Business groups, insolvency and tax policy *

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Abstract

This paper examines the impact of intercorporate dividend taxation (IDT) on the joint determination of the optimal capital structure and dividends in a business group. Intercorporate dividends contain default costs in a levered parent. The presence of IDT reduces intercorporate payout, thereby increasing default costs and reducing welfare. IDT is welfare irrelevant when only the subsidiary raises debt.

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1 Introduction

The crisis led to close scrutiny of highly leveraged firm combinations, that may jeopardize financial stability. The reliance on debt financing by complex industrial and financial actors, among which business groups and financial conglomerates, attracted the attention of supervisors around the world.[1] Tax policy, alongside with regulation, may be able to reduce excessive leverage and promote more transparent and less fragile ownership structures. As sometimes history repeats, this paper considers *intercorporate dividend taxation* (IDT) because it has been one of the instruments used towards the unbundling, after 1929, of US groups that figured as prominent culprits of the Great Depression. IDT consists in taxing profits distributed as dividends by subsidiaries to their parent companies. Absent any tax credit, such provision leads to the double taxation of dividends with the purpose of discouraging companies to hold stakes in other firms.

This paper investigates whether and how IDT impacts on the value of firm combinations, on their leverage, insolvency and - ultimately - on welfare. To this end, it presents a model where a fund owns two activities, and chooses the intercoporate links between them that maximize overall value. The first link is intercorporate ownership. The fund may either own the two firms directly, or it may set them up as a business group. In this last case a parent company will own part of the equity of its subsidiary and will be entitled to intercorporate dividends. The second link is an intercorporate bail-out mechanism in the form of a guarantee through which one firm helps the other out of insolvency.[2] Each firm experience the traditional tax-bankruptcy cost trade-off, which drives the choice of optimal leverage. Debt provides a tax shield since interests are tax-deductible.[3] At the same time, higher leverage increases the likelihood of default, which brings about dissipative costs. These are a deadweight loss for both the firms and society as a whole.

A first result is that the optimal intercorporate ownership and bail-out

[1] In 2009, the equity/assets levels reached figures as low as 2% in some large banks (Blundell-Wignall et al., 2009). Regulators, and research, have so far mostly focussed on prudential regulation to achieve higher capital standards.

[2] Gopalan et al. (2007) witness the role of cash transfers to support weaker subsidiaries in Indian business groups. Boot et al. (1993) document that parent companies issue comfort letters addressed to their subsidiary lenders, which promise help to their subordinate unit in case of distress. Although legally unenforceable they are perceived as credible offers by the lenders of the subsidiary.

[3] Our model takes as given the possibility of subtracting interest from taxes, as this is a realistic and simple way to generate a demand for debt. Interest deductions are granted by almost every jurisdiction and may be per se welfare improving, by spurring creative destruction (He and Matvos, 2012).

choices are in general interdependent, together with leverage. As intuition suggests, the bail-out link generates high leverage and default costs in the guaranteed firm, unless the bail-out commitment is not credible at all. The reason is that the endogenous cost of debt falls when a (partially) credible bail-out promise is in place, inducing the guaranteed firm to raise more debt for tax shield purposes. When lenders believe that the parent does not always abide its bail-out promise[4], both the parent and its subsidiary raise debt. In order to optimize the tax-bankruptcy trade-off, the optimal intercorporate ownership - absent IDT - is then 100%, since intercorporate dividends help the parent in servicing debt thereby reducing its default probability.

The results concerning tax policy are as follows. The presence of IDT reduces such optimal intercorporate ownership, even to zero, but such unbundling of the parent-subsidiary organization may be inefficient. The policy is thus detrimental not only to firm value, but also to welfare: discouraging intercorporate dividends and ownership can lead to higher default costs. The model indicates that IDT is instead irrelevant when leverage is optimally concentrated in the guaranteed subsidiary, a situation that arises when lenders consider the bailout guarantee as fully credible. The reason is that, in this case, ownership structure is itself irrelevant. Thus, intercorporate dividends have no impact on the Parent tax-bankruptcy trade-off. When IDT is introduced, the subsidiary is spinned off but this is irrelevant to both firm value and welfare. Of course, an alternative to group dismantling is a change in the dividend payout ratio, which is set equal to 100 percent. The two actions cannot be distinguished in our model, and have similar effects.

Our model is based on two previous papers concerning firm combinations. Leland (2007) provides the model foundations, and analyses optimal leverage and value in both stand alone firms and in their merger. Our setting coincides with the stand alone case when there is no intercorporate ownership and the bail-out promise is not credible. Luciano and Nicodano (2012) examine leverage and value in parent-subsidiary structures, when the credibility of the guarantee is full and intercorporate ownership is 100%. The guarantee is unilateral (say from the parent to the subsidiary, but not *viceversa*) and conditional, i.e. the parent bail-outs its profitable but insolvent subsidiary if it has sufficient cash to do so. They also show that, in this situation, leverage is concentrated in the guaranteed company. Moreover, they demonstrate that leverage is larger than in two stand alone companies, under suitable conditions. We borrow their model with unilateral conditional guarantees as an ideal benchmark for a highly leveraged firm combination. We extend it to any level of intercorporate ownership and to the introduction of IDT, beside

[4]Parent companies enjoy limited liability vis à vis their subsidiaries' debt obligations.

analyzing the allocation from a welfare perspective.

Other models of firm combinations do not usually study risky leverage, focusing instead on investment financing (Stein (1997); Rajan, Servaes and Zingales (2000); Matvos and Seru (2011)) or shareholders' expropriation (Almeida and Wolfenzon (2006b)). In contrast to these works, we overlook operational synergies in order to concentrate on financial ones, and stress the tax shield as a motive for raising debt.

Almeida and Wolfenzon (2006a) highlight that firm combinations use the internal capital market to allocate resources to their own investment projects, generating a negative externality on other firms that obtain less credit. The present setting focuses instead on insolvency, as welfare costs coincide with default costs. The operating return on investment is exogenous and there is no competition between internal and external projects, as in our no-arbitrage setting there is no constraint on credit availability. However, the cost of external funds to the parent and its subsidiary depends on both internal bail-outs transfers and intercorporate ownership.

Our paper represents the first attempt to model the effects of IDT, which is however a debated tax policy. Recently, Morck (2005) argues that IDT – which is still present today in the US tax code – is an effectivel tax policy in discouraging business groups, which in turn improves on corporate governance. This argument is consistent with the fact that, according to La Porta et al. (1999), business groups are the dominant corporate structure in several countries whereas Stand Alone firms are more common in the US. Bank and Cheffins (2010) test Morck's conjecture and argue that intra-group dividend payouts seem not to respond to the intercorporate dividend tax. Their historical explanation for this puzzling result is that pyramids were already rare outside the public utility industry, as they had been already targeted in the Thirties by other specific reform acts. This model offers a new perspective on IDT. It suggests that complex ownership structures are of interest to policy-makers not only for corporate governance, but also for financial stability. In this light, they may even help corporate solvency and welfare. IDT reduces the intercorporate ownership below the optimal one, possibly causing a reduction in welfare.

Our model presumes that tax policy is, in general, non-neutral for corporate dividend payout (ownership structure). Chetty and Saez (2005) support such non-neutrality, as they detect a payout increase caused by a recent US cut on dividend tax rates. A recent literature on payout policy emphasizes that US corporations have a lower tax rate on dividends than US individuals. Allen and Michaely (2003) show that, in a tax- clientele equilibrium, individuals hold low-dividend paying stocks while corporations hold high-dividend paying stocks. In a similar vein, Dahlquist et al. (2013) show that, in Sweden, controlling corporations, which are tax exempt, hold larger stock portfolios than non-controlling ones, that are taxed. Some studies consider the opposite case, namely that corporation may change the payout policy of firms they acquire from individuals, since they have a lower tax rate on dividends. The evidence is however mixed (Barclay et al. (2009), Holen et al. (2008)).

A related literature concerns repatriation taxes from multinationals. Altshuler and Grubert (2003) model dividend transfer strategies from foreign multinational subsidiaries located in low-tax countries, including parent borrowing using subsidiary's assets as collateral. They also find empirical evidence that a high level of tax repatriation is related to higher internal financing to the subsidiary. Desai et al. (2007) analyze dividend payout determinants in multinational companies. They highlight the role of tax considerations, as well as control issues in explaining dividend policies inside multinationals.
This paper does not consider the relevant international dimension, but focuses instead on the other relevant dimensions of highly leveraged complex organizations. Other studies focus on dividend payout policy in groups. A recent paper (De Jong et al., 2012) presents empirical evidence on French groups. It finds that larger dividend payouts in groups are associated to larger debt financing. They provide an explanation for this evidence, suggesting that dividends can help servicing debt. This is a feature which our model incorporates. La Porta et al. (2000) and Faccio et al. (2001) report mixed evidence on the relationship between dividends and control wedge in business groups, but ignore tax incentives. The present model focuses on the latter without offering implications for investor protection.

The paper is organized as follows. Section 2 describes IDT and its implementation in the US. Section 3 presents the model. Section 4 proves the irrelevance of IDT. Section 5 provides numerical evidence of the possible welfare diminishing effects of IDT. Section 6 concludes.

2 Intercorporate Dividend Taxation

IDT is typical of the US tax system. In order to understand the reason for its introduction we have to go back to the years following the Great Depression. In the 1920s business groups were common in the U.S. and they were considered responsible for the 1929 crisis. Morck (2005) gives an overview of the downsides attributed to pyramids by US regulators at that time and also nowadays. The list includes excessive market and political power concentration and tax avoidance through transfer pricing. Accordingly, the Congress promoted rules to discourage business groups: during the Thirties it eliminated consolidated group income tax filing, enhanced transparency duties, offered tax advantages to capital gains from sales of subsidiaries and introduced intercorporate dividend taxation. The US rule on IDT – which is still place – taxes dividend transfers between companies, at least at a 7% rate if ownership is below 80%. The action of the Congress induced companies either to sell their shares in controlled subsidiaries or to fully acquire them: by the end of the Thirties US firms were almost entirely stand alone companies. According to La Porta et al. (1999), still nowadays U.S. firms are organized mainly as stand alone units, while in several emerging and continental European countries pyramidal groups are widespread. Morck (2005) and Morck and Yeung (2005) point out that, among all the measures adopted by the Congress, IDT was the crucial one in dismantling business groups.

The European Union, as well as all most other developed countries, excludes the double taxation of dividends instead. The Parent Subsidiary Directive (1990) requires EU member states not to tax intercorporate dividends to and from qualified subsidiaries, whose parent's equity stake is above a certain level. Since a subsidiary company is taxed on the profits out of which it pays dividends, the Member State of the parent company must either exempt profits distributed by the subsidiary from any taxation or impute the tax already paid in the Member State of the subsidiary against the tax payable by the parent company. A 2003 amendment prescribes to impute any tax on profits paid also by successive subsidiaries of these direct subsidiary companies. Starting from January 2009, the control stake necessary in order to qualify for the double taxation elimination is as small as 10%. Our analysis below deals with the effect of this tax provision on the optimal incorporation decisions. In order to simplify the modelling, we will not consider the ownership threshold that may apply in certain jurisdictions.

3 The model

This section describes the set-up following Leland (2007) and firm combinations as in Luciano and Nicodano (2012).

At time 0, a fund owns two units and incorporates them as a PS structure - i.e. a Parent (P) and a controlled Subsidiary (S). It also decides how much debt is raised in each unit. Each unit has a random operating cash flow X_i realized at time T. At time 0, the entrepreneur selects the face value F_i of the zero-coupon risky debt to issue so as to maximize the total value for equityholders, E_i, and debtholders, D_i. These are equal to the expected present value of their future cash flows, where the expectation is based on the risk-neutral probability[5] and ϕ is the discount factor. At time T, realized cash flows are first used to repay creditors. Equity is a residual claim: shareholders receive the difference between operational cash flow, net of corporate income taxes, and debt face value paid back to lenders. A unit which cannot meet its debt obligations is declared insolvent. Its income, net of the deadweight loss due to bankruptcy costs, is distributed first to the tax authority and then to lenders.

The total (optimal) value ν_{PS} of the PS structure is

$$\nu_{PS} = \max \sum_{i=P,S} E_i + D_i. \tag{1}$$

The firm pays a flat proportional income tax at an effective rate τ and suffers proportional dissipative costs α in case of default. Interests on debt are deductible from taxable income.[6] The presence of a tax advantage for debt generates a trade-off for the firm: on the one side, increased leverage results in tax benefits, while on the other it leads to higher expected default costs since – everything else being equal – a highly levered firm is more likely to default. Value maximization leads to the same choices as the minimization of the sum of those cash flows that are expected to be lost in the form of taxes (T_i) or of default costs (C_i). The program (1) can be equivalently stated as:

$$\min \sum_i T_i - C_i, \tag{2}$$

where $i = P, S$.
Absent any link between units, the total expected tax burden of each firm is equal to the stand alone one (see Leland (2007)):

$$T_{SA}(F_i) = \tau\phi\mathbb{E}[(X_i - X_i^Z)^+], \tag{3}$$

for $i = P, S$, where $X_i^Z = F_i - D_i$ is the tax shield, i.e. the level of interest deductions. Similarly, expected default costs are:

$$C_{SA}(F_i) = \alpha\phi\mathbb{E}\left[X_i 1_{0<X_i<X_i^d}\right], \tag{4}$$

for $i = P, S$, where $X_i^d = F_i + \frac{\tau}{1-\tau} D_i$ is the default threshold, i.e. the level of net realized cash flows under which default occurs. Default costs represent a deadweight loss to the economy, and they cannot be redistributed to any

[5]This allows to incorporate a risk premium in the pricing of assets without having to explicitly specify the utility function.

[6]No tax credits or carry-forwards are allowed.

stakeholder of the firm. We measure the sum of the levered firm value and the tax burden of each unit as a measure of welfare generated by the organization:

$$W = \nu_{PS} + \sum_i T_i. \tag{5}$$

W represents the total value created by the firm and distributed to stakeholders: lenders, shareholders and tax authorities (after paying workers, suppliers etc).

3.1 Intercorporate Bail Outs and Dividends.

This section provides details on intercorporate linkages. We model internal support in PS structures assuming that the Parent promises to transfer cash to its Subsidiary, in order to prevent its default, when it has sufficient funds. Lenders perceive the promise as being honoured with probability π.[7] This type of promise increases the value of the organization as a whole (see Luciano and Nicodano (2012)) with respect to the Stand Alone arrangement, since it allows it to increase leverage and tax savings in the optimum.
The Parent owns a fraction ω of its Subsidiary' s equity. We assume a unit payout ratio. As a consequence, a share ω of Subsidiary profits is distributed as dividend at time T to the Parent.[8] We explicitly introduce a flat intercorporate dividend taxation rate τ_D, which is proportional to the cash flows transferred from the Subsidiary to its Parent. The Subsidiary pays out dividends only if its net profits are positive and it is able to service its own debt. When this occurs, the Parent receives a fraction ω of Subsidiary profits as dividend, while the remaining $1-\omega$ goes to the other shareholders of S. The present value of the intercorporate dividend net of taxes is

$$ID = \phi\omega\mathbb{E}\left[(1-\tau_D)(X_S^n - F_S)^+\right], \tag{6}$$

where cash flows, net of corporate income taxes, are defined as X_i^n. Given ω, F_P, F_S, dividends increase the Parent cash flows, while IDT reduces them. The cash flow available to P after the net intercorporate dividend transfer is equal to:

$$X_P^{n,\omega} = X_P^n + (1-\tau_D)\omega(X_S^n - F_S)^+.$$

By reducing the Parent cash flows, IDT reduces the Parent's ability to repay its lenders. IDT has instead no direct – i.e. for given capital structure –

[7]When $\pi = 0$, the PS become equivalent to two Leland's (2007) stand alone units if there is zero intercorporate ownership.

[8]Abandoning the unit payout assumption, we can interpret ω as the dividend the S decides to transfer to its Parent that owns at least ω of its equity.

impact on the rescue promise, since the events of a dividend transfer and of subsidiary's insolvency can never happen simultaneously.
Both the dividend and the guarantee are conditional cash flow transfers between P and S. In order to better understand the effect of these intercorporate transfers on the value of PS structures, we describe them more accurately. Let us consider first the conditional guarantee. The rescue promise by the parent, honored with probability π, results in the transfer of the amount necessary to repay the lenders of the subsidiary provided that P remains solvent after rescuing its affiliate. In formulas, it implies a transfer equal to $F_S - X_S^n$ if the Subsidiary is insolvent but *profitable* ($0 < X_S^n < F_S$) and if the Parent stays solvent after the transfer ($X_P^n - F_P \geq F_S - X_S^n$). The presence of the guarantee influences both the value of S obligations and the value of the shares of P. Luciano and Nicodano (2012) determine the value increase due to the guarantee when $\pi = 1$. We simply extend their set up to account for the presence of π:

$$\begin{aligned} \Gamma(F_P, F_S, \pi) &= C_{SA}(F_S) - C_S(F_P, F_S, \pi) = \\ &= \pi\alpha\phi\mathbb{E}\left[X_S 1_{\{0<X_S<X_S^d, X_P<h(X_S)\}}\right], \end{aligned} \tag{7}$$

where $h(X_S)$ is a function of X_S^Z, X_S^d and X_P^d. At a given face value of debt in P and S, and given π, the conditional transfer – being a transfer from the shareholders of the Parent to the lenders of the subsidiary – increases the value of Subsidiary debt and reduces the value of Parent equity. The higher π, the larger these effects. This is a direct effect. Luciano and Nicodano (2012) discuss the indirect effect of the conditional transfer on capital structure, showing that the optimal face value of debt in the Parent (Subsidiary) falls (increases). In practice, the group exploits tax avoidance through leverage in the guaranteed unit, mitigating the increase in expected default costs thanks to the rescue effect provided by the guarantor.

In order to better understand the effect of dividends, for given capital structure, we first notice that a higher dividend ω increases P debt value, for given face value. Its cum-dividend cash flow $X_P^{n,\omega}$ is larger the larger is ω. The additional cash flow transferred from the subsidiary raises both the chances that the Parent is solvent and lenders' recovery rate in insolvency. We call this a "rescue through dividends" effect. More precisely, the following expression defines the expected value of the default costs of the parent saved thanks to the dividend:

$$\begin{aligned}\Delta(F_P,F_S,\omega) &= C_{SA}(F_P)-C_P(F_P,F_S,\omega)= \\ &= \alpha\phi\mathbb{E}\left[X_P\left(1_{\{0<X_P^n<F_P\}}-1_{\{0<X_P^{n,\omega}<F_P\}}\right)^+\right]= \\ &= \alpha\phi\int_{X_S^d}^{+\infty}\int_{\left(X_P^d-\omega(1-\tau_D)\left[(1-\tau_S)y+\tau X_S^Z-F_S\right]\right)^+}^{X_P^d} xf(x,y)dxdy \quad (8)\end{aligned}$$

The overall effect Δ is always non-negative. It is increasing in intercorporate ownership ω, but decreasing in τ_D. Also, everything else being fixed, Δ is larger the lower is S debt (since both intervals of integration enlarge). The dividend transfer - exactly like the guarantee - has no effect on the tax burden of the two units for given F_S and F_P unless IDT is present. This is because dividends are already taxed as equity in the subsidiary and are not taxed again as proceeds in the parent. The overall effect on tax burden is then due only to IDT, when present. We denote the corresponding increase, which is indeed the dividend tax, with $\Sigma(\cdot,\cdot)$:

$$\Sigma(F_S,\omega)=T_S(F_S,\omega)-T_{SA}(F_S)=\omega\tau_D\int_{X_S^d}^{+\infty}[(1-\tau)x+\tau X_S^Z-F_S)]f(x)dx. \quad (9)$$

Summarizing, when we consider now program (2), the optimal PS structure is the one that minimizes:

$$\min_{F_S,F_P,\omega,\pi} T_S(F_S,\omega)+C_S(F_P,F_S,\pi)+T_P(F_P)+C_P(F_S,F_P,\omega), \quad (10)$$

through the choice of its capital structure (F_P and F_S) and of its intercorporate links (π and ω).

4 Irrelevance of Intercorporate Dividend Taxation

This section characterizes the optimal choice for both intercorporate ownership and the probability of honoring the bail out promise in a PS structure, assuming no IDT. This is a necessary step in order to assess the impact of Intercorporate Dividend Taxation. Ownership structure[9] and the credibility of the bail out promise are jointly determined with leverage. We first state the following proposition.

[9]For simplicity we assume that there is no "piercing of the corporate veil", i.e. the Parent enjoys limited liability vis à vis its Subsidiary's lenders also when it is the sole owner of its subsidiary.

Proposition 1 *Assume $\tau_D = 0$. If the sum of the tax burden and default costs in each unit is convex in both face values of debt, then:*
(i) if $\pi \geq \bar{\pi}$ the parent is unlevered ($F_P^* = 0$) and the optimal ownership share is indefinite;
(ii) if $\pi < \bar{\pi}$ the parent face value of debt is positive and optimal intercorporate ownership is 100 percent.

Proof. See Appendix. ∎

Proposition 1 states that, if the bail-out promise is credible enough, the parent is optimally unlevered and all the debt is raised by the subsidiary unit. The rescue guarantee lowers the default likelihood of S and increases the expected recovery, at the initial face value of debt, making S debt more attractive to lenders. In this case, PS is indifferent to dividend receipts: dividends simply pass from the subsidiary to the holding with no effect on value. If the bail-out promise is not credible enough, P levers up too. In this case, absent IDT, dividends are able to help servicing debt.
For given F_S^*, the level $\bar{\pi}$ above which the parent is unlevered is increasing in τ and decreasing in α. The incentive to raise all debt in the subsidiary, thus increasing the spread charged by lenders and the tax shield, is indeed higher the higher is the effective tax rate. The higher is α, the larger the incentive to save on default costs in at least one company by avoiding to raise debt.
The next Proposition characterizes the value maximizing level of the probability π of honoring the bail-out promise.

Proposition 2 *The value of PS is increasing in the credibility of the guarantee, given ω. Hence $\pi^* = 1$.*

Proof. Fix ω to a certain level. As credibility increases ($\pi > 0$) the value of debt in the subsidiary grows thanks to the guarantee, for fixed face values of debt in both P and S (see (7)). Indeed, the net effect is an increase in the overall PS value, proportional to π. The increase is for given capital structure and, a fortiori, for the endogenously optimal one. The Reader may argue that full credibility is hard to sustain in a one shot game. Luciano and Nicodano (2012) set up the repeated version of this game, characterize conditions ensuring that the Parent always honours the guarantee ex post and find that they are always satisfied in reasonable numerical evaluations.
We now use the results above to establish that IDT is irrelevant when PS structures are not constrained in their choice of ownership, debt and commitment. ∎

Proposition 3 *The introduction of a tax on intercorporate dividend is irrelevant in optimal PS structures.*

Proof. Under appropriate conditions, we proved in Proposition 1 that if $\pi \geq \bar{\pi}$, ω is indefinite. In Proposition 2 we proved that optimal PS structures are characterized by $\pi = 1$. Combining the two results, as a consequence, in the optimal arrangement, i.e. $\pi^* = 1, F_P^* = 0$, as soon as $\tau_D > 0$, the entrepreneur can set ω to 0 with no influence on optimal value, since both Δ and Σ are 0 for every (F_P, F_S) couple. τ_D is then irrelevant at the optimum. ■

Proposition 3 states the irrelevance of IDT, which derives from the fact that the parent is unlevered and therefore indifferent to dividend receipts. It implies either that the subsidiary payout is set to zero, or that there is a spin-off of the subsidiary. Thus, IDT is not irrelevant to payout policy or corporate ownership. It is however irrelevant to corporate value and to the default costs borne by society.

The next section will explore cases when IDT matters.

5 Welfare Costs in Optimal Firm Combinations: a Numerical Assessment

The numerical exercise provides an indication of the welfare costs borne by society due to the insolvency of firm combinations with and without dividend taxation. Table 1 reports the set of parameters used in our "base case" simulations.

Table 1: Base case parameters	
Parameter	**Value**
Cash flow actual mean (X_0)	100
Annual cash flow volatility (σ)	22%
Default costs (α)	23%
Effective tax rate (τ)	20%
Intercorporate dividend tax (τ_D) rate	7%
Correlation level (ρ)	0.2
Risk-free rate (r)	5%

Table 1: This table reports the set of parameters we use in our numerical simulations.

We assume that each unit has Normally distributed cash flows with expected present value 100 and annual volatility 22%. The correlation level between the two cash flows is $\rho = 0.2$. We follow Leland (2007) and set the level of proportional default costs $\alpha = 23\%$ and the effective tax rate $\tau = 20\%$. T is 5 years, which matches the average maturity of corporate bonds issued by commercial firms. When introducing the intercorporate dividend tax, we set $\tau_D = 7\%$, consistent with the lowest rate applied in the US. Table 2 displays the optimal PS figures in the no tax policy basecase, i.e. when $\tau_D = 0$. Proposition 2 affirms that $\pi^* = 1$ and Proposition 1 that optimal ownership is indefinite in such case and thus ω has no effect on value and welfare.

Table 2: Effect of IDT on optimal PS ($\pi = 1$)

	PS (P; S), no IDT	**PS (P; S), IDT**	**SA $\pi = 0$, $\omega = 0$**
Value	166.59 (80.65; 82.72)	166.59 (80.65; 82.72)	162.94
Equity	49.52 (49.46; 0.06)	49.52 (49.46; 0.06)	78.64
Debt	117.07 (0; 117.07)	117.07 (0; 117.07)	84.29
Optimal ownership	Indefinite	0	0
Dividend	0	0	0
Default costs	8.13 (0; 8.13)	8.13 (0; 8.13)	1.78
Tax Burden	25.40 (20.01; 5.39)	25.40 (20.01; 5.39)	35.40
Welfare	191.99	191.99	198.34
Face Value of Debt	220 (0; 220)	220 (0; 220)	114
Leverage	70.27% (0%;99.94%)	70.27% (0%;99.94%)	51.73%

Table 2: The table reports the optimal figures for PS and for each unit separately when the credibility of the guarantee is endogenous ($\pi = 1$) absent (first column) and absent (second column) IDT and compares them to the case in which $\pi = 0, \omega = 0$, which is the benchmark case present in Leland (2007).

Table 2 reports the endogenous characteristics of Parent- Subsidiary structure, absent or with IDT (left and central columns respectively).

It indicates, consistent with the analytical results in the previous section, that only the Subsidiary optimally issues debt. The principal in this unit is, strikingly, equal to 220 even if mean Subsidiary cash flow is only 100. Despite bail-outs and the absence of default costs in the Parent, expected default costs are very large as a percentage of Subsidiary cash-flow (8.13). This leads to a high cost of Subsidiary debt, as lenders correctly anticipate the insolvency probability, which in turn brings high tax savings and fosters the value of the combined firm.[10] The value of firm combinations exceeds that

[10]This kind of capital structure is commonly observed in the private equity industry, if the private equity fund is identified with the unlevered Parent and the Subsidiary with the LBO target. Kaplan (1988) observes that a large part of the profitability of the MBOs is

of both stand-alone units (166.59 versus 162.94). However welfare generated by firm combinations is lower than in stand alone firms (191.99 as opposed to 198.34). This observation justifies our analysis of the introduction of intercorporate dividend taxation. The right-hand side column confirms that, with a positive tax rate on intercorporate dividend, default costs and welfare are unchanged.

5.1 On Welfare Diminishing IDT

Irrelevance of IDT holds when the Parent always honours the bail-out promise ex-post. In a multi-period interaction, incentives to deviate from the ex-ante optimal behavior of honoring it may be only partially countered by the lenders' threats.[11] On these grounds, this section explores the effects of IDT fixing the ex-post probability of being honored to a value lower than 1.

In this case, the Parent company need not be optimally unlevered as Proposition 1 indicates. Dividend receipts help contain the default costs in the Parent, when it has debt outstanding, without affecting tax savings and default costs in the Subsidiary. The introduction of IDT increases the cost of dividend support, thus reducing the incentive to substitute debt in the Parent for debt in the Subsidiary. The optimal value of intercorporate ownership (or of Subsidiary payout) may even fall to 0, for high enough τ_D. We will see that IDT may have the detrimental effect of lowering welfare, alongside with private value.

The first column of Table 4 shows the optimal values when $\pi = 0.5$, absent IDT. In this case, $\omega^* = 1$ as Proposition 1 precognises.

Now group capital structure changes radically relative to the previous case, as it levers the Parent up more than the Subsidiary: the face value of Subsidiary and Parent debt is equal to 52 and 83 respectively. This suggests that support of the parent company through dividends is perhaps more relevant than value provided by the not-so-credible bail out promise. Indeed, the large Subsidiary dividend (42.56) allows the Parent to raise more debt and obtain larger tax savings, while default costs are contained thanks to the extra-buffer provided by intercompany dividends. Overall, PS value (163.65) is almost 2% lower than the base case with a fully credible bail out promise.

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due to tax benefits, which are the key driver of leverage in our model. This is partly due to the Parent ability to bail out it Subsidiary in many states of the world, thanks to its zero debt obligations.

[11] In Boot et al. (1993) reputation mitigates the incentive not to honour the implicit rescue promises.

However, default costs are lower (1.59 vs. 1.89). The second effects dominates and welfare increases relative to the case of full credibility (198.44 vs. 191.99).

The next numerical simulation indicates that, for sufficiently low ex-post guarantee credibility, $\pi < \bar{\pi} < 1$, the introduction of IDT impacts the optimal capital structure, since the value of PS is decreasing in τ_D when ω is fixed. In fact, when $\pi < \bar{\pi}$, IDT discourages intercorporate ownership. For large enough τ_D , the optimal ownership falls to zero ($\omega^* = 0$). This happens for our base case parameter ($\tau_D = 7\%$). The second column of Table 3 shows that IDT does achieve some perhaps desidered effect, in that combined leverage falls from 61.92 to 56.13. Moreover, the face value of debt is more evenly distributed across parent and subsidiary. Yet expected default costs increase from 1.59 to 1.89, because dividends no longer allow the parent to contain its default. As a consequence, welfare falls from 198.44 to 198.22. IDT is thus inefficient, since the welfare generated by firm combinations when IDT is introduced is lower than without the tax provision.

Table 3: Effect of IDT, $\pi = 0.5$		
	PS (P; S),$\pi = 0.5$ **no IDT**	**PS (P; S),**$\pi = 0.5$ **IDT**
Ownership share	100 %	0
Value	163.65 (123.78; 39.87)	163.23 (80.75;82.48)
Net Equity	62.32 (62.32;0)	71.62 (39.91; 31.71)
Debt	101.33 (61.46; 39.87)	91.61 (40.84; 50.77)
Dividend	41.89	0
Default costs	1.59 (1.07; 0.52)	1.89 (0.78; 1.11)
Tax Burden	34.79 (16.82; 17.97)	34.99 (17.81; 17.18)
Welfare	198.44	198.22
Face Value of Debt	135 (82; 53)	124 (55; 69)
Leverage	61.92 % (61.51%; 48.76%)	56.13% (50.58 %; 61.55%)

Table 3: The table compares the optimal properties of PS absent the tax policy (first column) and when IDT is in place (second column).

Table 4 shows effects of IDT for different levels of ω. It indicates that the privately optimal choice of reducing intercorporate ownership to zero is also welfare optimal. At the initial level of intercorporate ownership (see the third column of the Table), combined leverage is highest but both combined value and social welfare are lowest. Paradoxically the tax burden increases as intercorporate ownership falls in order to avoid IDT; but the reduction in default costs more than compensates such an increase, leading to a (third-best) welfare-optimal and privately optimal spin-off.

Table 4: Effect of IDT for different ω, $\pi = 0.5$			
	ω		
	0	0.5	1
Value	163.23 (80.75; 82.48)	162.41 (92.49; 69.91)	161.67 (98.21; 63.46)
Net Equity	71.61 (39.91;31.70)	59.57(46.83; 12.74)	53.85 (53.85; 0)
Debt	91.61 (40.84; 50.77)	102.84(45.67; 57.17)	107.82 (44.35; 63.46)
Default costs	1.89 (0.78; 1.11)	2.70 (0.76; 1.94)	3.72 (0.65; 3.07)
Tax Burden	34.99 (17.81; 17.18)	34.10 (17.63; 16.47)	33.32 (17.73; 15.59)
Welfare	198.22	197.39	196.36
Face Value of Debt	124 (55; 69)	141 (61; 80)	151 (59; 92)
Leverage	56.13% (50.58 %; 61.55%)	63.32% (49.37%; 81.78%)	66.69% (45.16%; 100%)

Table 4: The table compares the optimal properties of PS for different levels of ω.

6 Concluding comments

This paper investigates whether and how tax policy affects the default costs of a firm combination. Taxing dividends while allowing to deduct interest distorts capital structure against equity (see e.g. Desai et al. (2004) and references therein). The first implication of the analysis is that bail-out promises inside groups, combined with interest deductions, magnify this distortion. They generate the very high leverage observed in several types of firm combinations. Another implication is that the value maximizing combination has no minority shareholders and the subsidiary distributes all profits to its parent. Interestingly, high payout ratios and no separation between ownership and control are not motivated by improved managerial incentives - as in the large governance literature on both groups and free cash-flow. They are a consequence of concerns relating to default costs.

As for the policy-maker, taxing intercorporate dividends does not add to the distortion in favour of debt financing, contrary to intuition. It does however distort the optimal allocation of debt in the firm combination: it shifts from the parent to its subsidiary. This increases default costs, anyway, despite the reduction in overall leverage.

In the real world, there are moral hazard problems as well as debt constraints that are ignored in our model. As a consequence intercorporate ownership can be lower than 100%, as in listed groups. Both in the US and in Sweden, the intercorporate dividend tax rate decreases as ownership increases. This provision is able to mitigate the adverse effects on welfare that our model highlights.

Last but not least, in the model IDT is welfare diminishing only when the bail-out promise has partial credibility. However the model ignores that tax regulators, in most countries, cap the subsidiary leverage with so called "thin capitalization rules". It is straightforward to show that the parent is optimally levered when such rules are accounted for, irrespective of credibility of the bail-out promise. And intercorporate dividend taxation, therefore, reduces welfare.

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7 Appendix

7.1 Proof of Proposition 1

We first prove some properties of the default cost and tax burden effects of the dividend transfer in PS. The default costs saved thanks to the dividend transfer are proportional to α and are larger the larger is ω and the lower is τ_D. The tax burden is instead increasing in both ω and τ_D. Let us now describe the behavior of these quantities when F_S and F_P change:

$$\begin{aligned}
\frac{\partial \Delta}{\partial F_P} &= \alpha\phi \frac{\partial X_P^d}{\partial F_P} \int_{X_S^d}^{+\infty} X_P^d f(X_P^d, y) dy + \\
&- \alpha\phi \frac{\partial X_P^d}{\partial F_P} \int_{X_S^d}^{+\infty} \left(X_P^d - \omega(1-\tau_D) \left[(1-\tau) y + \tau X_S^Z - F_S \right] \right)^+ \times \\
&\times f\left(\left(X_P^d - \omega(1-\tau_D) \left[(1-\tau) x + \tau X_S^z - F_S \right] \right)^+, y \right) dy.
\end{aligned}$$

$$\begin{aligned}
\frac{\partial \Delta}{\partial F_S} &= \alpha\phi\omega(1-\tau_D) \left[\tau \frac{\partial X_S^z}{\partial F_S} - 1 \right] \int_{X_S^d}^{+\infty} (X_P^d - \omega(1-\tau_D) \left[(1-\tau) x + \tau_S X_S^z - F_S \right])^+ \times \\
&\times f\left(x, (X_P^d - \omega(1-\tau_D) \left[(1-\tau) y + \tau_S X_S^z - F_S \right])^+ \right) dy.
\end{aligned}$$

$$\frac{\partial \Sigma}{\partial F_P} = 0$$

$$\frac{\partial \Sigma}{\partial F_S} = \omega\tau_D \left[\tau \frac{d X_S^Z}{d F_S} - 1 \right] (1 - F(X_S^d)).$$

Armed with these considerations, we can prove our Proposition 1, looking for the conditions under which $F_P^* = 0$. Notice first that, when $\omega = 0$ and $\pi = 1$, we are in Luciano and Nicodano's setting. When $\pi = 0$, $\omega = 0$ we are in Leland's setting.

Let us examine the K-T conditions for a minimum of the sum of tax burden and default costs. We keep the convexity assumption of SA's sum of tax and DC of Luciano and Nicodano (2012).

$$
\begin{cases}
\frac{dT_1(F_P^*)}{dF_P} + \frac{dC_1(F_P^*)}{dF_P} - \frac{\partial\Gamma(F_P^*,F_S^*)}{\partial F_P} - \frac{\partial\Delta(F_P^*,F_S^*)}{\partial F_P} = \mu_1, & (i) \\
F_P^* \geq 0, & (ii) \\
\mu_1 F_P^* = 0, & (iii) \\
\frac{dT_2(F_S^*)}{dF_S} + \frac{dC_2(F_S^*)}{dF_S} - \frac{\partial\Gamma(F_P^*,F_S^*)}{\partial F_S} - \frac{\partial\Delta(F_P^*,F_S^*)}{\partial F_S} + \frac{\partial\Sigma(F_S^*)}{\partial F_S} = \mu_2, & (iv) \\
F_S^* \geq 0, & (v) \\
\mu_2 F_S^* = 0, & (vi) \\
\mu_1 \geq 0, \mu_2 \geq 0 & (vii)
\end{cases}
\tag{11}
$$

We are investigating the existence of a solution in which $F_P^* = 0$ and $F_S^* > 0$. Hence, $\mu_1 > 0$ and $\mu_2 = 0$. Let us examine whether these conditions are satisfied.

As for condition (iv), let us examine $\frac{d\Sigma}{dF_S}$ and $\frac{d\Delta}{dF_S}$ when $F_P^* = 0$. We want to prove that their sum has a negative limit as S debt tends to zero, and a positive one when F_S goes to infinity, since we know from L-N (2012) that the rest of the l.h.s. does. Under the technical assumption that $xf(x)$ converges as $x \longrightarrow +\infty$, as F_S increases the l.h.s has a finite limit, since both terms vanish. In order to prove that the limit as F_S goes to zero is negative, we simply notice that $\frac{d\Sigma}{dF_S}$ has a negative limit, since $\lim_{F_S \longrightarrow 0} \frac{dX_S^Z}{dF_S} = F(0)$. F_S^* when $F_P = 0$ can be determined by solving the equation that equates the l.h.s. of condition (iv).

As for condition (i) notice that the derivative $\frac{d\Delta}{dF_P}$ vanishes at $F_P^* = 0$. Hence, we look for conditions for the l.h.s. to be positive and then set it equal to μ_1 to fulfil the condition. The l.h.s. is positive when

$$
\pi \geq \frac{\tau(1-F(0))}{\alpha \frac{1-\tau F(0)}{1-\tau} \left[\int_0^{X_S^Z(F_S^*)} xg(x, \frac{F_S^*}{1-\tau} - \frac{x}{1-\tau})dx + \int_{X_S^Z(F_S^*)}^{X_S^d(F_S^*)} xg(x, X_S^d(F_S^*) - x)dx \right]}.
\tag{12}
$$

Hence, when this condition is satisfied, given F_S^*, there exists a solution in which $F_P^* = 0$. Under our convexity assumption, this condition is necessary and sufficient. We denote the level at which equation (12) is satisfied as an equality as $\bar{\pi}$. Notice that the condition is satisfied for all levels of π only when $\tau = 0$.

Above $\bar{\pi}$, $F_P^* = 0$. When π is above $\bar{\pi}$ and $\tau_D = 0$, the dividend from S to P does not affect the Parent value, as it does not affect its default costs (Δ=0). Also Σ=0 when $\tau_D = 0$. ω has no effect on the default costs and tax burden of the subsidiary and S value is unchanged. Hence, ω^* is indefinite and part (i) of our proposition is proved.

When $\pi < \bar{\pi}$, leverage is optimally raised also by the Parent. Fix $\pi = \tilde{\pi} < \bar{\pi}$ and let us focus on the effects of the dividend transfer on the value of PS. A higher dividend transfer ω results in higher value if $\Delta > \Sigma$. In general, we are interested in the behavior of $\Delta - \Sigma$, the net value gains from the dividend transfer when ω changes. Consider first the derivative $\frac{\partial \Delta}{\partial \omega}$. This is positive for fixed F_P and F_S:

$$\begin{aligned}\frac{\partial \Delta(F_P, F_S)}{\partial \omega} &= \alpha\phi \int_{X_S^d}^{+\infty} (1-\tau_D)[(1-\tau)y + \tau X_S^Z - F_S](X_P^d - \omega(1-\tau_D)[(1-\tau)y + \tau X_S^Z - F_S])^+] \times \\ &\times \ f\left(\left(X_P^d - \omega(1-\tau_D)\left[(1-\tau_S)y + \tau X_S^Z - F_S\right]\right)^+, y\right) dy.\end{aligned}$$

On the other side, also the tax burden is increasing in ω:

$$\frac{\partial \Sigma}{\partial \omega} = \tau_D \int_{X_S^d}^{+\infty} (x(1-\tau) + \tau X_S^Z - F_S) f(x) dx.$$

However, tax burden increase is zero when $\tau_D = 0$. Then, value increases as ω increases: $\omega^* = 1$ and part (ii) is proved.