Leverage in Pyramids: When Debt Leads To Higher Dividends*

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Abstract

This paper explores the use of leverage in pyramids and its relationship to dividend policy. The use of leverage in holding companies widens the disparity between control rights and cash flow rights. We postulate that it also leads to more generous dividend payouts since dividends are needed to service debt in the holding companies. We analyze a comprehensive sample of French pyramidal structures. Consistent with our hypothesis, we find that dividend payouts increase in the disproportionality between control and cash flow rights that is explained by holding company debt. By contrast, disproportionality generated by holding company equity leads to lower payouts. Servicing debt in the holding companies of a pyramidal structure is the primary motive for dividends, as opposed to alternative explanations such as investments or dividend preferences. Finally, the combination of high leverage in holding companies and high dividends negatively affects firm value, consistent with the hypothesis of tunneling by dominant owners.

Keywords: pyramids, payout policy, leverage, ownership structure, control wedge, disproportionality of control and cash flow rights.

JEL classification: G32, G34, G35.

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Abstract

This paper explores the use of leverage in pyramids and its relationship to dividend policy. The use of leverage in holding companies widens the disparity between control rights and cash flow rights. We postulate that it also leads to more generous dividend payouts since dividends are needed to service debt in the holding companies. We analyze a comprehensive sample of French pyramidal structures. Consistent with our hypothesis, we find that dividend payouts increase in the disproportionality between control and cash flow rights that is explained by holding company debt. By contrast, disproportionality generated by holding company equity leads to lower payouts. Servicing debt in the holding companies of a pyramidal structure is the primary motive for dividends, as opposed to alternative explanations such as investments or dividend preferences. Finally, the combination of high leverage in holding companies and high dividends negatively affects firm value, consistent with the hypothesis of tunneling by dominant owners.

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With more than a quarter of listed firms worldwide constituted as pyramids according to LaPorta, Lopez-de-Silanes, and Shleifer (1999) (and probably even more, as our research indicates), pyramids are the most commonly used mechanism leading to discrepancies between the control rights and cash flow rights, an important problem in corporate governance. When analyzing the control-enhancing effect of pyramids, however, the literature only considers the role of equity in pyramids. It ignores the possibility that debt financing can be used in the pyramidal holding companies, and that the disproportionality between control rights and cash flow rights is much wider than currently recognized when holding company debt is taken into account.

We investigate the control-enhancing effect of leverage in holding companies and its relationship to dividend payouts. Our focus on payout policy is motivated by a disagreement in the literature on the role of dominant shareholders in payout policy. According to one view, the Expropriation Hypothesis, introduced by La Porta et al. (2000), dominant owners prefer to keep cash resources within the firm rather than share them with minority shareholders. The weaker the investor protection and the larger the distance between the dominant owner's voting rights and cash flow rights, the smaller should be the payout. Empirical support, however, is mixed. While the findings of La Porta et al. (2000) are consistent with the Expropriation Hypothesis, Faccio, Lang and Young (2001) present seemingly contradictory evidence that dominant owners in European business groups pay larger dividends. They refer to an alternative explanation, the Substitution Hypothesis, which stipulates that large shareholders care about the stock market value and thus build a reputation by paying higher dividends. It is an open question how to reconcile these findings. The role of debt in pyramids has not been studied in this context.

The use of debt in holding companies increases the incentive to expropriate minority shareholders, by widening the discrepancy between cash flow and control rights. At the same time, leveraged financing of a pyramid leads to a potential need by the dominant owner for higher dividends to service the debt contracted in the holding company. We call the latter effect the Debt Service Hypothesis. The Debt Service Hypothesis helps us understand the relatively high dividend payouts by pyramid-controlled firms in spite of the heightened disproportionality.

We illustrate this idea through an example (see Figure 1). Ms. *X* dominates company *OpCo* by controlling 30% of its equity, by means of a holding company *HoldCo* that is 60% owned by her and has no other assets. Ms. *X*'s cash flow rights are conventionally measured by the product 0.6*0.3 = 0.18, her claim on *OpCo*'s dividends. In measuring control rights, we apply the same product rule but convert the majority stake, 0.6, into full control, 1.0 (see section 2.2 for details). Thus, the control rights of Ms. X are 1.0*0.3=0.3. A useful measure of the disparity between control rights and cash flow rights that we call the *equity wedge* is the ratio control rights/cash flow rights, calculated as 0.3/0.18 = 1.66. Now consider that *HoldCo* is financed with 35% debt and 65% equity. In this setting, *OpCo* needs to pay a sufficient dividend so that *HoldCo* can service its debt. Ms. *X*'s effective claim on *OpCo'*s cash flows is reduced as a consequence. To reflect this effect, we adjust for debt and introduce the *effective control wedge*, defined as control rights/debt-adjusted cash flow rights. The debt-adjusted cash flow rights are obtained by adjusting cash flow rights for the equity-to-assets ratio in every holding company along the pyramidal structure. Ms. *X*'s effective control wedge is substantially larger, namely 0.3/[0.18*0.65] = 2.55. The equity wedge of 1.66, which is based exclusively on equity stakes, captures only 65% of the effective control wedge. The remaining 35% of the effective control wedge, the part of Ms. *X*'s disparity attributed to *HoldCo*'s debt, we call the *debt wedge* (2.55-1.66 = 0.89). In effect, we decompose the effective control wedge into the equity wedge and the debt wedge, and explore their roles in pyramidal firms.

In an ideal environment to test our hypotheses, pyramids should be the only reliable way to engineer a control wedge. Further, pyramids should be tax neutral. Finally, we require complete transparency of the pyramidal structure, i.e., ownership structure, financial structure and payout policy of privately-owned as well as publicly listed companies including holding companies. As detailed in Section 2.1, France is a well-suited laboratory due to its specific institutions; we study a comprehensive panel of French companies over the 1997-2004 period.

Our main contribution is the finding that the equity and debt wedges have opposite effects on dividend payout behavior. On one hand, operating companies with dominant owners characterized by a large equity-based discrepancy between control rights and cash flow rights (equity wedge) pay out less

cash. On the other hand, we find that the use of leverage in holding companies increases dividend payouts, in accordance with the Debt Service Hypothesis.

A second contribution is to document the importance of debt in holding companies as a mechanism to enhance control of dominant owners. In France, debt in holding companies constitutes a significant part of the effective control wedge, increasing the mean from 1.84 (equity wedge only) to 5.99 (equity plus debt wedge) and the median from 1.56 to 2.57. Moreover, debt financing may help to resolve the puzzle observed in Almeida and Wolfenzon (2006), that owners often hold overwhelming majority stakes, or even 100% stakes, in a holding company along the control chain. We find that control is actually enhanced by the use of outside debt rather than equity; in such cases, the possibility that debt magnifies the control wedge is a plausible motive for 100% stakes, which has been ignored in past literature.

Further assessing the implications of the Debt Service Hypothesis, we investigate the valuation effects of leverage and dividend payouts in pyramids for minority shareholders in the operating company. We find that dividends in general have a positive effect on firm value, consistent with the prevalent theories on dividend payouts and earlier studies. However, when dividend payouts are explained by holding company debt, these theories do not necessarily apply. Consistent with Bertrand, Mehta and Mullainathan (2002), such dividends paid to service the debt in pyramidal structures could be another form of expropriation and have a negative effect on the value of minority equity. We find that dividend payouts explained by the debt wedge of a dominant owner's holding company have a negative valuation effect. The valuation effect of dividend payouts reverses its sign when driven by the need to service holding company debt, lending further support to the Debt Service Hypothesis.

We undertake additional tests to evaluate our hypotheses. First, if dividend payouts by the operating company are driven by the need to service debt, then the dominant owner should ultimately receive only a small fraction of the dividends, and the fraction received should decrease in the importance of holding company debt. To explore this implication, we analyze the actual dividend payouts to

dominant owners along the entire pyramidal structure.[6] We find that only a fraction of the cash made available to dominant owners is actually paid out to them, with a substantial part retained within the pyramidal structure. Crucially, the fraction retained in each holding company in the pyramidal structure increases in the importance of debt service in that holding company.

Next, we investigate alternative explanations. The fact that a substantial fraction of dividends are retained in pyramidal structures could be explained by investment in other business ventures (Almeida and Wolfenzon (2006)). It could also be explained by a desire to cater to different dividend preferences among shareholders.[7] We consider these two alternative explanations and show that the Debt Service Hypothesis is the principal motivation for the payout policy of the operating company and the payout policies through the pyramidal structure.

Ownership structure, the use and design of pyramids, operating and holding company leverage, and finally dividend policy may not be chosen independently. Firms with different characteristics may select different relations among these key variables. We undertake a series of tests and use alternative specifications to address concerns about self-selection and endogeneity. First, we examine whether firm characteristics that should be related with capital structure and dividend decisions play a role in our key relations. Second, we address the possible endogeneity of ownership structure and pyramids. Third, we address concerns about a possible endogenous relation between Tobin's Q and dividend policy. The results provide assurance that self-selection and endogeneity are not important concerns.

The paper is organized as follows. Section 1 presents the theoretical arguments. Section 2 describes the study's design and data. Section 3 presents our main results. Section 4 presents additional tests, Section 5 addresses alternative explanations and Section 6 deals with robustness issues. Section 7 concludes.

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[6] Bertrand, Mehta, and Mullainathan (2002) note that actual dividend payouts are the best way to assess the impact of shareholder control on expropriation in pyramids, but they are unable to observe payouts in their data of Indian business groups. In contrast, our balance sheet data of holding companies allow us to reconstruct the actual dividends that are paid by all holding companies in the pyramidal structure. Earlier pyramid studies only considered potential dividend payouts to dominant owners, defined as the maximum payout that they would obtain if each holding company in the pyramid paid out all of the cash flows received from companies below.

[7] If some owners, including minority shareholders, prefer payouts whereas a dominant owner or other blockholder prefers to retain cash then a holding company is an effective structure to separate dividend preferences.

1. Hypotheses and Related Literature

A substantial body of theory argues that owners choose a higher level of expropriation if the control wedge increases (Burkart and Lee (2008)). For a given dividend payment, a dominant shareholder with a control wedge gets only a fraction of the cash benefit compared to a dominant shareholder without a control wedge (the latter has a larger cash flow stake), but loses the same amount in control benefits. Theory suggests that, for a given level of voting rights, a higher control wedge provides larger incentives for the dominant shareholder to engage in expropriation. For dividends, there should be a negative relationship between dividends and the equity control wedge for a given block size:

H1: The control wedge has a negative effect on operating company dividends (Expropriation Hypothesis).

The alternative view can be traced to the notion that dividend payouts are favorably received by stock markets. Resources paid out are resources not diverted (free cash flow hypothesis) or sticky dividends imply a long-term commitment to stable payouts (as dividend signaling models postulate). Accordingly, the Substitution Hypothesis (La Porta et al. (2000) and Faccio, Lang, and Young (2001)) holds that from the dominant shareholder's perspective, the positive stock market value effect dominates the potential gains from expropriation. Dominant owners can and do commit to a stable dividend level in order to offset the market doubts about expropriation risk. The larger the control wedge, the more skeptical the stock market concerning the intentions of dominant owners, and more important the dividend payout:

H2: The control wedge has a positive effect on operating company dividends (Substitution Hypothesis).

The Substitution Hypothesis, however, has not been subjected to a formal theoretical analysis. It is not obvious that a dominant owner wants to commit to generous dividend payouts, even if this commitment could generate strong positive value effects. Only the level of control, i.e. her voting rights, determines her control benefits and hence the control effect. On the other hand, the larger the control wedge for a given level of voting rights, the smaller the consequences of the stock market reaction for the dominant owner's wealth. According to this argument, the value effect fades relative to the control effect as the control wedge increases. We suggest an alternative mechanism that explains why a control wedge

may lead to higher dividend payouts. This effect arises if the ownership stake of the dominant owner is leveraged, because the owner directly benefits from an increased dividend payout as a source of funding to service her debt.

Leveraged ownership creates a disparity between voting rights and the ultimate cash flow benefits of the dominant owner. Both debt and equity provide the opportunity for the dominant blockholder to reduce her investment in a controlling equity stake, as well as the residual cash flow rights that she derives from it. However, the use of debt instead of equity in a pyramid leads to an important difference; the dominant shareholder must assure the solvency of the holdings.[8] We postulate:

H3: The equity wedge has a negative effect on operating company dividends, but the debt wedge has a positive effect on dividends (Debt Service Hypothesis).

From this argument, we derive a number of hypotheses on the value effects of payout policy and the control wedge.[9] First, the literature generally agrees that, starting from very low dividend payouts, an increase in dividends should have a positive value effect. The free cash flow and the signaling theories, the two most influential dividend theories, agree on this prediction (e.g., Bhattacharya (1979)), Jensen (1986)). Both the Substitution Hypothesis and Expropriation Hypothesis make the same prediction, because both are ultimately grounded in the free cash flow hypothesis. Based on this consensus, if an operating company pays larger dividends, the value impact from the point of view of minority shareholders should be positive:

[8] Our focus is the capital structure of the pyramidal structure. We discuss the relationship between the capital structure in the holding company and that in the operating company in Section 5.

[9] Our paper is closely related to studies relating pyramidal ownership, and the discrepancy between voting and cash flow rights in general, to firm valuation. These studies present broad evidence showing a negative relationship between valuation and the control wedge which is generally viewed as supporting expropriation (even though important methodological problems remain, see Adams and Ferreira (2008). The negative valuation effect is also documented for East Asia (Claessens et al. (2002)), Continental Europe (Bennedsen and Nielsen (2006)) and a multi-regional sample of emerging markets (Lins (2003)). These studies do not specifically consider pyramids, but pyramiding is likely to be the primary reason for the divergence of cash flow rights from control rights in their samples (Morck, Wolfenzon, and Yeung (2005)). A few papers link a negative firm valuation effect specifically to pyramid ownership (Claessens et al. (2002), Volpin (2002) and Cronqvist and Nilsson (2003)). These papers do not consider holding company debt or payout policy in their sample nor their valuation effects. The literature also suggests that the use of pyramids is not independent of firm characteristics such as size, age, and growth opportunities. Attig, Fischer, and Gadhoum (2004) find that pyramidal firms tend to be larger than unaffiliated firms and appear to be associated with larger capital investments. Similarly, Claessens, Fan, and Lang (2002) find that firms with the highest separation of voting rights from ownership (i.e., those most likely to be owned through pyramids) are younger than those with less separation.

H4: Higher dividend payouts have a positive effect on operating firm value (Free Cash Flow/Signaling Hypothesis).

Corporate finance theory does not predict that dividend increases create value at *all* payout levels. Mainstream capital structure models emphasize the value of internal financing, based on asymmetric information (pecking order) and similar frictions like transaction costs, and highlight the financial distress cost (debt overhang) of companies that deplete their cash reserves and their capacity to raise financing. Therefore, when combining the corporate governance and the capital structure arguments, it is useful to consider an internal optimum for dividend payouts. The view expressed in Hypothesis 4 is that the typical incentives for dominant owners are to keep dividends below the internal optimum.

In the context of our analysis, it is useful to introduce a distinction between voluntary payouts and debt-induced payouts. Voluntary payouts are those that are at the full discretion of managers or, in blockowner-controlled firms, the dominant owner. Debt-induced payouts are those that are explained by debt service obligations, as argued in our Debt Service Hypothesis. According to the prevailing view, the stock market reaction to the first type of dividend decision is positive because payout ratios are below the value optimum:

H5: The larger the equity control wedge, the larger the positive effect of dividend payouts on operating firm value.

The same expectation is not true if dividend payouts are debt-induced, even if we assume a valuation reaction to dividend policy. The prediction must be more nuanced. It depends whether the dividends induced by the debt service are smaller or larger than the optimal payout level, in terms of firm value. Both cases may occur. One can postulate that dominant owners of firms with a substantial debt wedge are more likely to adopt a larger payout policy. Effectively, by paying out dividends in excess of the optimum from the viewpoint of the operating company's financial structure, the dividend payout may become a subtle form of tunneling (Bertrand, Mehta and Mullainathan (2002)), since it takes financial resources away from their best use for the benefit of the dominant owner's debt obligations. Thus:

H6: The larger the debt wedge, the smaller the dividend payout effect on operating firm value.

Our paper and its hypotheses also bear some relationship with the sizable literature on business groups. However, pyramids and business groups should not be confounded, as Khanna and Yafeh (2007)

note in their survey. Our paper focuses exclusively on corporate governance related-aspects of pyramids, and the pyramid-controlled companies in our sample are predominantly not part of business groups (see Section 5.1). Still, we explore whether alternative explanations emphasized in the business groups literature, e.g. by Almeida and Wolfenzon (2006), can help to explain the payout patterns that we find, and we discuss some of this literature in that context. We also mention a small number of papers that explicitly address the question of how business groups will allocate debt between parent firms and subsidiaries (Bianco and Nicodano (2006), Luciano and Nicodano (2008) and Lee (2009)). They generally find evidence that debt seems to be concentrated within parent firms, and argue that this is an optimal arrangement. None of these papers investigates payout policy or the role of debt in facilitating the span of control exercised by the dominant shareholder. These are questions not yet discussed in the literature; for example, holding company debt is absent from recent lists of control-enhancing mechanisms that create a disparity between voting and cash flow rights (Adams and Ferreira (2008) and Shearman and Sterling (2007)).

2. Design Issues and Data

2.1 Pyramids in France

France is an ideal laboratory to investigate the role of pyramids in the relationship between large and small shareholders. France is a developed market, with the largest percentage of foreign stock ownership among the large European economies, and a high degree of ownership concentration in listed firms. For all practical purposes, dual class shares are not allowed. Double voting rights, a French particularity, are constrained; see Section 6.1 for robustness results for double voting rights. Thus, in France, the use of pyramids is the only way to reliably engineer a control wedge. Pyramids in France are also tax neutral, which explains why holding companies can conveniently be used for leveraged financing of a dominant owner's stake. A dominant owner can fully deduct the corporate income taxes that the operating company paid from the tax liability of the holding company on dividends received from the operating company. As a result, there is no real cost to establishing elaborate pyramidal structures in France, where pyramids are widespread and deeply embedded. Further, French regulations, which by and large are respected, require

all companies, public and private, to file their *un*consolidated financial statements on an annual basis. French regulations also require all companies, public and private, to register their list of important shareholders, shareholdings and disclosure important changes in shareholdings.[10] Thus, the ownership structure, financial structure and payout policy of privately-owned as well as publicly listed companies including holding companies are accessible.

2.2 Definitions and Algorithms

Pyramids can be complex and France is no exception. To correctly identify dominant owners and their control and (debt-adjusted) cash flow rights, we first identify for each company all direct equity stakes in excess of 5%. We then determine whether the entities owning these blocks of shares are directly or indirectly owned by other shareholders or entities with stakes in excess of 5%. This process is iterated until we reach the ultimate owners.[11] For the set of N entities found in this process, including ultimate owners and the operating company, we denote the equity stake of entity i in entity j by α_{ij}. Let $\mathbf{A} = (\alpha_{ij})$ be the $N \times N$-matrix of all shareholdings in the pyramid, including those of ultimate owners. We place the operating company in the last position, so that α_{iN} denotes entity i's stake in the operating company. Let $\mathbf{a}_k$ be the column vector of direct stockholdings of ultimate shareholder k in the N entities. Then the cash flow rights $\mathbf{f}_k$ of ultimate shareholder k in all entities are consistently defined by the vector:[12]

$$\mathbf{f}_k = (\mathbf{I} - \mathbf{A})^{-1} \mathbf{a}_k ,$$

where $\mathbf{I}$ is the identity matrix. The N-th element of this vector, f_{kN}, denotes shareholder k's level of (equity) cash flow rights in the operating firm. For example, if the pyramid consists only of a single control chain in which all entities are vertically aligned and there are no multiple branches (as in the

[10] Per French corporate laws, the following key thresholds give rise to discontinuous changes in control rights: 1) 33%: This level of control grants veto rights. It also triggers the mandatory bid rule, i.e. any owner passing through the 33% threshold is required to launch a full and unrestricted takeover offer; 2) 40%: Control is presumed if one shareholder has at least 40% of voting rights, directly or indirectly, and is the largest shareholder (according to article 355-1 of French securities law per Bloch and Kremp (2001)); 3) 50%: This constitutes majority voting rights (or legal control) and triggers notification to the French authorities; 4) 67%: Reverse of the 33% rule, i.e. the ability to block any veto rights by other shareholders. This is also the highest conditional takeover offer allowed under French law (restricted offers are not allowed in France).

[11] For ultimate owners identified in this procedure, we also record share stakes smaller than 5% that they hold in the operating company or in another entity.

[12] This procedure is used and explained e.g. in Almeida et al. (2009) and Chapelle and Szafarz (2005). It follows the classical example of input-output analysis and can handle any level of pyramidal complexity.

example in the introduction), this algorithm determines f_{kN} simply as the product of all ownership stakes along this control chain, $f_{kN} = \prod_{i=k,\ldots,N-1} a_{ii+1}$. If the ultimate owner is linked to the operating company via multiple but disjoint control chains, the algorithm will calculate the product of ownership stakes along each control chain and then add these products to obtain f_{kN}.[13]

Next, we capture the discontinuous character of control rights, by using concepts similar to those adopted in Almeida et al. (2009). We introduce a threshold that indicates the level of control above which the shareholder is said to assume absolute control over the operating company. We call this threshold the *critical control threshold* and fix its value at 50%. Adopting this majority rule, we convert effective control rights (i.e. the sum of direct and indirect voting rights in a company) of greater than 50% in any entity into full control of 100%. The other stakes are then allocated zero control rights. Formally, we redefine the control right stake of owner k in entity j as:

$$c_{kj} = \begin{cases} 1 & \text{if} \quad f_{kj} > 0.5 \\ 0 & \text{if} \quad \exists i \neq k, f_{ij} > 0.5 \\ f_{kj} & \text{otherwise} \end{cases}$$

This algorithm must be applied iteratively, by replacing f_{kj} by c_{kj} for all ultimate owners and repeating the algorithm until the procedure converges to a vector $\mathbf{c_k}$, which in our sample it does in all cases after only a few rounds.[14] After the iterative process converges, c_{kN}, the N-th element in the vector $\mathbf{c_k}$, denotes shareholder k's level of control rights in the operating firm.[15]

[13] The matrix approach is only needed to properly define ownership rights in more complex pyramidal structures, such as cross-holdings, and it handles any level of complexity consistently. For the implementation of the matrix algorithm, we use a consistent and conventional procedure to resolve possible conflicts and to assign the appropriate stake to the applicable control chain, by checking whether a particular stake occurs twice and then stopping tracing.

[14] The iteration is only needed if an ultimate owner k has several, direct or indirect, holdings in an entity j; if their sum f_{kj} exceeds 0.5, the algorithm will convert f_{kj} to $c_{kj} = 1$, which in turn may lead the combined holdings of owner k in another entity m to exceed 0.5 and hence trigger the next round of conversions, etc.

[15] It is instructive to compare this measure of control rights to the widely used weakest link rule (see La Porta, Lopez-de-Silanes, and Shleifer (1999)). In a single control chain such as in the Figure 1 example, the weakest link equates control rights with the smallest equity stake along the chain, thus implicitly converting the control rights of all other links to 100% similar to our rule. Since this conversion, however, also applies to equity stakes smaller than 50% but larger than the weakest link, the weakest link rule often leads to assigning larger control rights to dominant owners than our rule does. The control rights assigned by the weakest link rule are not always larger in the case of multiple and complex control chains.

We define the equity wedge of owner *k* as:

$$\text{equity wedge}_k = \frac{c_{kN}}{f_{kN}}$$

Finally, we determine the debt-adjusted cash flow rights to account for the possible presence of debt in all pyramid entities. Let l_i denote the leverage ratio (1 - equity/total assets) of entity *i* ($l_i = 0$ for ultimate owners). We define $\beta_{ij} = \alpha_{ij} \cdot (1 - l_i)$ as the debt-adjusted cash flow right, $\mathbf{B} = (\beta_{ij})$ as the $N \times N$-matrix of all debt-adjusted cash flow rights in the pyramid, and $\mathbf{b_k}$ as the vector of debt-adjusted cash flow rights of shareholder *k*. Following the same procedure as for unadjusted cash flow rights, we obtain the vector $\mathbf{d_k} \equiv (\mathbf{I} - \mathbf{D})^{-1} \mathbf{b_k}$, where the *N*-th element d_{kN} denotes shareholder *k*'s level of debt-adjusted cash flow rights in the operating firm. We define the effective control wedge of ultimate owner *k* as:

$$\text{effective control wedge}_k = \frac{c_{kN}}{d_{kN}}.$$

Finally, we obtain the debt wedge of ultimate owner *k* from the definition:

$$\text{debt wedge}_k = \text{effective control wedge}_k - \text{equity wedge}_k .$$

In accordance with La Porta, Lopez-de-Silanes, and Shleifer (1999), Claessens, Djankov, and Lang (2000), Faccio and Lang (2002) and others, we require that a shareholder possess a substantial level of control (i.e. voting rights) in order to qualify as a dominant owner. The typical threshold used in the literature, called the *inclusion threshold*, is 20%. We use a 20% inclusion threshold in our baseline analysis and perform robustness analyses for 33% and 40% thresholds. Our inclusion threshold is consistent with the literature and allows comparisons with prior findings. In each operating company, we verify whether the largest ultimate owner exceeds this threshold. If all $c_{kN} < 20\%$, the company is considered as widely held. Otherwise, we identify the dominant owner as the ultimate owner with the largest number c_{kN}. In the remainder of our paper we refer to this ultimate owner as the dominant owner.

2.3 Data and Implementation

Our starting point is the set of all publicly listed companies on Euronext Paris as of January 31, 2003. Our initial sample includes firms from all three tiers of the Paris market: 393 listed firms on the Premier

Marché (market), 324 listed firms on the Second Marché, and 152 listed on the Nouveau Marché. We then impose one filtering criterion, which is inclusion in the WorldScope and Datastream databases over the period 1996-2005. The final sample consisting of 355 firms (i.e. 206 Premier, 138 Second and 11 Nouveau Marché firms). We refer to each of these publicly listed companies as an operating company. Next, we collect the complete ownership information for 1997, 1999, 2001 and 2003 for all holding companies, public and private. This information is available from the Dafsaliens database that also documents validation dates (Dafsaliens was set up by large French financial institutions to provide precise ownership information). Starting from the operating company, we use Dafsaliens to trace the ownership of the owners of the operating company and continue this process until we have traced the entire ownership structure to the dominant owners. We trace ownership across all ownership classes, individual/family, public company, unlisted private company and state.

From the Diane database (the French component of Bureau van Dijk's Amadeus database), we collect the unconsolidated financial statements for the private unlisted companies and for publicly listed companies in the ownership chain for 1996 to 2004. The *un*consolidated financial data provided by Diane eliminates the effect of group debt and focuses the analysis on the capital structure of the firm itself. For the sample of 355 operating companies, we use their consolidated financial statement information from WorldScope.[16]

The richness of the Dafsaliens and Diane information offers an important advantage over annual report-based data and company handbooks used in most previous works such as La Porta, Lopez-de-Silanes, and Shleifer (1999) and Faccio and Lang (2002), which cover only ownership information of public companies. The ownership structures are stable over time; see Section 5.3 for endogeneity analysis. For this reason we also use the ownership structures information collected for a specific year in the subsequent year. With our ownership data in 1997, 1999, 2001 and 2003 we measure ownership structures in 1997-2004. In our payout and valuation regressions, we use the ownership and control variables in year t to explain payout and valuation variables in year $t+1$.

[16] If there are subsidiaries controlled by any of the 355 companies, the net financial position of the subsidiaries and operating company is reflected in the operating company's consolidated financial information.

3. Results

Section 3.1 and Table 1 present the summary statistics for the full sample of operating firms. For the full sample, Section 3.2 and Table 2 focus on the determinants of dividend payout and firm valuation for the full sample of operating firms. Focusing on pyramids, Section 3.3 and Table 3 address the importance of debt wedges in pyramids. Section 3.4 and Table 4 presents the determinants of dividend payout and firm valuation for operating companies in pyramids.

3.1 Summary Statistics for the Full Sample

Table 1 describes the ownership structure and firm characteristics of the 355 French operating companies, yielding 2597 observations in our 1997-2004 window. We find that 85.6% of operating companies have a blockholder who satisfies the inclusion threshold of 20%, and only 14.4% of the firms are widely-held. Moreover, in 55.3% of our sample dominant shareholders use pyramids to control the operating company. Note that the frequency of pyramid-controlled firms is about double the 26% frequency found in La Porta, Lopez-de-Silanes, and Shleifer (1999) and Faccio and Lang (2002). The reason for this dramatic increase in the frequency of pyramidal structures is the inclusion of private holding companies. By contrast, all earlier studies on pyramids in France only classify firms as pyramids if at least one of the holding companies in the pyramidal structure was a public company.[17] We find that only 20.1% of pyramidal structures contain a public company (not reported in tables). While perhaps an inevitable restriction for cross-country studies, restricting the pyramid definition to only structures with public holding companies leads to a substantial undercount of the use of pyramids in at least the case of France.

Table 1 also classifies the dominant owners by type (individual/family, firm, and state). 47.1% of operating companies are controlled by either a family or an individual, roughly in line with earlier studies. Firms comprise 30.2% of dominant owners followed by state ownership of 3.6%. Again, 14.4% of the firms do not have a dominant owner with a stake equal to or greater than 20%.

The table next provides an overview of key financial characteristics with definitions for the companies in our sample, both in the aggregate as well as broken down according to control. We measure

[17] Besides La Porta, Lopez-de-Silanes, and Shleifer (1999) and Faccio and Lang (2002), this includes Ginglinger and Hamon (2008).

dividends relative to cash flow, net earnings and market value. We follow common practice and set payout ratios to unity when dividends are paid but cash flow or earnings are negative or less than the dividend (e.g. Megginson and Von Eije (2008)). Our measure for market valuations is Tobin's Q, defined as the book value of total assets minus book value of equity plus market value of equity, over book value of total assets. Leverage is defined as total debt obligations, scaled by book value of total assets. Sales growth is the two-year growth rate of sales.

Measured in terms of total assets, widely-held firms are substantially larger than firms with dominant owners, and they have a higher Tobin's Q and a lower sales growth rate than operating companies in pyramids. Widely-held firms have valuations and dividend measures comparable to the full sample means. Relative to the full sample, operating companies with pyramidal ownership generally pay higher dividends, but appear to have a lower valuation and grow faster. Relative to operating companies with pyramids, block-owner controlled firms have lower dividend payouts, higher dividend yields and higher valuation. The frequency of loss firms is comparable across the subsamples. We also tabulate an industry breakdown. A wide mix of industries is represented in the full sample as well as the subsamples of block owner-controlled and pyramid-controlled operating companies.

3.2 Determinants of Dividend Payout and Firm Valuation for the Full Sample

For the full sample, Table 2 presents regression results that analyze the impact of financial characteristics and ownership structure on dividend policy and firm valuation for operating companies. All regressions include industry and year fixed effects and report Newey-West based robust *t*-values. We measure explanatory variables in year *t* and explained variables in year *t+1*.

In Panel A, we consider determinants of payout policy. The dependent variables are the three conventional measures used for dividend payout, dividend/cash flow, dividend/earnings, and dividend/market capitalization (dividend yield). Dividends increase in firm size and decrease with leverage. Sales growth does not have a significant influence. Companies in loss years tend to cut back on dividends. The dividend payout is also influenced by industry, with services having a lower payout and financials having a higher payout (industry effects not reported in the table).

The results for ownership structure are mixed when compared to widely-held firms. For the dividend/earnings ratio, block owner-controlled firms have lower payouts, regression (2). Pyramid-controlled operating companies have a higher dividend yield, regression (3); however, as we show in Panel B this reflects a mechanical relationship based on lower market value for pyramid-controlled firms. The surprising result is that ownership structure does not matter for dividend payout measured by cash flows. Given our hypotheses, the implications of the Expropriation Hypothesis, lower dividends, could be offset by the implications of the Debt Service Hypothesis, higher dividends. The Substitution Hypothesis generates an analogous prediction but the basis for the prediction is the dominant shareholder's preference for value over control. At this stage of the analysis, we cannot distinguish between the three hypotheses, Substitution, Expropriation and Debt Service.

In Panel B, we consider the determinants of firm valuation (Tobin's Q) using the dividend/cash flow payout ratio. Size has a negative impact on firm valuation and there is also a weak negative impact for sales growth. We find a significant negative coefficient for pyramid-controlled operating companies**.** This finding is consistent with theories emphasizing the discretionary power of dominant owners to the detriment of minority shareholders (e.g., Shleifer and Vishny (1986), Bolton and von Thadden (1998), Burkart, Gromb, and Panunzi (1997)). Further, this lends support to the notion that these conflicts are reinforced by the use of pyramidal structures. Confirming many earlier studies on payout policy and consistent with H4, our free cash flow hypothesis, in regression (2) we find a positive effect for dividend payouts on firm value. However, as regression (3) shows, the valuation effect of dividends is fully attributed to dividend payouts by block owner-controlled companies who do not use pyramids. There is no comparable effect for pyramid- controlled operating firms. The dividend payout itself becomes insignificant once these interaction terms are included, but the coefficient for block owner-controlled firms becomes strongly and significantly negative if they do not pay dividends. These results are again consistent with the Free Cash Flow/Signaling Hypothesis, which predicts a positive coefficient for dividend payouts. Regardless of organizational form, a dominant owner enjoys considerable discretion in choosing the dividend policy. Since dividends are voluntary, they have a positive effect on firm value. On the other hand, these findings are consistent with the following interpretation from the perspective of

the Debt Service Hypothesis: dividend decisions are induced by the debt service obligations embedded in the holding companies. In this case, the valuation effect is fully captured by the fact that the dominant owner uses a pyramid and the payment of dividends has no incremental impact.

Thus, our results show that the dividend policy and valuation effects of pyramid-controlled operating firms differ from the widely-held and block owner-controlled firms. Our findings suggest that the behavior of pyramid-controlled operating firms could be explained by the Debt Service Hypothesis, where dividend payouts are driven by debt service obligations in the levered pyramidal structures. We continue our investigation by focusing on pyramids.

3.3 Importance of the Debt Wedge in Pyramids

In this section, we focus on operating companies with a dominant blockholder who exceeds the 20% ownership threshold and uses pyramidal structures. In Table 3, we present summary statistics for pyramid-controlled operating firms. Although we have information in Tables 1 and 2 about 1435 firm-years of pyramid-controlled operating firms, we continue our analysis with a sample of 1253 firm-years, a sample with sufficient information to calculate equity and debt wedges for the pyramidal structure. To be included in the refined sample, we require (1) at least 50% of the holding companies in the pyramidal structure are traceable in Diane and (2) the wedge variables are not outliers.[18] For the refined sample, 19.2% of holding companies on average have missing data and the median holding company has no missing data. It is interesting to note that on average only 8% of the holding companies are public firms, which underscores the importance of including private firms in our analysis.

In Table 3, we present summary statistics for pyramid-controlled operating firms, starting with an expansion of the financial characteristics shown in Table 1 broken down by the average, 25th percentile, median, 75th percentile and standard deviation. Table 3 shows that the dominant owner holds on average 40.391% of the voting rights in the operating company (median: 34.170%). If we use the more demanding inclusion threshold of 33% (40%) for the dominant blockholder, rather than the 20% threshold

[18] In particular, we exclude 3% with the highest debt wedge of the sample (42 observations). We run robustness analysis with alternative maximum debt wedges. The results do not materially change (results are available upon request from the authors). As an alternative approach to deal with high values for the debt wedge we apply a logarithmic transformation of unity plus the debt wedge and run robustness analysis with all observations. Again, the results do not materially change (results are available upon request from the authors).

that is standard in the literature, the vast majority of these firms are still classified as pyramid-controlled operating firms rather than widely-held firms, more precisely 83.5% (73.3%). Pyramidal structures contain 2.555 layers on average with a 25th percentile and median of 2, and a 75th percentile of 3.

The equity wedge with a mean of 1.840 [25th:1.085, median:1.563, and 75th:1.996] measures the control-enhancing effect of pyramids as follows: considering only equity stakes in the pyramidal structure, dominant owners own 1.840 times more voting rights on average than they hold cash flow rights. The debt wedge is our proposed measure to aggregate the effect of leverage throughout the pyramidal structure. In determining the debt wedge we assume that there is zero debt in a holding company in the pyramid that is not included in the Diane data; thereby presenting conservative estimates of the debt wedge. The mean debt wedge has a value of 4.149 [25th:0.449, median:1.059, and 75th:3.021]. The debt wedge says that for every one percent of cash flow rights to which the dominant owner is exposed, the use of debt in the pyramidal structure enhances the voting rights by 4.149 on average. Considering the effective control wedge (equity wedge plus debt wedge), dominant owners in our sample have on average 4.149+1.840 = 5.989 times more voting rights than cash flow rights in the pyramid-controlled operating company. The use of leverage in pyramids is highly important for France: on average 69.3% of the effective control wedge is attributed to the use of leverage whereas only 30.7% is attributed to the participation of minority shareholders in the holding companies along the pyramidal structure. As the distribution shows, the magnitude of the debt wedge motivates our conclusion that focusing on minority equity alone in the analysis of pyramidal structures substantially underestimates the extent to which pyramids are used as a control-enhancing mechanism.

3.4 The Role of Pyramidal Debt for Dividend Payout and Firm Value

Table 4, Panel A presents the regression analysis for the dividend policy for the pyramid-controlled operating firms. We consider in particular the use of minority equity and debt as the two alternative financial tools to enhance the control wedge in pyramids. We document the opposing effects of the equity wedge and the debt wedge on the dividend policy of the operating company which is the key finding of our paper. The coefficients for the equity wedge are negative and significant when analyzed separately and together with the debt wedge. On the other hand, the coefficients for the debt wedge are

positive and significant when analyzed separately and together with the equity wedge. The economic magnitudes of these effects are also significant. If the equity (debt) wedge changes from the 25th to the 75th percentile, the dividends change with -0.02 (+0.006), which is -16% (+5%) of the median dividend payout. Taken together, the positive sign for the debt wedge coefficient and the negative sign for the equity wedge coefficient are consistent with the Debt Service Hypothesis. These signed results are inconsistent with the other dividend hypotheses: the Expropriation Hypothesis predicts a negative sign for the equity wedge but has no direct prediction for the debt wedge. The Substitution Hypothesis predicts a positive sign for the equity wedge but has no direct prediction for the debt wedge.[19]

To complete the discussion, the regressions confirm that dividend policy depends on other variables. Similar to the results in Table 2, dividend payout decreases in the leverage of the operating company and with losses in the operating company. Though not shown, the regressions in the two tables load the same for industry categories. Overall, our results corroborate the Debt Service Hypothesis and suggest that leverage is an important determinant of operating companies' dividend payouts.

Table 4, Panel B investigates the valuation (Tobin's Q) implications of the pyramid-controlled operating firm, its dividend payout and the debt and equity wedges in the pyramid. Supporting the Free Cash Flow/Signaling Hypothesis, the regression results show that the coefficient for dividend payout is always positive and significant. The coefficient for the equity wedge is always insignificant, which is inconsistent with the Expropriation Hypothesis,. The debt wedge has a significant and negative effect on valuation, regressions (3) and (4), but regression (5) shows that it is the interaction of the dividend payout with the debt wedge that drives this initial result. The positive valuation effects of dividend payouts are offset by the dividend payouts associated with the debt wedge. The effect is statistically significant at the 1% level. Also, the economic effect measured as the difference between the 25th and 75th percentiles for the dividend payout and debt wedge times the regression coefficient is about 1.1% of the pyramid-

[19] Faccio, Lang, and Young (2001) report regression results for four dividend metrics using a sub-sample of 250 group-affiliated firms from their French sample of 529 firms. Their explanatory variable of interest is the inverse of our equity wedge (ratio of ownership to control rights), and their findings are inconclusive, with two out of four coefficient estimates being negative, one of them significantly (at 1% level). Their sample cannot be directly compared with ours because it includes group-affiliated firms with and without pyramidal ownership; 33.1% of the group-affiliated firms in their European sample are pyramid-owned (the corresponding number for France is not reported), whereas our sample includes only pyramid-controlled firms.

controlled operating firm's value. This result makes sense if a certain proportion of the dividend payout associated with the debt wedge is a form of tunneling because excessive debt in holding companies forces dividend payouts beyond what is optimal for minority shareholders, as discussed in our hypothesis section. This result supports H6, the larger the debt wedge, the smaller the dividend payout effect on firm value, the coefficient is negative. The results also support H5, after controlling for the equity wedge by interacting the dividend payout with the debt wedge (Table 4, Panel B, regression (5)), dividend payouts have a positive effect on firm value.

4. Additional Tests: Anatomy of Dividends in Pyramidal Structure

We expect pyramidal ownership and leverage structures to influence not only the dividend policy of operating bottom companies but also dividend policy of the holding companies in the pyramidal structure. Continuing our assessment of the Debt Service Hypothesis, we next address how dividends and debt policies interact in the holding companies in the pyramidal structure. We do this by looking directly into the structure of holding companies, in particular their debts and dividends. We consider in particular two payout metrics; (1) the proportion of dividends that are actually received by the dominant owner, the pass-through decision, and (2) the amount of the dividends received by each holding company in the pyramidal chain in relationship to the debt service obligations of that holding company. Our hypothesis for both is that dividends in pyramidal structures are paid to service debt.

4.1 Dividends Received by Dominant Owner

We determine the ratio of the dividends ultimately received by the dominant shareholder to the operating company's dividend payout available to the dominant shareholder. We call this ratio the *received-payout ratio*. The Debt Service Hypothesis implies that the received-payout ratio should be negatively associated with leverage in the holding companies. The Debt Service Hypothesis entails no direct predictions on the complexity of pyramidal structure since a substantial debt control wedge can be created by aggressively levering up in a very short pyramidal structure.

For these tests, we need the dividend payout for the operating company and each holding company in the pyramidal structure. For both public and private companies, we again use the

unconsolidated financial statements from Diane. While the financial statements do not directly disclose the dividend payments made by holding company, French regulations and the structure of the owners' equity section of the financial statements allow us to back out the dividend payments.[20] Due to data availability from Diane, we use the entities in the pyramidal structures for 1999, 2001 and 2003.

For each dominant owner, we calculate the received-payout ratio. The number of layers is the maximum number of holding companies from the operating company to dominant owner. The average leverage is the average of the ratio total debt/total assets for the holding companies in the pyramid. We include observations with a dividend payout by the operating company; a received-payout ratio equal or less than 2; an average leverage ratio equal or less than 1; and data availability for 50% or more of the entities in the chain of control.[21] For missing holding companies in the pyramidal structure, we set leverage equal to zero and the dividend received-payout ratio equal to 1, which biases against our tests.

Table 5, Panel A presents summary statistics for how dividends paid out by the operating company are used and passed through the pyramidal structure. The summary statistics for the received-payout ratio show an average of 0.655. The average leverage is .141. For the number of layers in the pyramidal structure, the average is 2.441. The data show a wide range in received-payout ratios and leverage. Using the Diane database, we have sufficient balance sheet information for 72.9% of the holding companies along the pyramidal structures. To provide an additional perspective on the implications of the missing holding company data, we provide summary statistics for pyramidal structures with complete data. There are 128 observations with an average received-payout ratio of 0.471. Average

[20] Net income is used to either pay dividends or is allocated among the specific owners' equity accounts. The English version of Diane's Complete Account format details the net income and allocations. We calculate dividends paid in year *t* from the owners' equity accounts by subtracting the change in allocations between year *t* and year *t-1* from the net income in year *t*. This is the dividends paid if there are no other substantive changes. To insure the veracity of the dividend number, we did the following: to obtain a measure of potential substantive changes in capitalizations for year *t*, as a separate calculation, we compared capitalization for year *t* to year *t-1*. The only other event we need to consider is the potential impact on reserves that are set up or altered directly via the balance sheet (rather than the income statement). To insure the veracity of the formula and verification checks, we compared the dividend payout per the formula to the dividend payout per the annual report for a sample of public companies. Since the private companies typically have simpler capital structures, we are confident in our number. Details are available from the authors upon request.

[21] The received-payout ratio may reach values greater than one, e.g. because the assets of holding companies in the pyramid are comprised of the shareholding and additional assets, leading to dividend outflows exceeding the inflow. Leverage ratios exceed one when book value of equity is negative. Our results are not sensitive to excluding these observations.

leverage is 0.211. For the number of layers in the pyramidal structure, the average is 2.156. Using averages, the received-payout ratio is lower for the pyramidal structures with complete data. The leverage is also higher.

Table 5, Panel B presents the regression results. We find that dividends received by the dominant owner, received-payout ratio, is negatively associated with leverage in the pyramid. The coefficient for leverage is negative and significant. The coefficient is also negative and significant for the number of layers in the pyramidal structure. Both results are clearly consistent with the Debt Service Hypothesis.

4.2 Dividend Decisions in Holding Companies

We next turn to our second payout metric for holding companies, the dividend received by each holding company. At each level of a pyramidal structure, a dividend and leverage decision is made. Our hypothesis is that dividends are set to enable the holding companies higher up to meet their debt obligations. In other words, the dividend received by an "owning" holding company should be sufficient to pay interest and pass dividends to the next level if needed. We expect a positive sign for funds needed to service debt. If the next layer is the dominant owner, we expect a negative sign. According to the Debt Service Hypothesis, if the next layer is the dominant owner, the remaining control chain is shorter (consisting only of one level) and thus, on average less dividends are needed to meet debt service obligations.

Table 6, Panel A presents the summary statistics for the determinants of the dividends received by holding companies in the pyramidal structures for 1999, 2001 and 2003. For each holding company, we calculate the dividend received denominated in € millions (dividends paid in the lower layer times the ownership stake in the lower layer). The average (median) for the dividends received by the holding company is 28.752 (1.038). Interest expense is the interest payments for the holding company in € millions, average (median) of 33.240 (0.907). We next determine the importance of the holding company's investment in the lower layer as a fraction of its total assets. Specifically, we calculate the ratio of the lower layer's equity times the holding company's ownership stake, divided by the holding company's total assets and call it the *investment ratio*. Total assets are the book value of the holding company's total assets. We exclude observations with a negative investment ratio or an investment ratio

beyond an upper limit (set at four in the reported baseline) to avoid outlayer effects. The variable ultimate owner is an indicator variable with a value of one if the next layer is the ultimate owner, and zero otherwise. Ownership stake is the shareholder stake in the lower layer. Cash is the amount of cash and securities for the holding company in € millions. We control for cash because a holding company can accumulate cash for other investments and/or due to differences in dividend preferences.

Table 6, Panel B presents the regression results. The findings suggest that dividends received by the holding company are increasing in the interest expense of the company, lending support to the Debt Service Hypothesis, which implies a positive sign for funds needed to service debt. Crucially, we normalize interest expense by the investment ratio, the importance of the holding company's investment in the lower layer. Moreover, the dividends received increase in the importance of the lower layer to the holding company, both relative to the holding company's assets, investment ratio, and in absolute terms, the ownership stake itself. With adjusted R^2 between 43.3% and 46.1%, we are able to explain a substantial portion of the dividends received by the individual holding companies in the pyramid. The results are insignificant for the qualitative variable Ultimate owner (that takes the value one if the next layer above is the ultimate owner), consistent with the idea that the debt service effect and expropriation motives generated by a wider control wedge create countervailing effects, as discussed above. The results for dividends received and its clear dependence on debt service obligations in every holding company along the control chain provide strong additional support for the Debt Service Hypothesis.

5. Alternative Explanations

5.1. Investment and Dividend Preferences

Our analysis so far provides evidence that an important motivation for dividend payouts in pyramids is the debt service obligations along the pyramidal control chain. There are two additional explanations how the level of dividends received and the dividends passed-through pyramidal structures are determined. First, Almeida and Wolfenzon (2006) suggest that pyramids are used to create new businesses from retained earnings of existing companies in the presence of imperfect capital markets, thereby taking minority investors in existing companies hostage in the interest of capital accumulation. In this theory,

dividends received in a layer and not passed through to the dominant owner can be used to fund investments in other entrepreneurial activities.[22]

According to the second explanation, dividends are not passed through because the dominant owner has lower dividend preferences than other shareholders. A characteristic of pyramidal structures, given tax neutrality, is that they can accommodate diverging dividend preferences, by paying out dividends to cater to owners with high dividend preferences, while permitting a dominant owner with lower dividend preferences to retain part or all of her dividend allocation in a holding company. Such retention of dividends in intermediate layers can be used for deferred payouts, investments, or as a cash cushion. This second explanation differs from the first one in emphasis and timing. The investment motivation predicts immediate investment of the dividends and very little payout to the dominant owner; dividend preferences predict initial retention of dividends and a larger portion being paid out.

A simple but insightful observation concerning the investment hypothesis arises from inspecting the asset base of holding companies. For a given holding company in the pyramidal structure, on average the investment in the company one layer below comprises 77% of the total assets of these pyramidal companies, which is part of the pyramidal structure we study. In other words, while holding companies on average own some other physical or financial assets, over three quarters of a typical company's assets base is motivated by a dominant owner's stake in the company below, operating or holding.

More specific evidence emerges when we analyze the relationship between dividends received and the various alternative uses of those dividends, looking at individual holding companies as the unit of observation. In general, dividends received by a holding company have one of four uses: (1) to pay debt service; (2) to pay dividends to the next holding company above; (3) to make investments; and (4) to save

[22] There is a literature examining the relationship between pyramidal ownership and the growth of business groups on one hand, and expropriation on the other hand. Consistent with the predictions of Almeida and Wolfenzon (2006), the only formal theory on the purpose of pyramids, Almeida et al. (2009) provide evidence that affiliated firms owned through pyramids have lower profitability and are more capital intensive than firms controlled without pyramids. Along similar lines, Bertrand, Mehta, and Mullainathan (2002) document the importance of pyramids in India and their wide-spread use for tunneling. Baek, Kang, and Lee (2006) find that intra-group equity issues in Korea are priced to transfer wealth to controlling shareholders, and Bae, Kang, and Kim (2002) argue that intra-chaebol acquisitions transfer wealth from firms in which the family has low cash flow rights (typically the acquirer) to those in which the family has higher cash flow rights. None of these papers investigate debt or dividend policy in their analysis. For extended surveys, see Morck, Wofenzon, and Yeung (2005) and Khanna and Yafeh (2007).

by increasing cash or paying down debt. Performing correlation analyses with these four variables, we find that the correlation between dividends received and interest rate obligations (i.e., normalized for the size of the stake in the holding company below by the holding company's total assets) is very high, at 0.65 (0.91 if we exclude outliers). By contrast, the correlation between dividends received in year *t* and the increase in cash or the increase in total assets between year *t* and year *t+1* is smaller than 1%. Also, we examine whether the level of debt in a holding company is explained by the importance of the holding company's other assets (besides the stake in the entity below in the control chain) into which dividends received could be invested. We find that there is no correlation (0.00759).

A similar pattern emerges from our regression analysis. One test assessing the importance of the Debt Service Hypothesis relative to the two alternative explanations is contained in Table 6, Panel B. The coefficient for the interest expense normalized by the investment ratio is positive and significant in all the regressions. Further, the coefficient is always between 1.6 and 1.85. A coefficient greater than one implies that for every euro needed to cover the holding company's interest expense (in proportion to the investment ratio) more than one euro in dividends is received; a coefficient less than two means that the debt service motive can account for more than half of the dividends received by each holding company. In other words, the coefficient indicates that the interest expense is not the only determinant of payout decisions in the pyramid, but the principal one. Again, while our analysis does not eliminate the possibility that the two alternative explanations matter for the dividend decisions within pyramidal structures, our findings suggest that the Debt Service Hypothesis plays a major role.

Finally, we provide evidence on the role of the dividend preference motive by looking at the change in cash in reaction to dividend payouts. The dividend preference hypothesis predicts that free dividends not needed for debt service are initially retained in the pyramidal structure. Table 6 presents evidence by considering the impact of a holding company's cash holdings on dividends received. In Table 6, regression (4), we find no significant effect for cash holdings. In other words, there is no measurable contemporaneous relationship between the dividends received by holding companies and their level of cash holdings. This finding suggests that dividend preferences play a weak role in explaining the use of free dividends.

5.2 Debt and Operating Risk

For a given control wedge, the use of debt in pyramids versus minority equity increases the owner's risk. In principle, for a given risk profile of the dominant owner's residual cash flow, it does not matter whether the debt is located in the operating company or in any other layer in the pyramid.

Still, there could be reasons explaining that the location of debt within a pyramidal control chain can make a difference.[23] We explore the relationship between operating company debt and pyramidal debt. They could be substitutes (if owners target a given overall leverage exposure, so that borrowing more in the pyramid means less debt in the operating company) or complements (if owners with a highly leveraged equity stake add debt in several holding companies along the pyramidal structure). In non-tabulated tests, we find that there is a low correlation between operating company debt and pyramidal debt (0.046). This result holds also when controlling for other variables that typically explain leverage, such as size, age, tangible assets or past profitability.

We define a measure of the dominant owner's composite exposure to leverage, the equivalent net leverage, which is particularly well-suited to examine how operating company debt and pyramidal debt interact, and also to explore the relation between total leverage exposure and operating risk. We first calculate the *equivalent operating company leverage*, which we define as the leverage in the operating company that, if only the operating company was indebted and all holdings were all-equity financed, would expose the cash flow rights of the dominant owner to the same level of leverage as the combined debt in the pyramid.[24] We then calculate the *net equivalent leverage* as equivalent operating company leverage minus operating company leverage. In case information about leverage of a holding company is missing we assume zero leverage. This metric is clearly distinct from the debt wedge as it does not use equity stakes. Using this measure, we find little evidence that operating company debt and debt in pyramidal holdings are either complements or substitutes. We find a relatively low correlation (0.146) between our measure of equivalent net leverage and the leverage ratio of the operating company.

[23] Luciano and Nicodano (2008) provide a stylized model where there is a difference. Also, a dominant owner might have more flexibility to overcome distress when debt is placed in private holding companies.

[24] Formally, if l_0 is the leverage ratio of the bottom company (see the notation of Section 2.2), l_1 that of the first pyramidal layer, l_2 of the second layer etc., then we define the equivalent bottom company leverage as: $l_0 + (1- l_0)*l_1 + (1- l_0)* (1- l_1)*l_2$, etc.

Next, we explore the relationship between different variables measuring the cash flow risk of the operating company and our debt metrics. We use the 5-year average of ROA variance, the ratio of intangible assets to total assets, and R&D expenditures to total assets. We analyze the correlations between on one hand these three measures of risk and on the other hand the debt wedge, operating company leverage and the net equivalent leverage measure, respectively.[25] We find that almost all correlations are low, generally below 5%, and not significant. The only exception is a weak negative correlation between R&D expenditure and leverage. However, the correlation between R&D expenditure and the debt wedge is not significant. Based on these tests, we conclude that there is no evidence that differences in operating risk profiles are an important driver of the decision to use pyramidal debt.

5.3 Other Endogeneity Tests

Several of our tests addressing endogeneity have already been discussed in Section 5.2. In this section, we investigate the robustness of our results to two additional endogeneity concerns. In the OLS regression tests in Tables 2 and 4 that explain dividend payouts and Tobin's Q, we assume the estimations are not biased due to the endogeneity of explanatory variables. The first concern is endogeneity of the firm's dividend policy in the value regressions (Tobin's Q). The second is ownership structure (Demsetz and Lehn (1985) and Agrawal and Knoeber (1996)), which may be endogenously determined with dividend policy and Tobin's Q.

In order to measure the impact of endogeneity of dividend policy in the Tobin's Q regressions we performed Heckman (1979) tests on the regressions in Table 2 and 4, Panel B. We use the regression specification (1) in Table 2 Panel A to obtain an estimate of the Inverse Mills Ratio of the dependent variable, which we introduce as the dependent variable in Panel B of Table 2. We find that the regression coefficient for the Inverse Mills Ratio is insignificant and the other results are unaffected in all specifications. We apply a similar procedure to the analysis of Table 4, where we use specification (4)

[25] The correlations between ROA variance and debt wedge, operating company leverage and net equivalent leverage are respectively -0.013, 0.012, and 0.032. For the ratio of intangible assets to total assets, the three respective correlations are -0.024, -0.053, and -0.042. Finally, for R&D expenditures to total assets, the correlations are -0.098, -0.218, and -0.263, respectively.

from Panel A in the first stage to obtain the Inverse Mills Ratio estimate. Again, the coefficient is insignificant and the other results are unaltered.

Endogeneity of ownership structures requires that ownership is dynamic and adjusts when conditions change. We have measures for ownership with two-year intervals. Thus, we can investigate for three two-year changes (1997 to 1999, 1999 to 2001, and 2001 to 2003) whether the classification (widely held, block-non pyramid, block-pyramid) has changed and, for pyramids what the changes in the equity wedge are. In our sample [3 x 350 = 1,050 pairs], we find 960 pairs where we can investigate a change over two years. In 817 cases (85.10%) we find no change in the classification of ownership structure/use of pyramids. In this set of 960, 477 pairs are pyramids in both years (besides 340 other stable pairs, such as block-controlled firms without pyramids). In the set of 477 stable pairs of pyramids, the average absolute change in the wedge is 0.339, which is relatively small in comparison with an average wedge of 1.840. The stability of the ownership structure implies that endogeneity of this variable is not likely to induce biased estimates. Although all regressions in Tables 2 and 4 use one-year lagged ownership measures, this lag may not be sufficient to account for reverse causality. As an additional robustness check we repeat all regressions in these tables with three-year lagged ownership measures. Obviously, we lose some power in our tests because we cannot use the first two years of our panel. The results (not reported) in Table 2 and Table 4 are robust to this three-year lag.[26] In a few instances the results become insignificant; however, the signs of the coefficients remain unaltered.

6. Robustness

6.1 Double Voting Rights

Apart from pyramids, double voting rights are the only alternative control-enhancing mechanism that is widely used in France.[27] According to French law, the company's charter can convey a double voting

[26] The robustness tests for Table 2, Panel A, regressions (1) and (2) have 1961 observations, regression (3) has 1874 observations and Panel B has 1943 observations. Table 4, Panel A has 941 and Panel B has 927 observations.

[27] Two other control-enhancing devices are in principle available, but rarely used: non-voting shares are used by less than 2% of blockowner-controlled firms; voting caps are used by only about 1% (Ginglinger and Hamon (2008)).

right to each share if the share is held for a specified period, which must be between 2 and 4 years. Double voting rights are distinct from dual-class shares since they are a premium for loyalty that is non-exclusive (*every* share acquires the right after satisfying the holding requirement) and is lost when the share is sold. About two thirds of listed French companies adopt double voting rights, and they are most popular among smaller and family companies (Ginglinger and Hamon (2008)).

We assess the robustness of our results to double voting rights. We trace the actual voting rights (including double voting rights) of the dominant owner in our 2003 sample from annual reports and disclosure statements obtained from the AMF, the French stock market regulator. We find only 1.4% of the operating companies in our overall sample initially classified as widely held change status to blockowner-controlled when we include double voting rights (with the dominant owner now controlling more than 20% of the votes). By contrast, for 58.9% of all operating firms in our sample, we find that double voting rights make no difference to the control rights allocation – either because the dominant owner already holds more than 50% of the votes and hence is attributed 100% of control rights with our methodology, or because the firm remains widely held after accounting for double voting rights. We find double voting rights change the control rights of the dominant owner for 73.9% of the companies in the remaining sample.[28] But this amounts to only 30.4% of the overall sample [.739 x (1 - .589)]. Moreover, for the companies where we actually observe a change in control rights, double voting rights increase the mean (median) voting rights of the dominant owner only by 17% (16%). Thus, double voting rights increase the equity wedge on average by only about 5% [30.4% x 17%]. This control-enhancing effect is small relative to the role played by pyramidal structures, as measured by our original equity wedge and debt wedge.

We calculate modified measures for the equity wedge and the debt wedge taking into account double voting rights. We then run our main regressions of Table 2 and Table 4 with these modified measures. Given the small impact of double voting rights on the modified control wedge measures, our results are unchanged by this modification. We conclude that double voting rights play a minor role in determining the relationship between the control wedge and dividend policy.

[28] We can identify the actual voting rights for 82.2% of the companies in the remaining sample.

6.2 Equivalent Net Leverage Ratio

We verify that results do not depend on our specific measure of pyramidal leverage, the debt wedge. As an alternative metric, we use the previously defined equivalent operating company leverage and net equivalent leverage. This metric is clearly distinct from the debt wedge as it does not use equity stakes. We find that the average equivalent operating company leverage in our sample is 0.315 and average net equivalent leverage is 0.082. The correlation with the debt wedge is, respectively, 0.471 and 0.387. Next we replicate all regressions in Table 4, replacing the debt wedge by our alternative measures. The results (not reported) demonstrate that our key conclusions are robust to this alternative metric. In all regressions the sign of the coefficients remains unaltered. In particular, in Panel A all results remain significant at the 1% level or less. In Panel B some results become insignificant; however, the key result – the interaction between dividends and equivalent leverage in regression (5) – is still significant at the 5% level.

7. Conclusions

We suggest in this paper that debt in pyramidal holdings constitutes a control-enhancing mechanism that widens the disparity between control rights and cash flow rights of a dominant owner because a fraction of the dividends paid out is needed to service the leverage. We decompose the control wedge into the equity wedge and the debt wedge, the parts that can be attributed to minority shareholders in holding companies and the use of pyramidal leverage, respectively. We show that debt in holding companies in France leads on average to a debt wedge that rivals the size of the equity wedge. We propose the Debt Service Hypothesis as an alternative hypothesis on the payout policy in pyramid-controlled companies that could help to reconcile conflicting evidence on dividend payouts in the presence of dominant owners. As the equity wedge becomes wider, the dividend payout decreases. However, as the debt wedge increases, dividend payouts should increase because dividends are needed to service the debt in the pyramidal entities. These predictions are borne out in our empirical investigation. We find that the use of debt in holdings commits the dominant block owner to larger dividend payouts, whereas a non-leveraged control wedge has the opposite effect.

We analyze the actual dividend payouts to dominant owners along the pyramidal chain, in contrast to earlier pyramid studies that only considered potential payouts. We find that only a fraction of the cash made available to dominant owners is actually paid out to them. Our valuation results suggest that bottom company dividends not only support debt service obligations in the pyramid, but also have an adverse valuation effect. This is consistent with our hypothesis that debt-induced dividend payouts may exceed the efficient payout level for the bottom company. We also analyze two alternative explanations for dividend payouts by pyramid-controlled companies, the investment hypothesis and the dividend preference hypothesis. Our evidence suggests these explanations play a minor role compared to that emphasized by the Debt Service Hypothesis.

The dominant shareholder's decision to use leverage in the holding company instead of minority equity in order to enhance his control is not neutral. The residual cash flow left for the dominant owner has a different risk profile. Dividends received from the bottom company in addition to being shared with minority equityholders must also service debt in the pyramidal structure. This decision alters the risk profile of the dominant owner's cash flows and her incentives for risk-taking. It alters the options of the dominant shareholder when reacting to financial distress and raising equity in distress-like situations. There is also the question of the relationship between the debt level of the bottom company and that of holding companies. We leave these questions to future research.

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Table 1: Summary statistics: full sample

	Full sample	Widely held companies	Block owned-no pyramid companies	Block owned-pyramid companies
Ownership structure:				
Widely held	0.144			
Block-owned, no pyramid	0.303			
Block-owned and pyramid	0.553			
Dominant owner:				
- Individual/family	0.471	0.000	0.470	0.692
- Firm	0.302	0.000	0.407	0.323
- State	0.036	0.000	0.029	0.048
- Unclassified	0.049	0.000	0.094	0.037
- Widely held, no dominant owner	0.144	1.000	0.000	0.000
Financial characteristics:				
Dividends/cash flow	0.193	0.182	0.177	0.205
	[0.116]	[0.141]	[0.104]	[0.122]
	(0.250)	(0.243)	(0.240)	(0.257)
Dividends/earnings	0.361	0.377	0.323	0.377
	[0.267]	[0.285]	[0.229]	[0.284]
	(0.349)	(0.366)	(0.340)	(0.348)
Dividend yield	0.025	0.020	0.023	0.027
	[0.018]	[0.012]	[0.016]	[0.020]
	(0.058)	(0.025)	(0.079)	(0.050)
Tobin's Q	1.599	1.630	1.962	1.392
	[1.153]	[1.222]	[1.168]	[1.122]
	(4.635)	(2.859)	(8.071)	(0.984)
Total assets	3010	8568	2689	1733
	[206]	[636]	[139]	[201]
	(9800)	(19036)	(9569)	(4404)
Leverage	0.239	0.252	0.228	0.242
	[0.218]	[0.223]	[0.196]	[0.223]
	(0.223)	(0.167)	(0.217)	(0.255)
Sales growth	0.040	0.047	0.021	0.048
	[0.037]	[0.047]	[0.035]	[0.036]
	(0.301)	(0.289)	(0.309)	(0.300)
Loss	0.091	0.104	0.102	0.082
Industry:				
- Primary products and construction	0.046	0.080	0.080	0.019
- Manufacturing, chemicals	0.077	0.067	0.067	0.084
- Manufacturing, equipment	0.151	0.115	0.216	0.125
- Manufacturing, other	0.219	0.152	0.217	0.237
- Trade	0.158	0.203	0.130	0.162
- Transport, comm. and energy	0.054	0.053	0.066	0.033
- Services	0.139	0.216	0.136	0.121
- Financial	0.153	0.115	0.116	0.184
Observations	*2597*	*375*	*787*	*1435*

This table presents the summary statistics of the full sample and of three subsamples (widely-held firms, block-owned firms without pyramidal structures and block-owned firms with pyramidal structures) in 1997-2004. Presented are the averages and for continuous variables the median (in brackets) and standard deviations (in parentheses). Dividends/cash flow is defined as cash dividend divided by net income plus depreciation. Dividend/earnings is cash dividend over net income. For both dividend measures the ratio is set to one when cash flows or earnings are negative and when the ratio exceeds one. Dividend yield is cash dividend over market value of equity. Tobin's Q is defined as the book value of total assets minus book value of equity plus market value of equity, divided by book value of total assets. Total assets is book value of total assets. Leverage is total debt over total assets. Sales growth is the two-year growth rate of sales. The dummy variable loss equals one when net income is negative and zero otherwise. The dummy variables for dominant owner

equals one if the dominant owner is respectively, an individual or family, another firm or the state. Eight dummy variables describe the industry of the firm's main activities. The number of observations are included in the bottom row (for dividend yield and Tobin's Q the number of observations is 2528 in the full sample, 370 for widely held firms, 765 for block held firms and 1393 for the pyramids). The dividend variables and Tobin's Q are measured at *t+1*.

Table 2: Determinants of dividend payout and firm value for the full sample

Panel A: Determinants of dividend payout and yield

	(1) Dividend/ cash flow	(2) Dividend/ earnings	(3) Dividend Yield
Ln(Assets)	0.007**	0.018***	0.0001
	(-2.32)	(5.24)	(0.02)
Leverage	-0.170***	-0.112**	-0.001**
	(-2.95)	(-2.35)	(-2.25)
Sales growth	-0.008	0.007	0.003
	(-0.41)	(0.32)	(0.47)
Loss	-0.070***	-0.200***	-0.020***
	(-3.34)	(8.43)	(-8.47)
Block owned-no pyramid	-0.006	-0.041**	0.002
	(-0.43)	(-1.97)	(0.82)
Block owned-pyramid	0.009	-0.004	0.006***
	(0.65)	(-0.19)	(3.14)
Industry fixed effects	*Yes*	*Yes*	*Yes*
Year fixed effects	*Yes*	*Yes*	*Yes*
Observations	*2597*	*2597*	*2528*
Adjusted R^2	*0.125*	*0.096*	*0.029*

Panel B: Determinants of Tobin's Q

	(1)	(2)	(3)
Ln(Assets)	-0.264**	-0.270**	-0.267**
	(-2.40)	(-2.41)	(-2.47)
Leverage	-0.629	-0.230	-0.150
	(-1.65)*	(-0.79)	(-0.51)
Sales growth	-1.453*	-1.474*	-1.465*
	(-1.81)	(-1.82)	(-1.89)
Block owned-no pyramid	-0.064	-0.074	-1.381**
	(-0.30)	(-0.34)	(-2.37)
Block owner-pyramid	-0.363*	-0.420**	-0.472*
	(-1.89)	(-2.12)	(-1.83)
Dividend payout		2.360**	-0.026
		(2.06)	(-0.05)
Dividend payout * Block owned-no pyramid			7.325**
			(2.09)
Dividend payout * Block owned-Pyramid			0.594
			(1.07)
Industry fixed effects	*Yes*	*Yes*	*Yes*
Year fixed effects	*Yes*	*Yes*	*Yes*
Observations	*2528*	*2528*	*2528*
Adjusted R^2	*0.047*	*0.062*	*0.089*

This table presents regression results for the full sample of firms. In Panel A the explained variables are the measures for dividends. In Panel B the explained variable is Tobin's Q. All variables are defined in Table 1. The regressions include an intercept, seven industry dummies and seven year dummies (not reported). Reported are coefficients and *t*-values, with a Newey-West correction for heteroscedasticity and autocorrelation. Significance is indicated as follows: '*' is 10% significance, '**' is 5%, and '***' is 1%.

Table 3: Summary statistics - pyramidal controlled firms

	Average	25th percentile	Median	75th percentile	Standard deviation
Dividends/cash flow	0.196	0.000	0.118	0.235	0.253
Dividends/earnings	0.363	0.000	0.270	0.575	0.343
Dividend yield	0.026	0.004	0.019	0.034	0.050
Tobin's Q	1.396	0.967	1.123	1.451	0.973
Total assets	1619	60	184	755	4201
Leverage	0.244	0.092	0.224	0.347	0.263
Sales growth	0.043	-0.014	0.034	0.090	0.309
Loss	0.085	0.000	0.000	0.000	0.280
Direct ownership	40.391	25.677	34.170	52.536	20.544
Equity wedge	1.840	1.085	1.563	1.996	1.016
Debt wedge	4.149	0.449	1.015	3.021	9.500
Number of layers	2.555	2.000	2.000	3.000	1.034
Proportion missing entities	0.192	0.000	0.000	0.500	0.221
Proportion listed firms	0.080	0.000	0.000	0.000	0.182
Pyramid with 33% threshold	0.835	1.000	1.000	1.000	0.372
Pyramid with 40% threshold	0.733	0.000	1.000	1.000	0.442

This table describes the firms block-owned via a pyramid, and the equity and debt wedge over 1997-2004. The variable direct ownership measures the direct ownership of the dominant owner. Equity wedge is the ratio of the total ultimate ownership over the direct stake of the dominant shareholder. Debt wedge is the ratio of the total ultimate ownership in terms of equity over the debt adjusted direct stake, minus the equity wedge. The number of layers is the number of layers in the pyramid. The proportion missing entities (listed firms) is the ratio of elements of a pyramid without leverage information (defined as publicly listed firm), scaled by the total number of layers. The variables pyramid with 33% and 40% threshold measure the proportion of firms still classified as a pyramid with other thresholds than 20%. The other variables are defined in Table 1. The sample includes observations with a proportion of missing entities of at most 0.5 and a debt wedge below 80. The number of observations is 1253; 1242 for dividend yield and Tobin's Q. The dividend variables and Q are measured at $t+1$.

Table 4: Determinants of dividend payout and firm value for pyramidal controlled firms

Panel A: Determinants of dividend payout (cash flow measure)

	(1)	(2)	(3)	(4)
Ln(Assets)	0.002	0.003	0.0002	0.0003
	(0.45)	(0.60)	(0.06)	(0.08)
Leverage	-0.141**	-0.141**	-0.143**	-0.142**
	(-2.02)	(-2.00)	(-2.03)	(-2.01)
Sales growth	-0.050*	-0.046	-0.03*	-0.049
	(-1.66)	(-1.53)	(-1.76)	(-1.62)
Loss	-0.083***	-0.081***	-0.087***	-0.089***
	(-2.71)	(-2.71)	(-2.82)	(-2.88)
Equity wedge		-0.015**		-0.021**
		(-2.03)		(-2.57)
Debt wedge			0.002*	0.002**
			(1.92)	(2.58)
Industry fixed effects	*Yes*	*Yes*	*Yes*	*Yes*
Year fixed effects	*Yes*	*Yes*	*Yes*	*Yes*
Observations	*1253*	*1253*	*1253*	*1253*
Adjusted R^2	*0.137*	*0.140*	*0.140*	*0.145*

Panel B: Determinants of Tobin's Q

	(1)	(2)	(3)	(4)	(5)
Ln(Assets)	-0.011	-0.010	-0.006	-0.006	-0.006
	(-0.85)	(-0.74)	(-0.42)	(-0.41)	(-0.45)
Leverage	-0.287	-0.287	-0.280	-0.280	-0.279
	(-1.53)	(-1.52)	(-1.50)	(-1.50)	(-1.48)
Sales growth	0.98	0.107	0.112	0.115	-0.110
	(1.38)	(1.45)	(1.53)	(1.55)	(1.51)
Dividend payout	0.510***	0.499***	0.521***	0.514***	0.454*
	(4.54)	(4.38)	(4.67)	(4.49)	(1.73)
Equity wedge		-0.032		-0.018	-0.041
		(-1.26)		(-0.67)	(-1.21)
Debt wedge			-0.006***	-0.005***	-0.001
			(-4.29)	(-3.05)	(-0.02)
Dividend payout * Equity wedge					0.093
					(0.53)
Dividend payout * Debt wedge					-0.019***
					(-2.58)
Industry fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	*1242*	*1242*	*1242*	*1242*	*1242*
Adjusted R^2	*0.105*	*0.105*	*0.107*	*0.107*	*0.108*

This table presents regression results for the subsample of firms that is owned using a pyramidal structure. Observations where more than 50% of the entities in the pyramidal structure have missing data are omitted. In Panel A the explained variable is dividend/cash flow. In Panel B the explained variable is Tobin's Q. All variables are defined in Table 1 and Table 3. The regressions include an intercept, seven industry dummies and seven year dummies (not reported). Reported are coefficients and *t*-values, with a Newey-West correction for heteroscedasticity and autocorrelation. Significance is indicated as follows: '*' is 10% significance, '**' is 5%, and '***' is 1%.

Table 5: Determinants of received-payout ratios for dominant owners

Panel A: Descriptive statistics

	Average	25th percentile	Median	75th percentile	Standard deviation
Received-payout ratio	0.655	0.299	0.827	1.000	0.389
Average leverage	0.141	0.000	0.052	0.236	0.186
Number of layers	2.441	2.000	2.000	3.000	0.878
Proportion missing entities	0.271	0.000	0.333	0.500	0.228

Panel B: Regression analysis

	(1)	(2)	(3)
Intercept	0.733***	1.057***	1.095***
	(28.25)	(17.95)	(18.92)
Average leverage	-0.554***		-0.471***
	(-4.98)		(-4.49)
Number of layers		-0.164***	-0.153***
		(-7.24)	(-6.88)
Observations	*329*	*329*	*329*
Adjusted R^2	*0.068*	*0.136*	*0.183*

Panel A presents the analysis of received-payout ratios in 1999, 2001 and 2003. For each dominant owner we calculate the ratio of the dividend actually received (received) and the dividend that would have been received if all dividends were passed through the chain of ownership (payout). The average leverage is the average of total debt/total assets ratios in the pyramid. The number of layers is the maximum number of layers from the bottom company to ultimate owner. The proportion missing entities is the number of entities without dividend and leverage information over the number of layers. We include observations that meet the following requirements: the bottom company pays a non-zero dividend; the proportion missing entities has a maximum of 0.5; the average leverage ratio is less than or equal to one; and the received-payout ratio is less than or equal to two. In case of missing dividend information we assume 100% payout; for missing leverage information we assume zero debt. The sample includes 329 observations. Panel B presents regression results. The explained variable is the received-payout ratio. Reported are coefficients and *t*-values, with a Newey-West correction for heteroscedasticity and autocorrelation. Significance is indicated as follows: '*' is 10% significance, '**' is 5%, and '***' is 1%.

Table 6: Determinants of dividends received by each holding company in the pyramid

Panel A: Descriptive statistics

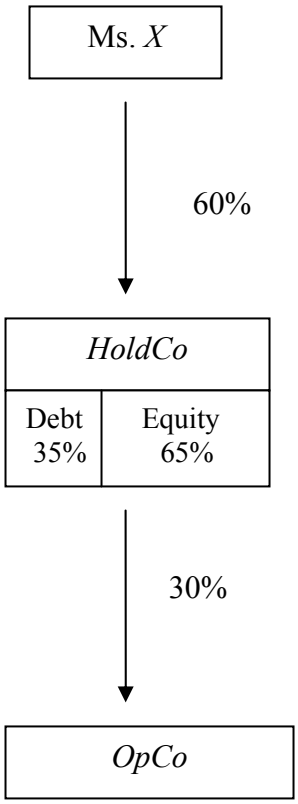
	Average	25th percentile	Median	75th percentile	Standard deviation
Dividend received	28.752	0.001	1.038	6.137	118.520
Interest expense	33.240	0.038	0.907	12.000	158.773
Investment ratio	0.772	0.216	0.640	1.035	0.754
Interest expense x Investment ratio	8.091	0.027	0.338	2.193	42.547
Total assets	2021	25	145	709	8438
Ultimate owner	0.531	0.000	1.000	1.000	0.499
Ownership stake	61.836	41.240	61.530	91.380	28.030
Cash	72.668	0.011	0.974	12.717	284.696

Panel B: Regression analysis

	(1)	(2)	(3)	(4)
Intercept	13.911***	-26.125***	-42.212***	-51.746***
	(3.92)	(-2.75)	(-3.45)	(-3.88)
Interest expense x Investment Ratio	1.833***	1.693***	1.670***	1.646***
	(22.38)	(20.01)	(19.62)	(19.25)
Log(Total assets)		8.163***	9.924***	7.733***
		(5.29)	(5.65)	(3.90)
Ultimate owner		0.440	-1.473	-4.025
		(0.06)	(-0.21)	(-0.57)
Investment ratio			10.948**	11.309**
			(2.09)	(2.16)
Ownership stake				0.336**
				(2.52)
Cash				0.014
				(1.01)
Observations	*657*	*657*	*657*	*657*
Adjusted R^2	*0.433*	*0.455*	*0.457*	*0.461*

Panel A presents summary statistics for dividend received and its determinants by entities in a pyramidal structure in 1999, 2001 and 2003. The dividend actually received is the dividend paid in the lower layer times the ownership stake. Interest expense is the interest payment in the holding company in € million. Investment ratio is the ratio of the lower layer equity times the ownership stake, divided by the asset value of the company. Total assets are the book value of total assets. Ultimate owner is an indicator variable with a value of one if the next layer is the ultimate owner, and zero otherwise. Ownership stake is the company's shareholdings in the lower layer. Cash is the amount of cash and securities of the holding company in € million. We include observations with an investment ratio greater than zero and less than four. Panel B presents regression results. The explained variable is the dividend received by the holding company in the pyramidal structure. Reported are coefficients and *t*-values, with a Newey-West correction for heteroscedasticity and autocorrelation. Significance is indicated as follows: '*' is 10% significance, '**' is 5%, and '***' is 1%.

Figure 1: Stylized example



Stylized example in which Ms. *X* holds a 60% equity stake in *HoldCo* and *HoldCo* holds a 30% stake in *OpCo*. *HoldCo* is financed with 65% equity and 35% debt.