Capital Structure and Risk Distribution in European Business Groups

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Abstract:

We analyze how the ultimate owner allocates leverage across the business groups, specifically, how a subsidiary's leverage relates to its position within the group and group complexity. These relationships have been neglected in prior literature. We find that leverage decreases in the distance from the ultimate owner and with the firm's importance to the group (measured by the number of its subsidiaries). Using the ATET, we exactly matched subsidiaries on country, period, and distance from the ultimate owner and found that members of international BG have, on average, lower leverage and are more likely to be zero-leveraged and less likely over-leveraged.

Keywords: Business groups, capital structure, ownership, private firms, European firms
JEL codes: G33, C23, G32

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1   Introduction

Optimal leverage and capital structure have been a focus of corporate finance research for a long time (see, e.g., De Jong and Van Dijk, 2007; Frank and Goyal, 2009; Lemmon et al., 2008; Rajan and Zingales, 1995; and Titman and Wessels, 1988). Generally, theoretical models of capital structure outline how firms must optimize leverage to take advantage of interest tax shields (Kraus and Litzenberger, 1973) and agency benefits (Jensen, 1986) while minimizing the costs of debt, such as bankruptcy (Warner, 1977). One aspect that is mainly overlooked is whether capital structure decisions will be impacted if a firm belongs to a business group. Balcaen et al. (2012) show that firms in a business group should aim to maximize the group value rather than the firm's value. As a result, the ultimate owners of a business group have the option to disperse the debt across the business group to optimize the advantages of debt better, thus significantly altering the capital structure compared to standalone firms.

Our paper focuses entirely on firms that belong to business groups. We explore whether the position[1] of a firm within a business group and general business group characteristics contribute to capital structure decisions of group-affiliated firms. To assess the importance of group characteristics for capital structure decisions of group-affiliated firms, we collect financial and ownership information on firms located in twenty-five European countries over the 2000–2018 period.[2]

Ultimate business group owners can choose and adjust how to allocate debt or risk in the business group through internal capital markets. Using this unique dataset, we aim to answer the following questions. To what extent do the value and position of a firm within a business group affect its capital structure? Are more leveraged firms closer or more distant from the ultimate

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[1] As outlined by Ferris et al. (2023) and Almeida et al. (2011), the position of a firm in the business group and the distance from the ultimate owner indicates the firm importance to the business group.

[2] The financial information was taken from annual and biannual updates of the Amadeus database, while the direct ownership information was merged from those updates and several historical queries and historical ownership data from Orbis covering the entire world of economic activities. (Both data sources are maintained by the Burea van Dijk, recently Moody's). We use an algorithm that constructs the complete structure of entire business groups from top-to-bottom. We require at least 50 percent control in each ownership link to ensure that it represents sufficient control. The resulting primary data (more than ten firms in the BG) contains 1,971,660 firm-year observations for 592,919 unique firms and 77,406 business groups having more than ten firms

owner? Are more complex and international business groups leading their member firms (i.e., subsidiaries) to higher leverage? What firm and business group characteristics affect the incidence of zero-leverage and overleveraged firms, and where are they located within the business group structure?

Analyzing the firm importance to the business group could help disentangle tax shield motifs and efficient use of capital versus the company default risk. Ferris et al. (2023) recently pointed out that the group decision about tunneling or propping in private European business groups is associated with the firm's role. Essential firms' defaults are extremely unlikely; those firms are saved even at the expense of other group members. Therefore, we expect that leverage distribution would also reflect the importance of the firms along with the particular country's shareholders' and creditors' rights protection.

Previous literature mainly compared leverage levels of groups-affiliated companies to leverage levels of standalone firms. It has been argued that group-affiliated firms should enjoy higher debt levels due to lower information asymmetries at debt renegotiations (Hoshi et al., 1990), intra-group debt guarantees (Chang and Hong, 2000) as well as group reputation (Schiantarelli and Sembenelli, 2000). Yet, groups could exploit the limited liability of their members and let affiliates file for bankruptcy at the expense of the creditors, perhaps after transferring valuable assets out of the failing subsidiary (Bianco and Nicodano, 2006). Empirically, higher leverage levels have been reported by Manos et al. (2007) for Indian-listed group affiliates, by Lee et al. (2000) and Jung et al. (2009) for Korean chaebol members, and by Dewaelheyns and Van Hulle (2012) for private Belgian business group affiliates compared to their standalone counterparts. There have been at least several theoretical considerations of how business groups organize their component firms. However, the empirical aspects are not well developed, and, as a result, the capital structure decisions of firms within business groups are not well-explored.

We find that the firm position within the business group structure, as well as the business group complexity, has a significant effect on the leverage of the given firm. Firms that are located further away from the ultimate owners, i.e., have a higher level, tend to have lower leverage. However, this effect is mitigated for endpoint firms, i.e., firms that do not own other firms with higher leverage. These results indicate that firms more distant from the ultimate owners might find it difficult to find external financing, and lenders might be hesitant to lend to these firms since ultimate owners can take advantage of limited liability protections. Moreover, ultimate owners

will also avoid placing higher leverage, and thus risk, on critical firms that control many subsidiaries and will instead place higher debt on endpoint firms. Subsidiaries belonging to international business groups tend to have lower leverage across all levels compared to their domestic counterparts. This result indicates that ultimate owners are capable of maximizing the benefits of leverage, such as tax shields, through other instruments, such as transfer pricing. This explains the lower desire for leverage for business group firms. Furthermore, the level of leverage also depends on the type of the ultimate owner, with family-owned business groups having the lowest leverage. Overall, the results show that business group structure and firm position indicate how the ultimate owner plans to distribute risk in the business group regarding leverage.

We contribute to the literature in the following ways: Firstly, we contribute to the literature on capital structure. Starting with Modigliani and Miller (1958), researchers have been analyzing the optimal capital structure of firms (see, e.g., Korteweg, 2010). Despite business groups corresponding to a large portion[3] of firms, business group membership and the firm's role in the business group have been mostly overlooked. Our paper aims to bridge this gap and analyze how owners distribute risk across the business group.

Secondly, we contribute to the literature on zero-leverage firms (e.g., (Bessler et al., 2013; Strebulaev and Yang, 2013). While Bessler et al. (2013) suggest that zero-leverage firms are financially constrained, internal capital markets offset this constraint for business group firms. Analyzing why business group members have zero leverage can allow us to understand what external factors can influence the ultimate owners to change the optimal leverage level for the business group.

Lastly, we contribute to the literature focusing on business group structure. Beginning with Wolfenson (1999), researchers have considered how the "shape" and "depth" of a business group are determined. Almeida et al. (2011) show the structure of the largest Korean chaebols and offer evidence that firms that are more distant from the ultimate owner are considered more expendable. Ferris et al. (2023) introduce concepts from graph theory to provide a robust framework for firms' importance to the business group and use it to analyze the incidence rate of bankruptcies. We build on their framework to explore how business group structure and the firm position within the business group can influence the firm's leverage.

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[3] Ferris et al. (2023) show that 28.8% of all European firms belong to a business group.

Our paper is organized as follows: Section 2 introduces our hypotheses and presents relevant literature. We describe our data and the descriptive statistics in section three. We discuss our methodology and present our results in section four. Finally, section five concludes our study.

2   Hypotheses

Each business group has a hierarchical structure that can be depicted as a graph, with the ultimate owner at the top and connections between firms in the graph representing equity ownership. Below, we plot an example of a graph illustrating a simple business group that contains five firms.
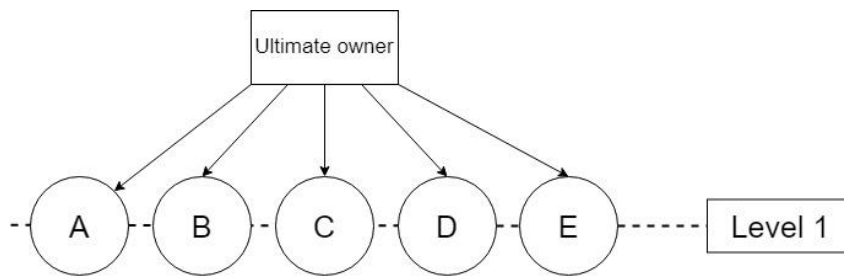
The graph above represents a standard subsidiary structure whereby all the firms in the business group are at the same level, i.e., all the firms are directly connected to the ultimate owner through an ownership relationship. A more complex business group is depicted below.
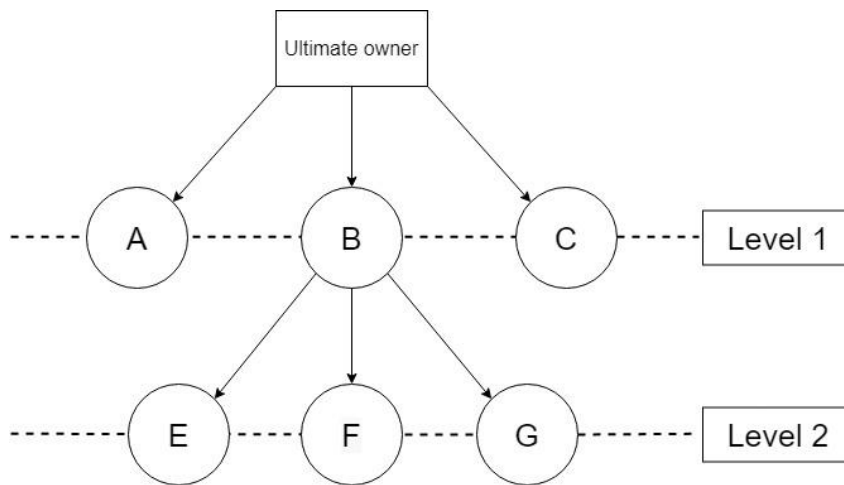
The business group above contains six firms. Three of the firms (A, B, and C) are directly connected to the ultimate owner of the business group through equity ownership. In contrast, three of the firms (E, F, and G) are indirectly connected through firm B's equity ownership in them, i.e., the ultimate owner owns company B, who has a control equity stake in firms E, F, and G. We refer

to firms A, C, E, F, and G as "endpoint firms" because they have no subsidiaries. In contrast, firm B is not an endpoint firm because it owns firms E, F, and G.

We conjecture that the capital structure of a firm is affected by both the characteristics of the business group that it belongs to (e.g., the size of the business group, the number of levels in the group, whether all the firms in the group are headquartered in the same country, etc.) and where the firm is located within the graph of the business group, e.g., the level where the firm is located, whether or not it is an "endpoint" firm, etc.

2.1 _Characteristics of the business group and firms' leverage_

2.1.1 Simple versus complex business groups

Using the existing results, one can assume that the larger and more complex the group, the more potential there is for collateral cross-pledging (Larrain et al., 2019). Moreover, Almeida and Wolfenzon (2006) and Almeida et al. (2011) argue that group membership and access to resources can loosen financial constraints. Therefore, the forces that predict a positive (negative) relation between group size and leverage also expect a positive (negative) relation between group complexity and leverage. Thus, we have the following competing hypotheses:

> **H1A**: *There is a positive relation between the complexity of a business group and the amount of leverage its firms have.*
> **H1B**: *There is a negative relation between the complexity of a business group and the amount of leverage its firms have.*

Moreover, there is an additional mechanism that should work towards producing a positive relation between complexity and leverage for specific subsidiaries. In particular, a strong relationship exists between firm position (distance from the ultimate owner) and BG complexity in less complex BG. Therefore, we should also analyze these effects separately, and we hypothesize:

> **H2**: *There is less of a positive relation (equivalently, less of a negative relation) between the complexity of a business group and leverage than there is between the firm distance from the ultimate owner and leverage.*

2.1.2 Domestic versus international business groups

A broad literature on tunneling and propping shows that resources are often transferred within the business group (e.g., Ferris et al., 2023). These transfers can be in the form of internal assets stripping and transfer pricing or even in the form of outright cash appropriation. We hypothesize that it is more difficult for lenders to monitor international business groups' activity and that they will, therefore, be more reluctant to extend loans to members of international business groups. We thus hypothesize:

> **H3**: *Subsidiaries in international business groups have, on average, less leverage than firms in similar domestic business groups.*

2.2 Location of the firm within the graph and its leverage

Ferris et al. (2023) note that the group's decision to tunnel or prop firms is associated with the firm's role. A firm's role and importance to the group can be proxied by the distance from the ultimate owner and whether it is an "endpoint" firm without subsidiaries.[4] Moreover, they argue that firms can use the limited liability provisions and the group complexity to place more risky projects more distantly from the ultimate owners. Liquidation of such firms is less costly and minimizes effects on the overall structure. In contrast, essential firms' defaults are extremely unlikely; those firms are saved at the expense of other group members. We expect the leverage distribution across firms within a group to depend on the importance of the firms and the country's protection of shareholder and creditor rights. The benefit of using firm position and business group structure to capture the firm importance is that it allows us to observe the apparent role of the firm in the business group without any further reporting requirements.

Conversely, according to standard economic theory, lenders will be more reluctant to provide funds to firms far from the ultimate owner, especially endpoint firms with relatively little net worth and collateral. Lenders can assume that the cost of liquidation for such subsidiaries is not high for the ultimate owners, who can abuse the limited liability protections and take on risky projects in these firms. Thus, we hypothesize that:

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[4] For more detailed definitions of used variables, see the Appendix Table (Definitions of variables).

H4A: *Subsidiaries positioned closer to the ultimate owner and firms that have large equity stakes in other firms (i.e., non-endpoint firms) have, on average, higher leverage due to their ability to obtain financing from lenders.*

However, if lenders have limited attention or rationality, we might find relatively more leverage far from the ultimate owner; clearly, if lenders do not discriminate based on where a firm lies in the business group, the borrowers would prefer to place the debt far from the ultimate owners at the endpoints. Thus, we have the following alternative hypothesis based on limited attention/rationality:

H4B: *Subsidiaries positioned further from the ultimate owner and endpoint firms have, on average, higher leverage because this is optimal for the business group (ceteris paribus).*

Another indication of firm importance to the ultimate owners is the number of subsidiaries given its ownership controls, i.e., the subgroup size with the particular firm on the top. It is unclear what effect this will have on the leverage. On the one hand, the larger the subgroup, the more potential for collateral cross-pledging (Larrain et al. 2019). Similarly, as for the whole BG, the sub-group members, due to a closer connection, can help even more to facilitate mutual assurance and risk-sharing among affiliated firms (Khanna and Yafeh, 2005). The sub-group could benefit from some partial independence and, as a result, have more aggressive expenditures. This is supported by Larrain et al. (2019), who find reduced leverage and investment after a firm loses its group membership. These factors suggest that a firm on the top of bigger business sub-groups might have easier access to resources and potentially higher leverage.

On the other hand, the value of the firm leading the sub-groups is also embodied by the sum of the values of all firms in the respective sub-group. Jeopardizing this firm with a potential insolvency/bankruptcy would result in losing its entire ownership chain. We expect that the risk motive will dominate. In other words,

H5: *There is a negative relation between the size of a business subgroup controlled by the firm and the amount of leverage that this firm has.*

2.3 Zero leverage, over-leveraged, near zero leveraged firms

The zero-leverage firm phenomenon, whereby some firms can easily support debt and benefit from the resulting tax shields but choose to remain unleveraged, has recently received considerable attention in the academic literature (Bessler et al., 2013; Dang, 2013; Strebulaev & Yang, 2013; Lotfaliei, 2018). Bessler et al. (2013) highlight several possible motivations for firms to stay zero-leveraged. Focusing on market data of exchange-listed firms, they find that countries with high creditor protection exhibit the highest percentage of zero-leverage firms. They also find that most zero-leverage firms are financially constrained and do not choose to be zero-leveraged.

Business groups can shed more light on the zero-leverage phenomenon. The vast majority of firms in business groups are private and, therefore, might be financially constrained. However, business group members can access internal capital markets, which should alleviate financial constraints.[5] As a result, business group membership should ease financial limitations and allow more optimal allocation. Yet, there exist firms in the business groups that are zero-leveraged. Building on the study by Bessler et al. (2013), we speculate that banks in countries with limited creditor protection might be reluctant to issue loans to firms in business groups due to the potential abuse of limited liability provisions by the ultimate owners. As a result, we expect that the origin of bankruptcy law would contribute to the incidence and frequency of zero-leveraged firms in the business group. This allows us to specify the following hypotheses:

H6A: *Subsidiaries that are more important to the group are more likely to be zero-leveraged (near zero-leveraged) and less likely to be over-leveraged.*

H6B: *Subsidiaries that are endpoints are more likely to be zero-leveraged (near zero-leveraged) and less likely to be over-leveraged.*

As mentioned in the literature, two main factors could drive the phenomena of zero-leveraged or "near-zero-leveraged" firms. First, it could be an outcome of minimizing the risk of default, and second, it could reflect a company risk profile for internal and external funding. This leads us to specify Hypothesis H6A. Conversely, Hypothesis H6B uses the rationale expectation that zero-

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[5] It is important to note that even if all member firms are financially constrained, meaning they are not able to get external funds, they can still shift capital through internal capital markets.

leverage firms should be disproportionately concentrated at the endpoints because lenders should be reluctant to extend credit to such firms.

3 Data and descriptive statistics

3.1 *Sample construction and basic coverage*

We collect comprehensive financial and ownership information on European companies from Amadeus and Orbis Databases maintained by Bureau van Dijk, Moody's Analytics Company.[6] We use these databases to construct business groups, defined as organizational forms in which at least two legally independent firms are controlled by the same ultimate owner (e.g., Almeida and Wolfenzon, 2006). To ensure that all ownership links represent control, we develop a unique algorithm that constructs the complete structure of business groups from top-to-bottom, requiring at least 50 percent control in each ownership link. A more detailed description of the algorithm is available in the Internet Appendix.

Our data also contain firm-specific details on the year, the country of incorporation, and the industry membership. We further supplement firm financial information with macroeconomic variables and business environment indicators from World Bank Governance Indicators and World Bank Development Indicators databases.

Overall, we have collected more than 11.5 million observations of firms from 24 European countries. Following existing literature, we exclude firms operating in financial services industries (NACE codes 65 and 66) and firms that are subject to specific regulations or objectives, including government/public entities, firms from education, health, and social sectors, private households, national organizations, and firms that cannot be classified (NACE codes 75, 80, 85, 90-99). We also eliminate firms with missing ownership information and a missing number of employees.

Our final sample consists of firms located in twenty-five European countries over the 2000–2018. Our primary sample contains 1,971,660 firm-year observations for 592,919 unique firms and 77,406 business groups having more than ten firms.

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[6] Amadeus and Orbis databases usually remove firms' records after ten years or when they become inactive, merge with other firms, or change identification. To account for these shortcomings, we compile eleven annual versions of Amadeus to build financial and accounting data over the period from 2000 to 2018. In addition, we use a series of historical ownership queries and the Orbis historical ownership database (2007-2018) to collect detailed information on direct ownership links between firms in Europe.

3.2   Descriptive statistics

We first provide the descriptive statistics of the business groups in our sample. Table 1 focuses on the distribution of the business group by size and over time. Panel A presents the number of firm-year observations for business groups of a specific size. Business groups are assigned to groups by the number of firms they control. We provide the number and distribution for all business groups with more than five members in Table 1. For example, the smallest business groups with 5 to 10 members represent about 38.5% of all firm-year observations in the sample, while 26.8% belong to the BG with more than fifty members. Panel B provides further information on the number of unique business groups. Small groups with 5-10 members represent 41.6%, and large groups with more than 50 members represent 25.7% of all business groups.[7]

*** Table 1, Panel A and B here ***

Table 2 Panel A lists the business group ownership by country and business group size. Most of the groups with 6-10 and 11-20 members have an ultimate Russian owner (24.1% and 19.3%), followed by Italian owners (20.1% and 17.7%). The order is swapped for larger groups with 21-50 members; groups with Italian owners represent 13.7%, and Russian owners have 13.3%. In the groups with more than 50 members, French owners dominate (18.5%), followed by Italian (10.1%), German (8.1%) and Russian owners (7.7%). Country coverage concerning the subsidiaries reflects the country representation of ultimate owners. Panel B reports the sample distribution of firms across countries. We see that the majority of firms are located in Russia (18.64%), Italy (18.46%), and France (15.07%).

*** Table 2, Panel A and B here ***

Table 3 also summarizes descriptive statistics for financial variables. For simplicity, we define four corresponding categories for a subsidiary's distance from the ultimate owner: *Directly owned* (level=1), ($2 \leq$ level ≤ 3), ($4 \leq$ level ≤ 5), and (level ≥ 6). Note that the size of a typical subsidiary

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[7] In the main analysis, we restrict the sample to groups with more than ten members. Smaller groups might not have sophisticated enough internal capital markets, and, as a result, might exhibit different behaviors. We test the robustness of this exclusion by replicating our analysis for groups that have between 5 and 10 member firms. The results in Tables A4 – A8 in the Internet Appendix are generally consistent with our main results.

within the business group seems to be increasing with the number of levels, which should also reflect the size and complexity of the BG. Compared to firms that are near the ultimate owner (level = 1), the most distant firms (level ≥ 6) tend to be older (13.0 versus 10.3 years) and have lower tangibility (0.22 versus 0.26) and sales growth (0.10 versus 0.17) but higher ROA (5.0 versus 4.0).

*** Table 3 here ***

In addition to the existing measures associated with the depth of the business group, we create an indicator for a firm being at the *endpoint,* i.e., when the firm does not own any other firm. These firms tend to be more distant from the ultimate owners and generally do not have any service role in the business group. It is typically a production firm or a limited liability company created for riskier projects (Ferris et al., 2023).

4   Methodology and results

4.1   Methodology

To understand how business groups manage risk associated with debt, we run leverage regressions at the subsidiary level. We focus on firms that belong to business groups with more than ten members since the results could be size-sensitive, and it could be hard to control for the other BG characteristics.[8] We employ a standard set of firm-level leverage determinants used by previous studies, such as firm size, tangibility, and cash flow (for a complete list, see, e.g., Brav, 2009), as well as country, industry, and time-fixed effects. To capture the impact of a business group on a subsidiary's leverage, we also account for the importance of the subsidiary to the business group by using the firm position and group complexity as indications of the firm's importance. Specifically, our baseline model is defined as follows:

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[8] We report full set of results, including taking into account smaller business groups, in the Internet Appendix. Our results are robust to this inclusion.

$$Lev_{itG} = \alpha + \sum \beta_1 \, BG \, Complexity(= k)_i + \beta_2 Public + \beta_3 Intnl_G$$

$$+ \sum \beta_4 \, Distance_{it} + \beta_5 Endpoint + \beta_6 Endpoint \times Intnl_G$$

$$+ \sum \beta_7 \, SizeSG(= k)_i + \boldsymbol{\theta}_{it} firmC + owner_G + macro_{it} + govQty_{it} \quad (1)$$

$$+ cntryFE + indFE + timeFE + \epsilon_{it}$$

where Lev_{itG} is leverage of subsidiary i in year t belonging to a business group G. Leverage is defined as (*bank loans + long-term debt)/(total assets*). *BG complexity* is assigned to one of the following categories: i) pure subsidiary structures (BG depth=1, base/omitted category), ii) BG depth between 2 and 3, iii) between 4-5, and iv) BG depth greater than 6. The variable $Intnl$ equals one if the business group operates in more than one country and zero if all group subsidiaries are located in the same country. *Public* is a dummy equal to one if the ultimate owner of the business group is a publicly traded company. *Distance* captures the distance from the ultimate owner and is assigned to one of the following categories: a) directly owned (distance=1, base/omitted category), b) 2-3 levels below, c) 4-5 levels below the top, and d) 6 or more levels from the ultimate owner. The dummy variable *Endpoint* equals one if a firm does not own any other firm (i.e., it is an endpoint in the ownership structure) and zero otherwise. The variable *SizeSG* contains the total number of firms in the business sub-group with firm i on the top (as a pseudo-ultimate owner). We assign *SizeSG* to one of six categories of group size: 2 firms or less (omitted/base category), 3-5 firms, 6-10 firms, 11-20 firms, 21-50 firms, and more than 50 firms).

Each regression also includes firm-level control variables, consisting of the natural logarithm of total assets and its square, tangibility (=tangible/total assets), sales growth, ROA, and firm age. We also include country-level variables to account for variation in the availability of external finance (e.g., private credit/GDP, market cap/GDP, GDP growth) and for governance quality (regulations, government efficiency, the rule of law, corruption, etc.). For a detailed description and definition of all variables, see Appendix Table A1. Finally, we add several fixed effects. The set of year dummies controls for the idiosyncratic shocks that occurred during the specified period and the country- and industry-fixed effects address time-invariant heterogeneity in our data.

In addition to the leverage regressions, we investigate the likelihood of zero-leveraged and over-leveraged firms conditional on group characteristics. We define a firm as over-leveraged if

the firm's leverage is 1% greater than the predicted optimal leverage estimated over the entire sample. We use model (1) and the linear probability model (LPM) to analyze the determinants of being zero-leverage or over-leveraged. LPM should be preferred since any maximum likelihood, system, or control function estimator will generally become inconsistent if incorrectly specified (Lewbel et al., 2012).[9] We compute robust standard errors to control for heteroskedasticity stemming from the binary character of the dependent variable. When available and computationally feasible, we used variance clustered by company ID.

4.2   *Firm leverage and business group effects*

We begin by estimating a leverage specification (1) that accounts for group characteristics in addition to firm-level leverage determinants. Specifically, we focus on such characteristics as the distance from the top of the business group, the subsidiary's endpoint position, the number of subsidiaries controlled by the given firm, and whether a business group is international. Due to the potential multicollinearity of BG Complexity and the distance of the firm from the ultimate owner, we also report specifications where one of those sets of indicator variables is omitted. Table 4 reports the results.

*** Table 4 here ***

The coefficients of the BG complexity indicator variables offer mixed support for hypotheses H1A and H1B. The 0.004 coefficient on the indicator for the depth between 2 and 3 in (1) suggests that as groups become slightly more complex, leverage increases, consistent with H1A, but the −0.019 coefficient on the depth greater than six indicator reveals that the most complex business groups (business groups with depth higher than 6) have 1.9 percentage points lower leverage than firms in pure subsidiary structure. This suggests that as groups become more complex, the firms are less leveraged, consistent with H1B. However, we discussed the expected high correlation between the BG complexity and firm distance from the ultimate owner. When we omit one of these variables, the pattern becomes clear and consistent with H1B. Thus, it appears that at low levels of group

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[9] The LPM should provide very similar results to the estimated marginal effects employing logit/probit models and the delta method (Angrist and Pischke, 2009). Our results are robust to using logit and probit models, with results available upon request.

complexity, the effect that additional levels have on firms' ability to obtain financing through increased net worth and collateral (due to the existence of the firms below them in the graph) dominates the effect that the increased complexity has on making it more difficult for lenders to monitor borrowers' behavior. However, as a group becomes more complex, the effects of the increased difficulty for lenders to monitor borrowers' activity (or the increased efficiency of internal capital markets, which might reduce firms' need for external finance) dominate the effects of net worth and collateral, and the relation between group complexity and firm leverage reverses. Moreover, comparing (2) and (3), we see that the effect of the firm position (distance) is much stronger than the effect of BG complexity, H2(B).

The fact that we find support for H1B and strong support for H2(B) is consistent with H3, i.e., with the notion that in complex business groups, firms (near the top of the group) can easily obtain financing due to their high net worth and collateral (due to the presence of the firms beneath them in the graph).

The negative coefficient of *International* suggests that firms in international business groups have less leverage than ones that are confined to a single country, consistent with hypothesis H4. This is consistent with the idea that lenders worry that business groups might transfer assets away from the borrower and that it is harder for lenders to monitor such activity in international business groups than groups confined to a single country.

We next examine how a firm's position in a business group is related to its leverage. Consistent with H5A, the further a firm is from the ultimate owner, the less leverage it tends to have. For example, in regression (1), we see that a firm that is at least six levels removed from the ultimate owner has (on average) 1.6 percentage points less leverage than firms that are direct subsidiaries of the ultimate owner of the business group, and the estimated relationship is even strong (3.3 percentage points) in regression (2). This effect is highly economically significant, as the average leverage for business group firms is between 15-16% across BGs. This finding is consistent with the idea that firms with more net worth and collateral, e.g., those near the top of the graph of the business group, can more easily obtain external financing than those near the bottom. However, somewhat paradoxically, the coefficient of *Endpoint* suggests that the endpoint firms of business groups have 0.9 percentage points *more* leverage, while the endpoints in international business groups have 0.5 percentage points (=0.9% − 0.4%) more leverage. The fact that the interaction *International × Endpoint* is negative is consistent with the idea that it is more

difficult for lenders to monitor the activity of international business groups compared to ones where all the firms belong to the same country. Similarly, this can be the result of ultimate owners allocating the leverage, using internal capital markets, to endpoint firms to minimize the adverse effects of potential bankruptcy.

Second, we observe that firms more distant from the ultimate owner typically have lower leverage. This result may be consistent with the observations of Bessler et al. (2013). Banks might be reluctant to lend to firms in business groups due to the limited liability provisions by the ultimate owners. As a result, many businesses group firms might be financially constrained. However, it is important to point out that endpoint firms, i.e., firms that do not own any other subsidiaries, have significantly more considerable leverage, mitigating the effect of distance. This result is consistent with the view that endpoint firms are considered to be less important by the ultimate owners since their potential bankruptcy does not jeopardize the business group structure.

Thirdly, we observe that subsidiaries that control many other subsidiaries have significantly lower leverage. For example, subsidiaries that own directly or indirectly more than 50 other subsidiaries have two percentage points lower leverage than subsidiaries that control less than two. This result is consistent with observations of Ferris et al. (2023), who show that firms considered important by the ultimate owners are rarely exposed to financial distress. Firms that control large numbers of subsidiaries are critical to business group owners since bankruptcy might lead to loss of control of the other subsidiaries owned by the firm. Our results confirm that such critical firms tend to be under-leveraged to minimize the potential chance of bankruptcy. Similarly, we observe that firms in a business group with a publicly traded firm as an ultimate owner (or near the top) tend to have lower leverage. The possible explanation can be that ultimate owners might be reluctant to take on debt, as bankruptcy of their subsidiaries might "pierce the corporate veil" and harm their reputation despite possible limited liability protection (Beaver et al., 2023).

4.3 Alternative dependent variables

We next focus on over-leveraged and zero-leveraged firms and relate their incidence to group-level characteristics. Table 5 reports the results of the linear probability model on the likelihood of a firm being over-leveraged. Overall, the results are consistent with the results of Table 4. Subsidiaries in more complex groups and firms more distant from the ultimate owner are less likely to be overleveraged. This result is consistent with the idea that ultimate owners can distribute the

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debt across the entire business group, thus minimizing any firm's bankruptcy risk. Similarly, subsidiaries that directly or indirectly control many other subsidiaries have a significantly lower likelihood of being over-leveraged, further consistent with the idea of debt optimization to reduce bankruptcy. This is further supported by the fact that firms in business groups with publicly traded ultimate owners are less likely to be over-leveraged, as bankruptcy might be more damaging to the ultimate owner (Beaver et al., 2023).

*** Table 5 here ***

Interestingly, we do observe that endpoint subsidiaries are less likely to be overleveraged. This might be further consistent with Bessler et al. (2013) and suggests that endpoint subsidiaries might be financially constrained from external funding. We further investigate what business group characteristics are the essential determinants of zero-leverage firms within a business group. Specifically, we estimate a linear probability model to assess the probability of being a zero-leverage firm given group characteristics. Results are presented in Table 6.

*** Table 6 here ***

The results further confirm previous results. Subsidiaries that are more distant from the ultimate owner and in more complex business groups are more likely to be zero-leveraged. The result is further consistent with Bessler et al. (2013).

4.4 Ownership effect on leverage of international firms

In the previous section, we observe that, generally, international business groups have lower leverage than domestic groups. This result may appear counterintuitive if ultimate owners are thought to primarily pursue tax shield maximization. To disentangle the effects of international business groups on leverage, we use a randomized control trial setup and ATET (Average Treatment Effect on Treated).

Different controlling shareholders pursue different strategic objectives (Aguilera and Jackson, 2010; Bebchuk et al., 2017; Estrin, Hanousek, and Shamshur, 2023; Kang, Luo, and Na,

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2018; Lewellen and Lewellen, 2022, to name a few). Key ownership types[10] are usually defined in terms of majority ownership and include family owners, corporations, institutional owners, and the state as an owner (Appel, Gormley, and Keim, 2016; Villalonga and Amit, 2006; Estrin, Hanousek, Kocenda and Svejnar, 2009). Analyzing international groups' effects on leverage by type of the ultimate owner should eliminate the control and agency-type problems.

To eliminate the other possible effects, we use the nearest neighbor matching with the exact match on country, period, and level in the BG (the distance from the ultimate owner). Size (log of total assets) and tangibility (ratio of tangible to total assets) were covariates for approximate matching. Results are presented in Table 7.

*** Table 7 here ***

Results consistently show that the firms in international BG have a lower leverage, a lower likelihood of being over-leveraged, and a higher probability of having zero (or near zero) leverage. We also see consistent ordering between analyzed ownership types. The lowest difference is observed for the family-controlled group, followed by institutional investors, and the most considerable difference is held for corporate owners. This sorting makes perfect sense from the motives for the leverage (REF), especially with the possible interplay of transfer pricing. Corporate owners have the most extensive latitude for using transfer pricing to adjust the optimal taxation, performance, and use of the capital. On the other hand, family-owned firms are known to be risk-averse (REF); therefore, we expect the lowest difference between domestic and international groups. As a result, results indicate that business group owners prefer using transfer pricing to receive optimal taxation and instead prefer to minimize the likelihood of bankruptcy rather than tax shield maximization. This result is consistent with Ferris et al. (2023), who show that, on average, business groups tend to prop firms, i.e., shift assets to firms to avoid financial distress, rather than tunneling, i.e., expropriating assets out of firms. Business group owners might prefer reducing the likelihood of bankruptcy and may, as a result, choose a lower level of leverage.

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[10] We keep a grouping of the ownership type consistent with previous literature by using classification in Amadeus database. We consider three categories of ownership type: family-owned firms(Type I and L), institutional investors (B, E, F, J, and Y), and corporate owners (C and D). For obvious reasons, we exclude state-controlled BG.

6. Conclusions

Understanding how firms choose the mix of securities and financing sources to fund their real investments (i.e., their "capital structure") has been a central topic in corporate finance for many decades. It is well-known that debt financing provides both advantages, such as interest tax shields, and disadvantages, such as costs of financial distress. The tradeoff theory of capital structure posits that firms choose their capital structure to maximize the difference between the present value of these benefits and costs. Implicit in most analyses of capital structure is that the firm is a standalone. However, many firms are part of a "business group," i.e., a collection of firms with a common controlling shareholder. If a firm is part of a business group, the group owners should presumably seek to maximize the total value of the business group rather than the individual firm. The question of how a firm's capital structure is related to its position within a business group (i.e., whether it is near or far from the ultimate owners) and the characteristics of the business group (large versus small, simple versus complex, and domestic versus international) has been largely neglected by prior researchers even though business groups are a common ownership structure in much of Europe.

To examine how debt gets distributed within business groups, we construct a unique dataset of the structure of European business groups. We find that firms located further away tend to have lower leverage on average. This indicates that lenders are reluctant to lend money to more distant and, thus, more expendable firms, fearing that ultimate owners might abuse the limited liability provisions. However, we also observe that ultimate owners optimize the allocation of debt to minimize the cost of bankruptcy. Firms that control many subsidiaries have lower leverage, as their default would cause the ultimate owner to lose control over any subsidiaries the given firm controls. Conversely, firms that do not own any other subsidiaries, i.e., endpoint firms, have higher leverage. Our analysis of over-leveraged and zero-leveraged firms further supports our conclusions. Firms closer to the ultimate owner can find external financing by providing intra-group guarantees and collateral and, as a result, are more likely to be over-leveraged compared to the rest of the group and less likely to be zero-leveraged. Nevertheless, the ultimate owners are more likely to keep most critical firms to their structure zero-leveraged, as their bankruptcy could be far more costly than the bankruptcy of endpoint firms. Similarly, we observe that firms in business groups with publicly traded firm at the top tend to have lower leverage and a lower

likelihood of being over-leveraged since there might be reputation costs for the ultimate owner in case of default.

We further analyze the differences between domestic and international business groups to shed more light on the motivation for leverage. Overall, we observe that international business groups have lower leverage across all levels and all types of owners. This result indicates that lenders are even more hesitant to lend to international business groups, as the costs for monitoring is higher. However, we further see that another reason for lower leverage is that international business groups can achieve the benefits of leverage, such as optimal taxation, through other means, like transfer pricing. This is further supported by the fact that corporate owners, which have the highest latitude for transfer pricing, have the lowest leverage.

Overall, our results show that a firm's position within a business group as well as the business group's complexity, are essential determinants of leverage that prior researchers have largely ignored. We further show how access to internal capital markets and the possibility of transfer pricing can influence optimal capital structure. Analyzing how business group structure and firm position affects firm decisions is an exciting avenue for future research.

Table 1. Distribution of business groups by size and members in our sample

Panel A. Number of observations (business group members) by BG size

Panel A shows the distribution of firms in our sample (firm*year observations) for each BG size cluster. Business groups are split into the size cluster by the number of firms they control. The first number in the cell is the total number of the firms, and the second and third numbers correspond to the row and column percentages, respectively.

Period	Business group size				Total
	6-10	11-20	21-50	>50	
2000 – 2004	15,959	11,686	10,867	12,081	50,593
	31.54	23.1	21.48	23.88	100
	1.29	1.85	2.26	1.41	1.58
2005 – 2007	52,903	34,844	29,648	39,905	157,300
	33.63	22.15	18.85	25.37	100
	4.28	5.51	6.17	4.65	4.9
2008 – 2009	79,286	51,704	47,034	88,218	266,242
	29.78	19.42	17.67	33.13	100
	6.41	8.18	9.79	10.27	8.3
2010 – 2012	218,534	126,182	102,115	205,832	652,663
	33.48	19.33	15.65	31.54	100
	17.68	19.96	21.25	23.96	20.34
2013 – 2015	414,528	206,906	148,661	259,932	1,030,027
	40.24	20.09	14.43	25.24	100
	33.53	32.74	30.93	30.26	32.11
2016 – 2018	455,187	200,728	142,236	253,081	1,051,232
	43.3	19.09	13.53	24.07	100
	36.82	31.76	29.6	29.46	32.77
Total	1,236,397	632,050	480,561	859,049	3,208,057
	38.54	19.7	14.98	26.78	100
	100	100	100	100	100

Panel B. Number of unique firms in each size cluster and period

Panel B shows the distribution of unique business groups in our sample for each BG size cluster (Each group is represented only once). Business groups are split into the size cluster by the number of firms they control. The cell's first number is the BG's total number in the particular period and size cluster, and the second and third numbers correspond to the row and column percentages, respectively.

Period	Business group size				Total
	6-10	11-20	21-50	>50	
2000 – 2004	11,892	7,575	6,621	7,113	33,201
	35.82	22.82	19.94	21.42	100
	1.63	2.34	2.65	1.58	1.89
2005 – 2007	36,259	20,456	17,062	21,106	94,883
	38.21	21.56	17.98	22.24	100
	4.97	6.32	6.82	4.69	5.41
2008 – 2009	56,622	34,010	30,676	57,238	178,546
	31.71	19.05	17.18	32.06	100
	7.76	10.51	12.26	12.72	10.18
2010 – 2012	135,063	65,770	52,955	105,474	359,262
	37.59	18.31	14.74	29.36	100
	18.51	20.32	21.17	23.45	20.49
2013 – 2015	236,189	100,784	73,925	131,139	542,037
	43.57	18.59	13.64	24.19	100
	32.37	31.14	29.55	29.15	30.91
2016 – 2018	253,733	95,015	68,897	127,777	545,422
	46.52	17.42	12.63	23.43	100
	34.77	29.36	27.54	28.4	31.11
Total	729,758	323,610	250,136	449,847	1,753,351
	41.62	18.46	14.27	25.66	100
	100	100	100	100	100

Table 2. Country distribution by ultimate owners and by BG member

Panel A. Distribution of share of top ten countries (ultimate owners) by the business group size

This table lists the BG ownership country representation by the business group size. For country identification, we use ISO2, i.e., two letters official country abbreviations. Note that WW stands for Amadeus/Orbis assigned ownership identification for an unknown private individual, usually with a high probability from the same country as the controlled firm.

Top 10 countries	BG size (6-10)		BG size (11-20)		BG (21-50)		BG (more than 50)	
	Country	N (%)	Country	N (%)	Country	N (%)	Country	N (%)
1	RU	298,001 (24.1)	RU	122,097 (19.32)	IT	65,998 (13.73)	FR	158,737 (18.48)
2	IT	248,561 (20.1)	IT	111,983 (17.72)	RU	64,063 (13.33)	IT	86,674 (10.09)
3	NO	101,397 (8.2)	NO	46,472 (7.35)	FR	42,688 (8.88)	DE	69,356 (8.07)
4	WW	98,777 (7.99)	ES	44,848 (7.1)	ES	34,387 (7.16)	RU	65,724 (7.65)
5	ES	79,328 (6.42)	WW	43,458 (6.88)	DE	33,248 (6.92)	US	58,225 (6.78)
6	BG	70,144 (5.67)	FR	38,828 (6.14)	WW	30,472 (6.34)	GB	48,808 (5.68)
7	FR	52,677 (4.26)	DE	32,303 (5.11)	NO	28,033 (5.83)	ES	42,099 (4.9)
8	DE	39,769 (3.22)	BG	23,725 (3.75)	GB	20,667 (4.3)	SE	39,720 (4.62)
9	SE	38,720 (3.13)	GB	21,564 (3.41)	SE	20,191 (4.2)	WW	36,215 (4.22)
10	GB	29,097 (2.35)	SE	21,430 (3.39)	BG	14,810 (3.08)	UA	31,960 (3.72)

Panel B. Sample firm-level coverage by country and period.

Country	N	Percent	Country	N	Percent
RU	597,913	18.64	FI	29,889	0.93
IT	592,330	18.46	EE	17,675	0.55
FR	483,436	15.07	HR	17,460	0.54
ES	238,947	7.45	RO	17,177	0.54
NO	223,309	6.96	LV	15,891	0.5
GB	142,505	4.44	AT	15,881	0.5
BG	128,627	4.01	GR	15,274	0.48
DE	124,248	3.87	HU	12,358	0.39
SE	111,559	3.48	IE	7,344	0.23
BE	84,592	2.64	SI	6,652	0.21
CZ	80,442	2.51	DK	6,188	0.19
UA	67,695	2.11	NL	3,438	0.11
PL	67,582	2.11	LT	3,098	0.1
PT	61,839	1.93	CH	365	0.01
SK	34,343	1.07	Total	3,208,057	100

Table 3. Descriptive statistics for financial variables

Variables/Statistics	N	Mean	SD	p5	p25	p50	p75	p95
Directly owned (level=1)								
Log(Total assets)	751,122	14.80	2.33	10.62	13.35	15.00	16.52	18.25
Tangibility	751,122	0.26	0.31	0.00	0.01	0.11	0.46	0.91
Sales growth	751,122	0.17	1.36	-0.80	-0.18	-0.01	0.18	1.23
ROA	751,122	4.02	23.61	-23.06	-0.85	2.54	10.24	36.63
Age	751,122	10.27	7.35	3	6	9	13	20
Leverage	751,122	0.16	0.25	0	0	0.01	0.25	0.75
Over-leveraged	751,122	0.30	0.46	0	0	0	1	1
Zero-leveraged	751,122	0.42	0.49	0	0	0	1	1
Near zero leverage	751,122	0.49	0.50	0	0	0	1	1
(2≤ level ≤ 3)								
Log(Total assets)	952,151	15.42	1.95	12.02	14.20	15.58	16.83	18.36
Tangibility	952,151	0.25	0.31	0.00	0.01	0.10	0.42	0.92
Sales growth	952,151	0.16	1.24	-0.70	-0.15	0.00	0.16	1.01
ROA	952,151	3.37	21.21	-22.94	-1.04	2.95	10.19	30.77
Age	952,151	10.85	7.58	4	6	10	13	20
Leverage	952,151	0.16	0.25	0	0	0.01	0.25	0.75
Over-leveraged	952,151	0.30	0.46	0	0	0	1	1
Zero-leveraged	952,151	0.40	0.49	0	0	0	1	1
Near zero leverage	952,151	0.49	0.50	0	0	0	1	1
(4≤ level ≤ 5)								
Log(Total assets)	212,259	15.76	1.82	12.63	14.58	15.88	17.10	18.50
Tangibility	212,259	0.25	0.30	0.00	0.01	0.10	0.41	0.90
Sales growth	212,259	0.14	1.15	-0.58	-0.13	0.00	0.14	0.84
ROA	212,259	3.87	21.96	-25.11	-1.22	3.67	11.69	32.92
Age	212,259	11.72	8.33	4	7	10	14	21
Leverage	212,259	0.15	0.26	0	0	0.002	0.22	0.77
Over-leveraged	212,259	0.26	0.44	0	0	0	1	1
Zero-leveraged	212,259	0.43	0.50	0	0	0	1	1
Near zero leverage	212,259	0.54	0.50	0	0	1	1	1
(level ≥ 6)								
Log(Total assets)	56,128	16.01	1.78	12.91	14.86	16.16	17.38	18.62
Tangibility	56,128	0.22	0.28	0.00	0.01	0.09	0.35	0.88
Sales growth	56,128	0.10	0.98	-0.47	-0.12	-0.01	0.13	0.65
ROA	56,128	4.96	22.51	-24.33	-0.65	4.68	12.78	35.19
Age	56,128	13.01	9.21	4	8	12	15	23
Leverage	56,128	0.15	0.26	0	0	0.00034	0.19	0.78
Over-leveraged	56,128	0.24	0.43	0	0	0	0	1
Zero-leveraged	56,128	0.46	0.50	0	0	0	1	1
Near zero leverage	56,128	0.58	0.49	0	0	1	1	1

Table 4. Factors affecting leverage distribution

This table contains base leverage regressions controlling for firm position and importance within the group. In regression, we consider only firms (BG members) with more than ten firms from the BG. BG depth was clustered into the following categories: i) pure subsidiary structures (BG depth=1, base/omitted category), ii) BG depth between 2 and 3, iii) between 4-5, and iv) BG depth greater than 6. Variable International equals one if the business group operates in more than one country and zero if all group subsidiaries are located in a single country. Publicly traded is a dummy equal to one if at the top of the group is a publicly traded company. Particular firm distance from the ultimate owner was clustered into the following categories: a) directly owned (distance=1, base/omitted category), b) 2-3 levels below, c) 4-5 levels below the top, and d) 6 or more levels from the ultimate owner. The dummy variable *Endpoint* equals one if a firm does not own any other firm (i.e., it is an endpoint in the ownership structure) and zero otherwise. Variable *SizeSG* contains the total number of firms in the business sub-group with the firm i on the top (as a pseudo-ultimate owner). We clustered *SizeSG* into six categories according to the subgroup size: 2 firms or less (omitted/base category), 3-5 firms, 6-10 firms, 11-20 firms, 21-50 firms, and more than 50 firms). Distance from the ultimate owner is grouped into four categories, using directly owned firms (level=1) as the base category, also in all interactions. The set of firm-level control variables includes log (total assets) and its square, tangibility (=tangible/total assets), sales growth, ROA, and firm age. See the Appendix for variable and group control definitions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Detailed estimation results are provided in the Internet Appendix

Variables/ leverage regression	(1)	(2)	(3)
BG complexity ... ($2 \leq$ BG depth ≤ 3)	0.004***		0.001
	(0.001)		(0.001)
... ($4 \leq$ BG depth ≤ 5)	0.001		-0.006***
	(0.002)		(0.001)
... (BG depth ≥ 6)	-0.019***		-0.028***
	(0.002)		(0.001)
Publicly traded	-0.002	-0.009***	-0.002
	(0.001)	(0.001)	(0.001)
International	-0.028***	-0.032***	-0.029***
	(0.001)	(0.001)	(0.001)
Distance from the top ... ($2 \leq$ level ≤ 3)	-0.007***	-0.010***	
	(0.001)	(0.001)	
... ($4 \leq$ level ≤ 5)	-0.012***	-0.024***	
	(0.001)	(0.001)	
... (level ≥ 6)	-0.016***	-0.033***	
	(0.002)	(0.002)	
Endpoint	0.009***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)
International x leaf interaction	-0.004***	-0.002*	-0.004***
	(0.001)	(0.001)	(0.001)
SG size … 3-5 firms	-0.005***	-0.006***	-0.006***
	(0.001)	(0.001)	(0.001)
… 6-10 firms	-0.005***	-0.005***	-0.004***
	(0.001)	(0.001)	(0.001)

… 11-20 firms	-0.006***	-0.007***	-0.004***
	(0.001)	(0.001)	(0.001)
… 21-50 firms	-0.015***	-0.016***	-0.013***
	(0.001)	(0.001)	(0.001)
… >50 firms	-0.020***	-0.026***	-0.017***
	(0.001)	(0.001)	(0.001)
BG owner type, industry, country, period FE	Yes	Yes	Yes
Firm-level control	Yes	Yes	Yes
Macroeconomic and governance variables	Yes	Yes	Yes
Adjusted R^2	0.210	0.209	0.210
N (observations)	1,971,660	1,971,660	1,971,660

Table 5. Factors affecting the likelihood of being over-leveraged (0/1)

This table contains LPM regression results for the likelihood of being over-leveraged. We present here the coefficients for variables controlling for firm position and importance within the group. In regression, we consider only firms (BG members) from the BG with more than ten firms. BG depth was clustered into the following categories: i) pure subsidiary structures (BG depth=1, base/omitted category), ii) BG depth between 2 and 3, iii) between 4-5, and iv) BG depth greater than 6. Variable International equals one if the business group operates in more than one country and zero if all group subsidiaries are located in a single country. Publicly traded is a dummy equal to one if at the top of the group is a publicly traded company. Particular firm distance from the ultimate owner was clustered into the following categories: a) directly owned (distance=1, base/omitted category), b) 2-3 levels below, c) 4-5 levels below the top, and d) 6 or more levels from the ultimate owner. The dummy variable *Endpoint* equals one if a firm does not own any other firm (i.e., it is an endpoint in the ownership structure) and zero otherwise. Variable *SizeSG* contains the total number of firms in the business sub-group with the firm i on the top (as a pseudo-ultimate owner). We clustered *SizeSG* into six categories according to the subgroup size: 2 firms or less (omitted/base category), 3-5 firms, 6-10 firms, 11-20 firms, 21-50 firms, and more than 50 firms). Distance from the ultimate owner is grouped into four categories, using directly owned firms (level=1) as the base category, also in all interactions. The set of firm-level control variables includes log (total assets) and its square, tangibility (=tangible/total assets), sales growth, ROA, and firm age. See the Appendix for variable and group control definitions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Detailed estimation results are provided in the Internet Appendix

Variables/ LPM over-leveraged (0/1)	(1)	(2)	(3)
BG complexity ... (2≤ BG depth ≤ 3)	0.014***		0.005**
	(0.002)		(0.002)
... (4≤ BG depth ≤ 5)	0.001		-0.016***
	(0.003)		(0.003)
... (BG depth ≥ 6)	-0.038***		-0.064***
	(0.003)		(0.003)
Publicly traded	-0.000	-0.015***	0.000
	(0.002)	(0.002)	(0.002)
International	-0.049***	-0.057***	-0.051***
	(0.002)	(0.002)	(0.002)
Distance from the top ... (2≤ level ≤ 3)	-0.018***	-0.024***	
	(0.002)	(0.001)	
... (4≤ level ≤ 5)	-0.035***	-0.062***	
	(0.002)	(0.002)	
... (level ≥ 6)	-0.052***	-0.090***	
	(0.003)	(0.003)	
Endpoint	-0.003	-0.007***	-0.008***
	(0.002)	(0.002)	(0.002)
International x leaf interaction	-0.004	0.001	-0.003
	(0.003)	(0.002)	(0.003)
SG size … 3-5 firms	-0.011***	-0.012***	-0.012***
	(0.003)	(0.003)	(0.003)
… 6-10 firms	-0.011***	-0.012***	-0.009***

	(0.002)	(0.002)	(0.002)
… 11-20 firms	-0.017***	-0.019***	-0.012***
	(0.002)	(0.002)	(0.002)
… 21-50 firms	-0.038***	-0.042***	-0.033***
	(0.003)	(0.003)	(0.003)
… >50 firms	-0.060***	-0.073***	-0.049***
	(0.003)	(0.003)	(0.003)
BG owner type, industry, country, period FE	Yes	Yes	Yes
Firm-level control	Yes	Yes	Yes
Macroeconomic and governance variables	Yes	Yes	Yes
Adjusted R^2	0.097	0.096	0.097
N (observations)	1,971,660	1,971,660	1,971,660

Table 6. Factors affecting the likelihood of having zero leverage (0/1)

This table contains LPM regression results for the likelihood of being a zero-leveraged firm. We present here the coefficients for variables controlling for firm position and importance within the group. In regression, we consider only firms (BG members) from the BG with more than ten firms. BG depth was clustered into the following categories: i) pure subsidiary structures (BG depth=1, base/omitted category), ii) BG depth between 2 and 3, iii) between 4-5, and iv) BG depth greater than 6. Variable International equals one if the business group operates in more than one country and zero if all group subsidiaries are located in a single country. Publicly traded is a dummy equal to one if at the top of the group is a publicly traded company. Particular firm distance from the ultimate owner was clustered into the following categories: a) directly owned (distance=1, base/omitted category), b) 2-3 levels below, c) 4-5 levels below the top, and d) 6 or more levels from the ultimate owner. The dummy variable *Endpoint* equals one if a firm does not own any other firm (i.e., it is an endpoint in the ownership structure) and zero otherwise. Variable *SizeSG* contains the total number of firms in the business sub-group with the firm i on the top (as a pseudo-ultimate owner). We clustered *SizeSG* into six categories according to the size of the subgroup: 2 firms or less (omitted/base category), 3-5 firms, 6-10 firms, 11-20 firms, 21-50 firms, and more than 50 firms). Distance from the ultimate owner is grouped into four categories, using directly owned firms (level=1) as the base category, also in all interactions. The set of firm-level control variables includes log (total assets) and its square, tangibility (=tangible/total assets), sales growth, ROA, and firm age. See the Appendix for variable and group control definitions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Detailed estimation results are provided in the Internet Appendix

Variables/ LPM zero leverage (0/1)	(1)	(2)	(3)
BG complexity ... (2≤ BG depth ≤ 3)	0.004*		0.019***
	(0.002)		(0.002)
... (4≤ BG depth ≤ 5)	0.026***		0.052***
	(0.003)		(0.003)
... (BG depth ≥ 6)	0.087***		0.126***
	(0.003)		(0.003)
Publicly traded	-0.014***	0.010***	-0.015***
	(0.002)	(0.002)	(0.002)
International	0.055***	0.068***	0.059***
	(0.002)	(0.002)	(0.002)
Distance from the top ... (2≤ level ≤ 3)	0.029***	0.045***	
	(0.002)	(0.001)	
... (4≤ level ≤ 5)	0.049***	0.097***	
	(0.002)	(0.002)	
... (level ≥ 6)	0.082***	0.147***	
	(0.003)	(0.003)	
Endpoint	0.021***	0.018***	0.029***
	(0.002)	(0.002)	(0.002)
International x leaf interaction	0.016***	0.015***	0.014***
	(0.002)	(0.002)	(0.002)
SG size … 3-5 firms	0.012***	0.012***	0.013***
	(0.002)	(0.002)	(0.002)
… 6-10 firms	0.016***	0.014***	0.014***

	(0.002)	(0.002)	(0.002)
… 11-20 firms	0.022***	0.021***	0.014***
	(0.002)	(0.002)	(0.002)
… 21-50 firms	0.054***	0.057***	0.046***
	(0.003)	(0.003)	(0.002)
… >50 firms	0.076***	0.095***	0.061***
	(0.003)	(0.003)	(0.003)
BG owner type, industry, country, period FE	Yes	Yes	Yes
Firm-level control	Yes	Yes	Yes
Macroeconomic and governance variables	Yes	Yes	Yes
Adjusted R^2	0.249	0.247	0.248
N (observations)	1,971,660	1,971,660	1,971,660

Table 7. Effect of international BG membership on various leverage measures. RCT approach.

This table reports the Average Treatment Effect on Treated (ATET), measuring the impact of the international BG membership on various measures of leverage. For each type of investor, we require exact matching on period, country, and level (distance from the ultimate owner), while the approximate covariates for matching are the firm size (log of total assets) and tangibility(ratio of tangible to total assets).

The standard errors of the ATET (in parentheses) are computed with the robust option (at least two suitable matches for each treated). Below is the balance summary of the mean difference and variance ratio between the corresponding treated and control groups. ***, **, and * denote statistical significance on 1, 5, and 10% significance levels.

RCT output	Type of the BG ultimate owner		
	Individual/ Family	Corporate	Institutional
Leverage (ATET)	-0.026***	-0.046***	-0.038***
(std. error)	(0.002)	(0.002)	(0.005)
p-value	<0.001	<0.001	<0.001
Over-leveraged (ATET)	-0.056***	-0.081***	-0.064***
(std. error)	(0.003)	(0.003)	(0.008)
p-value	<0.001	<0.001	<0.001
Zero leverage (ATET)	-0.060***	0.106***	0.077***
(std. error)	(0.003)	(0.003)	(0.008)
p-value	<0.001	<0.001	<0.001
Near-zero leverage (ATET)	0.071***	0.121***	0.087***
(std. error)	(0.003)	(0.003)	(0.008)
p-value	<0.001	<0.001	<0.001
Number of treated	110,273	244,065	48,046
Number of observations	708,126	445,598	85,829
Balance summary			
mean difference (size)	0.021	0.042	0.071
variance ratio (size)	1.065	1.090	1.210
mean difference (tangibility)	0.016	0.017	0.050
variance ratio (tangibility)	1.011	1.013	1.061

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Appendix Table

Table of relevant variable definitions.

Variable	Definition
Business group characteristics	
BG Complexity	Complexity of the business group is defined as the number of the levels within the business group. BG Complexity was clustered into the following categories: i) pure subsidiary structures (BG depth=1, base/omitted category), ii) BG depth between 2 and 3, iii) between 4-5, and iv) BG depth greater than 6.
NF	The number of firms (with 50% control) within the business group.
Public	A dummy equals one if at least one firm in the business group is publicly traded. Private=1-Public.
Complx	Qualitative variable on complexity (number of the levels within the business group). =1 for the business group with just one level =2 if $1 <$ business group depth ≤ 3 =3 if $3 <$ business group depth ≤ 5 =4 if business group depth > 5
BG Breadth	Business Group Breath is the ratio of the number of endpoints (the most distant parts, i.e., the firms that do not own any other firm) over the total number of business group affiliated firms. $$BG\_Breadth = \frac{\#\ endpoints}{\#\ firms}$$
Firm-level characteristics	
Level	The level (the distance from the top) where the firm is located within the business group
Level-range	Qualitative variable on level (distance from the top of the business group) =1 if the level is equal to 1 =2 if $1 <$ level ≤ 3 =3 if $3 <$ level ≤ 5 =4 if level > 5
Endpoint	=1 if a firm does not own any other firm (i.e., it is an endpoint in the structure)
(Relative) value	Relative value (importance) of the firm for the business group, proxied by the number of firms in its ownership chain scaled by the size of the business group (NF), also using unscaled, i.e., just the number of controlled firms. We also use a variant of graph degree -- counting ownership lines "in" and "out,".. i.e., those that control the company and how many companies are below. It makes more sense for the benchmark of 20% direct control.

Ultimate owner – ownership type

G_type	Business group ownership type. The categorical variable contains aggregated ownership type categories for the owner with the highest share. Based on variable *SH_TYPE,* associated with the ultimate owner*,* initially covering fifteen different categories: [11]

We employ the following comprehensive categorization:

- *Family*: (=1), *SH_TYPE* = I ("Named individuals or families") and Anonymous individual: (=7), *SH_TYPE* = D ("Anonymous Private Stockholders"). This is our base category.
- *Corporate*: (=2), *SH_TYPE* = C ("Trade and Industry organization") and Anonymous corporate: (=6), *SH_TYPE* = L ("Other named Shareholders")
- *State*: (=4), *SH_TYPE* = S ("Public authority/ State/ Government")
- *Institutional*: (=5), *SH_TYPE* = B ("Bank"), F ("Financial Companies"), J ("Foundations"), Y ("Hedge funds"), and E ("Mutual/Pension fund/Trust").
- *Unknown*, missing: (=9), *SH_TYPE* has missing value/unknown ownership type

Firm-level control variables

Ln (Employees)	Natural logarithm of the number of employees (*EMPL*).
Ln (Total Assets)	Natural logarithm of total assets (*TOAS*) in million USD.
Tangibility	Tangible fixed assets (=*TFAS*) scaled by total assets (*TOAS*).
Sales Growth	Sales (*TURN*)$_t$ minus lagged sales (*TURN*)$_{t-1}$ scaled by lagged sales (*TURN*)$_{t-1}$.
Profitability	We use the ROA – Operational profit or loss (= *OPPL*) scaled by total assets (*TOAS*).
Leverage	Long-term debt (*LTDB*) plus bank loans (*BL*) scaled by total assets (*TOAS*).
Zero leverage (*levgt*)	The dummy is equal to one if firm leverage is equal to zero.
Age	Firm age since the (local) incorporation. It is computed as *YEAR* minus year of incorporation (*YEARINC*) plus 1. Winsorized at 50, i.e., the variable is set to 50 for age exceeding this value.

Country-level macroeconomic variables Source: WDI and WGI (World Bank)

Private Credit/GDP	Private credit is scaled by GDP. Private credit is a deposit by money banks and other financial institutions.

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[11] The aggregated ownership types use the ownership classification from the Amadeus (variable SH_TYPE): A = Insurance company, B = Bank, C = Trade and Industry organization, D = Nameless private stockholders, aggregated, E = Mutual and Pension fund / Nominee / Trust / Trustee, F = Financial company, I = One or more named individuals or families, J = Foundation / Research Institute, L = Other named shareholders, aggregated, M = Employees/Managers/Directors, P = Private Equity firms, S = Public authority/ State/ Government, V = Venture Capital, Y = Hedge funds, Z = Public (Publicly listed companies)

GDP Growth	The GDP's annual percentage nominal growth rate is denominated in the local currency.
GDP Per Capita	Real GDP per capita in 2010 USD (a proxy for country income)
GDP	Real GDP in 2010 USD (a proxy for country size), (in trillions)
Institutional Control Variables	Include the World Governance indicators: Voice and Accountability, Political stability, absence of violence, Government effectiveness, Regulatory quality, the rule of law, and control of corruption. According to WGI construction, all indexes ranged from -2.5 to 2.5; higher means better. Government Effectiveness (ge) is designed to capture perceptions of the quality of civil and public services, policy formulation, and interpretation. Regulatory Quality (rq) should reflect (perceptions of) the ability of the government to form and implement sound policies/regulations that affect private sector development. Rule of Law (rl) should capture the quality of contract enforcement, property rights, and the courts. Finally, Control of Corruption (cc) is constructed primarily to summarize (perceptions of) the extent of state corruption by elites and private interests. As an alternative, we also used the index of the creditor's rights (1 to 4, 1 is the highest) and bankruptcy law origin taken from Djankov et al. (2008)