns more disciplinary. The derivative of $D_T^*$ versus the controlling shareholder ownership is:

$$\text{sgn} \frac{\partial D_T^*}{\partial \alpha} = \text{sgn} \left[ \frac{\frac{1}{2} \ln(1-b) + \left( r - \frac{1}{2} \sigma^2 \right) T - \frac{\ln(1-\alpha)}{\ln(1-b)} \sigma^2 T}{\partial \alpha} \right]$$

$$\text{sgn} \frac{\partial D_T^*}{\partial \alpha} = \text{sgn} \left[ \frac{1}{1-\alpha \ln(1-b)} \right] > 0$$

(34)

This derivative is positive, which means that a higher stake of capital moves up the inflexion point. Then, the disciplinary role of debt is lessened and debt will relatively favor appropriation as it will penalize less the controlling shareholder’s wealth. A limited equity ownership is a signal that the controlling shareholder will be exposed to a string disciplinary effect of debt.

The derivative of the inflexion point versus $(1-b)$ is also positive:

$$\text{sgn} \frac{\partial D_T^*}{\partial (1-b)} = \text{sgn} \left[ \frac{\frac{1}{2} \ln(1-b) + \left( r - \frac{1}{2} \sigma^2 \right) T - \frac{\ln(1-\alpha)}{\ln(1-b)} \sigma^2 T}{\partial (1-b)} \right]$$
\[
sgn \frac{\partial \hat{p}_T}{\partial (1-b)} = sgn \left[ \frac{1}{2} \frac{1}{(1-b)} - \ln(1-\alpha) \left( -\frac{1/(1-b)}{(\ln(1-b))^2} \right) \sigma^2 T \right]
\]

\[
sgn \frac{\partial \hat{p}_T}{\partial (1-b)} = sgn \left[ \frac{1}{2} \frac{1}{(1-b)} + \left( \frac{\ln(1-\alpha)/(1-b)}{(\ln(1-b))^2} \right) \sigma^2 T \right] > 0
\]

(35)

It means that an increase in the appropriation rate \( b \) will entail a decrease in \( D_T^* \). Hence, the more the controlling shareholder is eager to appropriate private benefits, the more he is exposed to a strongly disciplinary role of debt. An increase in debt over \( D_T^* \) will weigh more on his wealth. A disciplinary rationale of debt and a regulation mechanism develop. A decline in private benefit appropriation will soften \( DT^* \) and the controlling shareholder is less exposed to a marginal loss in wealth if he uses debt. In the same rationale, a rise in the stake of equity capital pulls up the inflexion point, limits the disciplinary role of debt, and relatively helps debt to develop appropriation. However, by holding more equity capital an incentive to join the other outside investors’ interest develops and the controlling shareholder will expropriate relatively lower percentage of the assets \( b \). Using the implicit function theorem we get from (34) and (35):

\[
sgn \frac{\partial \hat{p}_T}{\partial (1-b)} sgn \left( -\frac{\partial \hat{p}_T}{\partial \alpha} \right) = sgn \left( \frac{\partial \hat{p}_T}{\partial \alpha} \frac{\partial \hat{p}_T}{\partial \alpha} \frac{\partial W_B}{\partial \hat{p}_T} \right) > 0
\]

(36)

The controlling shareholder is in a self-regulation game to maintain a given derivative of his wealth versus debt: if he wants to appropriate more with \( b \), he needs also to own a larger stake of equity capital \( \alpha \). If he does not, he will suffer from a lowering of the debt turning point \( D_T^* \) where the disciplinary role of debt turns more painful.
From the rational controlling shareholder’s point of view, a rise in equity capital should go in line with appropriation of private benefits. Debt level and equity stakes are a signal to other investors. They can infer the appropriation rate of the controlling shareholder. A scheme with very high debt (above the inflexion point) is a signal of pressured private benefits. This signal is a strong one as debt often is easier to manage than ownership stakes.

Conclusion

The conclusion is that the theory of debt financing should also include variables of financial governance. This is specifically derived in the framework of private benefits appropriated by a controlling shareholder who appropriates private benefits. It is shown that self-regulation mechanism may develop even in the situation of control by a dominant shareholder. The joint questions of ownership, private benefits, and debt levels are linked. The role of debt is of utmost importance as it may be in some situations strongly disciplinary on the controlling shareholder’s wealth. At levels of debt below a given threshold, debt is relatively less disciplinary compared with a no private benefit case.

Private benefits may be considered as a participative junior debt linked to the assets value of the firm and ranking just before the equity capital. Other alternate designs for appropriation may exist; the question of optimal design of the control contract is an extension of this study as we used as a benchmark a situation which makes appropriated benefits publicly known and contractually negotiated with outside investors. Improvement in the design of the private benefit contract will need to refer to the costs borne by the controlling shareholder when he diverts
private benefits. They have to be taken into account when asking the question of compensation for control. This has not been done here and could be the subject of further study.

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