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The "Cinderella" effect in business groups: Choosing Which Subsidiary is the Princess

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Abstract

Jan Hanousek, Jr., Mark J. Flannery, Stephen P. Ferris, Jan Hanousek, Svatopluk Kapunek: **The** "Cinderella" Effect in Business Groups: Choosing Which Subsidiary is the Princess

This study examines the nature of financial distress for firms within business groups distributed across twenty-five European countries from 2000 to 2018. We show that business group membership and a firm's importance within the group explain both the incidence and resolution of financial distress. We find that critical subsidiaries have a negligible chance of default and bankruptcy. Less critical firms, however, are more likely to default and liquidate. It suggests that the future resolution of financial distress could be decided during the group formation and the subsidiary's positioning. We also show the persistent effect of national legal regimes.

Key words

Bankruptcy, financial distress, business groups, ownership, legal origin

JEL: G33, C23, G32

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Introduction

The literature on financial distress typically analyzes firm characteristics like asset tangibility, covenant design, contract enforcement, industry characteristics, or the macroeconomic environment. Further, these studies often focus on the immediate effects of financial distress and examine issues including bankruptcy and liquidation (Hillegeist *et al.* 2004; Abadie & Imbens 2006; Bellovary *et al.* 2007; Hotchkiss *et al.* 2008; Senbet & Wang 2010; Khoja *et al.* 2019; Li & Faff 2019). Fewer studies tackle the longer-term response involving reorganization or corporate restructuring and the distressed firms' return to solvency (Altman 1968; Antill & Grenadier 2019; Garrido *et al.* 2021).¹

This study focuses on a mostly ignored factor in financial distress – business group membership.² It also introduces two new dimensions to the analysis of business groups: the complexity of businessgroup structure and the member firm's criticality to the ultimate owners. We also investigate how a firm's membership in a business group (BG) provides it with additional resources than stand-alone (SA) firms and how these member firms are allocated different levels of resources.

We contend that subsidiary firms differ in importance to a business group's total value. The group's ultimate owners focus on maximizing the group's aggregate value rather than that of any specific subsidiary. A subsidiary of a business group generally shares the group's brand and marketing activities as well as essential industry or competitor intelligence. Yet group support can go further, including new capital infusion from other group members through "propping." The transfer of needed resources occurs at the expense of the other firms within the group. The group's ultimate owners will strategically transfer profits (Jian and Wong (2010) and liabilities among group firms to ensure the survival of the most valuable firms (Desai & Dharmapala 2009; Jara *et al.* 2019). Firms less critical to a business group are more likely to have assets transferred ("tunneled") to other group members to minimize the loss associated with their financial distress.³

What determines a subsidiary's value to the group? Intuitively, a larger subsidiary should be more important than a smaller one. Similarly, more profitable subsidiaries and those controlling other subsidiaries are more critical. However, both of these aspects of a member's value ignore the existence of internal capital markets, which allow the transfer of profits and assets across BG member firms.

As an important contribution of this study to the literature, we use a firm's horizontal and vertical coordinates with the group structure and the extent of its subsidiary holdings to measure its importance to the ultimate owners. When a BG subsidiary defaults, the parent also loses control of any of that subsidiary's subordinate firms. Moreover, changing a firm's location within a business

group is a costly and prolonged process involving legal, logistical, and operational considerations. Consequently, we believe this approach captures a firm's importance within a business group.

This study finds that business group membership significantly affects the likelihood of a firm's default. Business group subsidiaries have a lower probability of default, which is consistent with the operations of internal capital markets (Colli & Colpan 2016). The likelihood of default is significantly related to the firm's criticality to the business group, with more essential firms having a reduced likelihood of default. It means that the ultimate owners will prioritize the financial safety of their essential group members. As a result, the sample of defaulting business group firms will predominantly consist of less important firms that do not own other subsidiaries.

We further determine that business group membership significantly affects the default resolution, with liquidation being more likely than reorganization. This outcome is consistent with the general statement of Balcaen et al. (2012). The likelihood of liquidation is also significantly higher for less critical firms, such as endpoint firms which lack ownership of other members. Previous research suggests that planned liquidation of a distressed BG member allows partial reallocation of assets that would be used to prop the member firm to those group members having a higher return potential (Shleifer & Vishny 1992; Kim & Kung 2016; Chen *et al.* 2020; Rong *et al.* 2020). Thus, the ultimate owners can use the proceeds from a planned liquidation to ensure the survival of more critical subsidiaries, which is consistent with our findings.

A significant contribution of this study is measuring a firm's criticality within a business group and relating that importance to the incidence and resolution of default. Unlike previous research that uses profitability to assess a firm's importance measure of business group importance, we introduce locational coordinates and subsidiary holdings as indicators of a member's criticality. This approach is highly generalizable since it does not require additional reporting and can be created using only ownership data.

Our findings also contribute to the literature on the international aspect of resolution and incidence of bankruptcy by its analysis of twenty-five European countries.⁴ During previous studies, such as McBryde (2004) and McBryde *et al.* (2005) report convergence in EU's bankruptcy legal codes and procedures, Djankov *et al.* (2008) described how differences in national legal origin can influence the corporate disclosures and information releases provided to investors. The national legal regimes have fundamental differences in minority shareholder rights, contract enforceability, creditor protections, disclosure, and voting (La Porta *et al.* 1999; Johnson *et al.* 2000; Djankov *et al.* 2008). Despite the proclaimed efforts on convergence in bankruptcy proceedings, we find significant differences in the

resolution of financial distress based on national legal regimes, which reflect existing and persistent differences in bankruptcy law even across seemingly unified EU acquis (McCormack *et al.* 2016). While we cite Djankov *et al.* (2008) as the primary source of typical examples, referred differences in bankruptcy law and insolvency procedures are still valid.

Further, this study offers new insights into the evolution and resolution of financial distress within a business group. Previous research, such as those by Gopalan *et al.* (2007) and Beaver *et al.* (2023), argue that the reduced likelihood of bankruptcy for BG member firms is due to the reputation damage that the ultimate owners would suffer. Our research is motivated by the disagreement in the literature (e.g., ibid and Colli and Colpan (2016)) since it is unclear whether possible reputation hit or limited liability offered to business group owners would dominate. However, none of these papers considers the heterogeneity in subsidiary importance to the ultimate owner, which has already been brought up by Almeida *et al.* (2011).

In our analysis, we propose a broader framework to reconcile these theories and use the business group's structure (complexity) and the subsidiary's position as the determinants of subsidiary importance (criticality). Naturally, any reputation damage to ultimate owners would be more significant for the default of a direct subsidiary than for a subsidiary separated from the ultimate owner by a long ownership chain. Past research, such as Beaver *et al.* (2023), does not consider this heterogeneity and argues that any default/bankruptcy within the business group carries the same reputation risk to the ultimate owner. We argue that our proposed measures are a superior proxy for capturing subsidiary criticality to a business group to measures solely based on profitability and size, which dominate the literature, as those can be more easily transferred via internal capital markets.

We organize our study into seven sections. Section 2 introduces the geometry of business groups and provides our definitions of business group complexity and firm importance. Section 3 develops our hypotheses regarding the effect of firm importance, business group complexity, and bankruptcy law origin on the resolution of financial distress. Section 4 discusses our data, the sample construction process, and an initial comparative analysis between stand-alone and business-group firms. Section 5 contains our main empirical findings. Section 6 concludes with a summary of our results and a discussion of their meaning for future research.

1 The Organizational Geometry of Business Groups

Intuitively, firms in the business group (BG) might vary based on profitability, access to external financing, or access to lower tax rates. As such, different BGs might value a firm quite differently, and

firm characteristics alone might not correctly measure its value to BG. Instead, a firm's importance to its parent BG depends on the characteristics of both the firm and the BG.⁵ For example, a firm that offers access to lower tax rates and controls numerous subsidiaries is likely more valuable to BG than a firm that does not own a subsidiary or provide other advantages beyond its profitability.

One possible indication of firm importance is suggested by Almeida *et al.* (2011), who studied the structure of Korean Chaebols and concluded that firms far from the ultimate owners should be considered more expendable. If a firm in the ownership chain becomes bankrupt or is acquired by a firm outside the business group, the ultimate owners will lose all firms controlled by the given firm. This means that the distance from the ultimate owner is inversely related to the BG owner's valuation of a BG subsidiary. The more distant the firm is, the higher the likelihood that the BG loses control over the firm when any connecting link is severed due to bankruptcy or acquisition. Based on these findings and logic, we define various measures of group complexity and firm criticality.

1.1 Business Group Complexity

We begin by measuring the complexity of the business group. Intuitive measures of group complexity consist of the total number of firms (subsidiaries) and the number of organizational levels within a business group. We define the first as (*BG*) *NF* and the second as *BG* (*Business Group*) *Depth*. Depth measures the distance between the most remote subsidiary and the ultimate owner and captures the group's hierarchy.⁶ Belenzon *et al.* (2013) find that a higher number of managerial levels implies a more complex organization.

Figure 1 provides several visual examples of business-group design and complexity to visualize and explain the BG structure.⁷ As group depth increases, see examples (1) to (3), the ultimate owner becomes more distant from actual operations. Similarly, there will be more subsidiaries in the BG. The ultimate owner will need to retain control of these firms to maintain ownership of the BG. Example (1) illustrates a pure subsidiary structure. There is only one level, with the ultimate owner directly controlling each of these subordinate firms. The ultimate owner will more easily extract profits and assets from its subsidiaries and can also more easily inject cash into a struggling subsidiary. Its disadvantage, though, is its transparency and direct accountability to the ultimate owner of its subsidiaries. As the ultimate parent is a direct owner of every member firm, it might be liable for some of the debt obligations of the subsidiary. Examples (2) and (3) illustrate more complex group structures with three and five levels and six and eleven subsidiaries, respectively.

Figure 1. Examples of Business Group Complexity and Firm Criticality

Example (1) illustrates the pure subsidiary structure, and no firm other than the ultimate owner owns any other firm. All firms are equally distant from the owner and appear to be of equivalent importance. Example (2) introduces a business group with multiple levels and member firms owning other members. Members A and C are likely less important, while members B and F are likely to be important to the group. This is because if firm F went bankrupt and was liquidated, ultimate owners would also lose control of firms E and G. Example (3) presents a more complex group with multiple levels and various internal ownership chains. Firms J and K are strong candidates for being classified as less important to the group and unlikely to be propped.

Pure Subsidiary	Less Complex	More Complex	
Structure	Business Group	Business Group	
Example (1)	Example (2)	Example (3)	
Ultimate owner	Ultimate owner A B C Level 1 F Level 2 E G Level 3	Ultimate owner A B Level 1 D E Level 2 F G Level 3 H 1 Level 4 J Level 5	

Another measure of BG structure is associated with the question: Where are most of the subsidiaries located? Is it on the top, following the subsidiary structure, in the middle, or even lower in the ownership chain? How spread out is the BG? To capture these dimensions, we introduce *BG Breadth*, defined as the ratio of endpoints to the number of firms in the BG (*NF*). The variable *BG Breadth* takes values between *1/NF* and *1*. The higher values correspond to those cases where most of the subsidiaries are closer to the ultimate owner and/or do not control other firms. Business groups that are not very wide but have more levels (Figure 2 Example 3) will make it easier for the ultimate owner to distance themselves from risky projects, not being directly accountable, reputationally harmed, and claim limited liability (for default of, e.g., subsidiary K). However, this will come at a cost since if the firm wants to shift profits from A to firm E, it is far more difficult for a deep business group (Example 3) than a broad business group (Example 1).[®] The complete list of variables with their definitions is available in Appendix A.

1.2 Firm Criticality within a Business Group

We employ the following variables to measure a firm's criticality for a business group: ⁹

- *Level* measures the firm's hierarchical standing within the group, which refers to the managerial level, i.e., the specific distance of the subsidiary from the ultimate owner. The Level is measured from top to bottom, with larger values indicating a greater distance from the ultimate owner. See Figure 2 for the visual definitions.
- *Relative value* is the ratio of the number of firms a subsidiary owns in an ownership chain scaled by the total number of firms in the business group. Using Example (2), we contend that even though firms A and B are on the same level, firm B should be considered more valuable to the BG owners. This is because firm B controls three other firms.10 Therefore, the variable Relative value serves as an additional proxy for the firm's criticality to the business group since it reflects the value lost in the event of a firm default.
- Endpoint is a binary indicator 0/1 dummy variable indicating whether the subsidiary is at the end of the ownership chain (i.e., does not control other firms). In Example (2), Endpoint firms are A, C, E, and G. Endpoint firms are candidates for being the least vital units within the business group since they have no ownership of other firms and can be the easiest to discard or divest.

Our measures of the subsidiary's criticality use a logical concept of business group optimization and efficient resource allocation. Note that in the analysis of incidence and resolution of bankruptcy, we use all other proxies for subsidiary importance as control variables steaming from firm financials: sales growth (a counterpart of Tobin's Q reflecting subsidiary business opportunities), cash flow, asset size, and profitability. Therefore, our concept of the subsidiary's criticality to BG reflects its position and role within the BG structure, not its business opportunities that we control using the subsidiary's financials.

2 Review of the Results and Development of the Hypothesis

2.1 Business Group Membership and the Likelihood of Default

There is a clear distinction in the resources available between stand-alone firms (SA) and businessgroup subsidiaries (BG). While SA firms operate independently and have limited external support, BG firms can access internal capital markets (Colli & Colpan 2016), which mitigate or even offset the effects of funding restrictions. This view is further supported by Almeida and Wolfenzon (2006) and Almeida *et al.* (2011), who argue that group assets provide member firms with slack resources that allow them to respond to disruptions in their operations or profitability that stand-alone firms cannot.

Because of existing internal markets, we assume that SA and BG firms have different likelihoods and factors affecting the incidence and resolution of default and bankruptcy.¹¹ The ultimate owner might have sufficient group-wise resources to support a struggling subsidiary or even rescue a defaulting firm. As a result, we assume that BG firms are less likely to default than SA firms.

However, past research does not consider the heterogeneity in the criticality of BG member firms to the ultimate owners. There exists a stream of literature focused on the relationship between managerial attention and the structure of an organization. Joseph and Ocasio (2012) argue that the ultimate owners' attention is limited and disproportionately focuses on the group's central firms. They further contend that the attention structure of an organization reflects its formal structure. Managerial attention is an essential factor since the ultimate owners can use their superior knowledge or information advantage to allocate resources to the most promising subsidiaries (Ferris *et al.* 2003; Ozbas 2005).

Friedman et al. (2003) develop a model in which, in equilibrium, the ultimate owner may choose whether to tunnel or prop their subsidiaries, depending on the magnitude of the adverse effects and private benefits. Building on their theoretical model, we contend that firm importance will capture the magnitude of the adverse effects and private benefits. As a result, ultimate owners decide whether to prop or tunnel a firm based on how essential the firm is to the group's value and operations. Previous research argues that a firm might be considered important based on the value of its assets or profitability (Desai & Dharmapala 2009; Jara *et al.* 2019). However, we contend that these mechanisms either do not consider internal capital markets, where assets can be transferred into other firms, transfer pricing mechanisms or are inapplicable to private firms.

Instead, we define subsidiary importance (criticality) from the perspective of the organizational structure of the business group, which is far more difficult, costly, and time-consuming to change. For example, when a BG subsidiary defaults, the parent also loses control of any subsidiary the defaulting subsidiary had controlled. In such a case, the ultimate owners are more likely to prop the firm against distress and disruption of services by injecting additional resources. If the firm is not central to the group's operations, e.g., it does not control any subsidiaries itself, the ultimate owner has less financial incentive to provide support.

We hypothesize that more critical BG subsidiaries are less likely to fail. The ultimate owners will prop such firms up, even if they encounter financial difficulty, at the expense of less critical BG subsidiaries.

2.2 Business Group Complexity and Subsidiary Criticality

Once a firm encounters a default, it has two possible outcomes. First, the firm might decide to liquidate its assets and distribute the funds according to the rules listed in its national bankruptcy code. This outcome probably leaves little, if any, value for the BG owner. Second, the firm might enter a reorganization process, offering its creditors substitute securities or mechanisms that promise a lower payment (but much higher than the liquidation value) or have the possibility of a large payout.

Given the resources available to the business group and the existence of internal capital markets, BG subsidiaries have more resources than SA firms, which should increase the likelihood of successful reorganization. However, as outlined in the previous section, we expect firms critical to business group operations to be shielded from financial distress. As a result, the sample of BG subsidiaries that default will primarily consist of non-essential firms deemed more expendable by the ultimate owners. This could make the default a conscious decision.

The planned liquidation of a distressed BG member allows partial reallocation of assets that would be used further within the BG, however, the management/owners of SA firms are limited in their ability to operate in this manner and rarely receive proceeds from liquidation (Shleifer & Vishny 1992; Kim & Kung 2016; Chen *et al.* 2020; Rong *et al.* 2020). Therefore, we assume that defaulting members of a business group are more likely to be liquidated than reorganized, consistent with the general statement of (Balcaen *et al.* 2012).

However, financial distress does not always lead to liquidation within business groups. BG subsidiaries considered more critical to the ultimate owner might default due to not receiving financial support in time. Namely, the complexity of BG has pros and cons. On the one hand, more complex business groups might distance the ultimate owners from potentially risky projects and provide limited liability. On the other hand, more complex groups are less efficient and can lead to friction in internal capital markets, which can delay financial support to struggling BG subsidiaries.

Consequently, complex business groups might have higher managerial costs, as they might not be as efficient as a direct subsidiary structure. On the other hand, they could reflect the international BG's operational (regional) structure; they could hide the ultimate owner's identity and original domicile or create a distance from the ultimate owner for potentially risky projects.

We, therefore, hypothesize that essential firms are less likely to be liquidated. Critical subsidiaries are unlikely to face default since the ultimate owners do not want to risk the business group structure. However, if such firms default, they will likely receive enough support to return to solvency quickly.

For less critical subsidiaries, the default could be an intentional decision by the ultimate owner, and we expect to observe a higher likelihood of quick liquidation, especially in more complex BG.

3 Data, Sample Construction, and Descriptive Statistics

This section explains how we organize the data and estimate the variables used in our empirical analysis. We assign our variables to one of four different categories: (a) measures and indicators of financial distress, (b) ownership structure indicators and characteristics, (c) firm-level financial or accounting variables, and (d) macroeconomic variables and indices of institutional quality. A detailed list of these variables, including their definition and sourcing, is provided in Appendix A. Basic descriptive statistics for these variables are reported in Table 1.

Our primary data source is the Amadeus (and ORBIS) Database maintained by Bureau van Dijk/Moody's. This database provides firm data with financial and accounting variables consistently defined across national borders. Amadeus also includes information about the firms: country of incorporation, primary industry, solvency status, and ownership. The ownership information allows us to identify business groups and differentiate between SA and BG firms. Our data spans 2000 through 2018, covering various macroeconomic conditions, business environments, and regulatory regimes.

We begin with over 14 million firm-year observations in Amadeus.¹² We eliminate firms with missing ownership data because we cannot determine whether such firms are members of a business group or stand-alone firms. We also exclude firm-years missing the firm's number of employees, which could significantly reflect the firm's financial distress resolution. Further, we exclude all firms in financial industries (i.e., NACE codes 65 and 66) whose financial reporting and regulatory requirements differ substantially from those of non-financial firms (see Klapper *et al.* (2006)).¹³ For the same reason, we eliminate government/public entities, education, health and social sector firms, private households, extra-territorial organizations, and firms that cannot be classified (i.e., NACE codes 75, 80, 85, \geq 90).¹⁴ Our initial sample consists of 11,152,520 firm-year observations for 2,000,926 unique firms operating in one or more of twenty-five European countries from 2000–2018.

Our first step is to categorize all sample firms into two groups: "stand-alone" (SA) firms that are not controlled by another corporate entity and "subsidiary" firms (BG) that are owned by another entity within a business group. We construct business-group structures using direct ownership links with a fifty percent control threshold, consistent with previous research (Belenzon & Berkovitz 2010).¹⁵

To classify a firm's solvency status, we use the variable *lstatus*, which contains a textual categorization of a firm's legal status provided annually by the Amadeus database. Our analysis identifies four stages

of a firm's journey through financial distress. Healthy firms are classified as active/solvent. Once they encounter financial difficulty and miss a payment, they progress to the first stage of financial distress identified by Amadeus: (1) default. Following the default, Amadeus recognizes two subsequent phases: (2) reorganization and (3) liquidation. The remaining category includes liquidation by the original owner (or bankruptcy court) or disposition through M&A.¹⁶ Figure 2 illustrates a sample firm's progression through financial distress.

Figure 2. The Financial Distress Process

This table illustrates a firm's path through the financial distress process, as well as the structure and order of our analysis. It shows the alternatives available to a firm upon default and possible ways to return to solvency. If a solvent firm is unable to pay back its debts, Amadeus classifies it as defaulted. Following the Default, there are two possibilities. A firm can be Liquidated (comparable to Chapter 7 in the US), which includes selling off the firm's assets or selling the firm to a different owner. We consider this (forced) M&A as a liquidation since, in the vast majority of cases, this sale does not satisfy the creditors, and the shareholders do not receive any proceeds, e.g. Djankov et al. (2008). Alternatively, the firm can enter Reorganization (comparable to Chapter 13), overseen by the court, and follow the bankruptcy code of the country where the firm operates. If the creditors agree on reorganization, a firm can return to solvency. If they cannot reach an agreement, the firm is liquidated to satisfy the creditors. A particular case can occur when a firm is sold shortly after reorganization. Unlike (forced) M&A during liquidation, we consider this disinvestment a successful reorganization since it could bring some value to the shareholders. Nevertheless, the incidence of M&A in either stage is low or does not affect the overall analysis. Let us note that a firm may continue to be unable to pay back its obligations during or shortly after reorganization, which can lead to a process called serial bankruptcy. However, the incidence is very low in our sample. As a result, it is considered an unsuccessful reorganization since it does not lead to a return to long-term solvency.



Table 1 reports the distribution of SA firms and BG subsidiaries across the stages of financial distress. The third column shows that 7.65 % of the sample firms experience some form of financial distress. BG firms are more commonly distressed (8.9%) than SA firms (7.15%). The observed default frequency is 1.08% (1.21%) for SA (BG) firms. Further, SA firms exhibit a higher incidence of reorganization (0.97%) vs. 0.68%) and a lower incidence of liquidation (4.75% vs. 5.84%).¹⁷ These observations are consistent with our hypothesized difference in the incidence and resolution of financial distress for business group firms.¹⁸

Table 1. Business Group Membership and Legal Status

Table 1 compares the number of observations for the various legal statuses associated with financial distress between the BG and SA firms. Within each Financial Distress Stage, the first row contains the total firm-year observations, while the second and third rows correspond to row and column percentages.

Financial Distress Stage	Business-group	Stand-alone	Total
	2,923,503	7,375,626	10,299,129
Active/Solvent	28.39%	71.61%	100%
	91.1%	92.85	92.35
	38,814	85,563	124,377
Default	31.21%	68.79%	100%
	1.21%	1.08%	1.12%
	21,820	76,869	98,689
Reorganization	22.11%	77.89%	100%
	0.68%	0.97%	0.88%
	187,414	377,047	564,461
Liquidation	33.2%	66.8%	100%
	5.84%	4.75%	5.06%
	37,661	28,203	65,864
Merged/Acquired	57.18%	42.82%	100%
	1.17%	0.36%	0.59%
	3,209,212	7,943,308	11,152,520
Total	28.78%	71.22%	100%
	100%	100%	100%

Note: The differences in the financial distress distribution of BG and SA firms are statistically significant for each table row. In addition, the overall test of homogeneity (equality of distribution across the categories of financial distress) rejects the similarity with p-values <0.001.

4 Empirical Results

4.1 Business-Group Membership and likelihood of default

In this section, we present our findings regarding the effects of business group membership on the probability of default. There is, however, potential endogeneity concern since firms in BG are not randomly selected. Therefore, we instrument the variable identifying BG membership. Previous researchers observe that business groups' membership is affected by external factors such as market

conditions, government activity, control of corruption, and the rule of law.¹⁹ They conclude that business groups from comparable countries, industries, and institutional environments behave similarly (Guillén 2002; Mahmood & Mitchell 2004; Khanna & Yafeh 2005, 2007; Holmes *et al.* 2018). That is, a firm's BG affiliation might be endogenous. Therefore, we utilize a set of instrumental variables to construct a proxy for business group membership. Formally, the instrumented regression has the following form:²⁰

$$P(BG = 1)_{it} = \alpha_0 + \beta r size_{it} * CountryFE + \gamma r size_{it} * IndustryFE + \delta_1 r size_{it}$$
(1)
* ge + $\delta_2 r size_{it} * rc + \delta_3 r size_{it} * rl + \delta_4 r size_{it} * cc + PerFE + \epsilon_{it}$

In equation (1), the control variables include Governance Effectiveness (*ge*), Regulatory Quality (*rc*), the Rule of Law (*rl*), Control of Corruption (*cc*), and country, industry, and period dummy variables. We interact firm size (*rsize*) with country factors since firms likely have different experiences with national institutions depending on their size. We cluster firm size with a size quartile dummy after converting each firm's total assets to U.S. dollars based on the annual average exchange rate provided by Amadeus.²¹

Given the data size and associated asymptotic properties, we use an LPM in the first stage to predict BG status.²² Results of the first stage regression are available in Appendix B. In the second stage, we also apply LPM²³ with the following specifications:

$$P(K = default)_{it+1} = \alpha_0 + \beta X_{it} + \gamma (BG_{it}$$

$$= 1) + \theta cf + \delta (BG_{it} = 1) * cf + \Lambda_c Macro_{ct} + PerFE + IndFE + \epsilon_{it}$$
(2)

The vector X_{it} contains firm-specific control variables as suggested by the literature (Altman 1968; Bhimani *et al.* 2014; Almamy *et al.* 2016; Mselmi *et al.* 2017). These include firm age, its size measured by the natural log of total assets and the number of employees, as well as proxies for profitability (*ROA*), the structure of the company assets (*tangibility*), capital structure (*leverage*), *cash flows*, and *cash*, both scaled by total assets. To control for the high incidence of zero leverage firms, we include a dummy variable for zero leverage, *levgt*, (Bessler *et al.* 2013; Strebulaev & Yang 2013). Furthermore, cash flow is essential for assessing firm profitability and sustainability. Consequently, we interact it with the business-group dummy (Bao *et al.* 2012; Hall *et al.* 2014; Almamy *et al.* 2016; Mulier *et al.* 2016) to include the sensitivity of business-group membership to firm-generated cash flow (*cf*).²⁴ Lastly, each country offers different protection levels to its investors and operates in a distinctive regulatory/legal infrastructure. Therefore, we include various macroeconomic variables to address cross-country variation in business conditions, the quality of the national institutions (Buehler *et al.* 2010; Naeem & Li 2019), and the influence of national financial conditions (Arcuri & Levratto 2020). We present the results from this analysis in Table 2.

Table 2. Business Group Membership and the Likelihood of Default

This table examines the effect of BG affiliation on the likelihood of a solvent firm defaulting. It was estimated by the 2SLS results using a linear probability model with an instrumented BG dummy to control for observed endogeneity associated with BG membership. Because of the low incidence of default (1.21%) in the primary sample, we employed matched samples with a set of 10,299,129 solvent firms to get a smaller group of comparable firms. We first exactly match default and solvent firms by industry, BG/SA status, during the same period, and country of incorporation. Among these similar firms, we choose firms with similar size (total assets) and asset structure (tangibility). The resulting sub-sample of 657,393 firms has an incidence rate of 14.2% (10.85% for the BG firms). The complete set of firm-level control variables includes cash flow/total assets, firm age, missing age indicator (=1), log (total assets), tangibility (=tangible/total assets), leverage (debt/total assets), zero debt indicator (=1), log (employees), CAPEX (investment ratio to total assets), cash/ total assets. French bankruptcy law origin and stand-alone firms are omitted (base) categories. See the (Online) Appendix for variable definitions and detailed results for different matched incidence rates. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Explanatory Variable, Transition Solvent to Default					
Variables	(Default=1,	(Default=1, Solvent=0)				
	(1)	(2)	(3)	(4)		
Bankruptcy law origin dummies						
(base category French law origin	ı)					
German		-0.232***	-0.232***	-0.230***		
		(0.001)	(0.001)	(0.001)		
English		-0.084***	-0.084***	-0.079***		
		(0.002)	(0.002)	(0.002)		
Nordic		-0.034***	-0.034***	-0.034***		
		(0.002)	(0.002)	(0.002)		
Business-group, BG (=1)	-0.071***	-0.040***	-0.041***	-0.038***		
(below are interactions)	(0.001)	(0.002)	(0.002)	(0.002)		
		0.058***	0.058***	0.058***		
BG [*] German		(0.002)	(0.002)	(0.002)		
		0.027***	0.027***	0.027***		
BG [*] English		(0.003)	(0.003)	(0.003)		
		-0.009***	-0.009***	-0.002		
BG [*] Nordic		(0.003)	(0.003)	(0.003)		
Cash flow	-0.050***	-0.021***	-0.023***	-0.026***		
	(0.003)	(0.003)	(0.003)	(0.003)		
Cash flow * BG (=1)	0.020***		0.011	0.011		
	(0.007)		(0.007)	(0.007)		
Firm controls	Full	Full	Full	Full		
Direct ownership controls	no	no	no	yes		
Macro control, governance	yes	yes	yes	yes		
Period dummies, Industry FE	yes	yes	yes	yes		
Adjusted R ²	0.168	0.206	0.206	0.216		
Observations (N)	657,393	657,393	657,393	657,393		
Percent of defaulting firms	14.2%	14.2%	14.2%	14.2%		

Across all model specifications, BG membership is negatively and significantly associated with the likelihood of default. The 7.1 and 3.8 percentage points of BG effect in columns (1) and (4) correspond to about 42 and 23.8 percent of the incidence rate, respectively. A lower probability of default for BG firms, while controlling for firm financials, is consistent with the idea that firms in a business group have access to the internal market, e.g., (Beaver *et al.* 2023).

In all columns (1) through (4), higher cash flows are associated with a lower incidence of default, which is intuitive given that such firms should be better equipped to avoid financial distress. This effect, however, is partially mitigated in column (1) for firms in business groups. In addition, the different impacts of cash flow in BG disappear when we control for the legal origin of the bankruptcy law in columns (2) through (4). Because column (1) omits legal origin specification, we attribute the different effects of column (1) to omitted variable bias.

Following Estrin *et al.* (2024) and Kampouris *et al.* (2022), in column (4) we add the (direct) owner type to the control variables. This substantially increases the regression's fit. We, therefore, conclude that the identity of the direct owner influences the likelihood of default. For the benefit of space, we again refer to the Internet Appendix for detailed results.

Based on Djankov *et al.* (2008) we classify our sample countries into four groups according to the legal origin on which their bankruptcy laws are constructed. The specifications using the legal basis of bankruptcy law and its interactions are presented in columns (2) through (4). Firms operating under French-origin law (base category) demonstrate the highest likelihood of default, followed by Nordic, English, and German legal origins. The lesser default rates for firms with a German-origin legal regime might reflect the automatic triggers for formal bankruptcy if a firm experiences over-indebtedness (Jostarndt & Sautner 2010). We also interact the BG dummy variable with the legal regime, as the law system can impact BG and SA firms differently. While the baseline effect is negative and similar to the original specification, the result is significantly mitigated for English and German firms.

4.2 Business-Group Membership and Resolution of Bankruptcy

In this section, we present our results concerning the effects of business group membership on the probability of reorganization compared to liquidation. Explicitly, conditional on defaulting during year *t*, we model the probability of restructuring vs. liquidation in the next year as follows:

$$P(K = defoult, L = reorg)_{it}$$
 versus $P(K = default, L = liquidated)_{it}$

Similarly as in Section 4.1, there is possible endogeneity associated with BG membership. We use the same methodology as in Section 4.1., namely 2SLS, where the first stage is outlined in Equation (1).

The second stage specification is identical to Equation (2), except that the dummy dependent variable takes a value of 1 if the firm is reorganized (after the default) and 0 otherwise (i.e., liquidated). The results of default resolutions are presented in Table 3.

Balcaen *et al.* (2012) show that business groups focus their decisions on maximizing value for the entire business group. In the previous section, we found a lower probability of default for BG firms, likely due to their access to internal financing. Therefore, the observed default for BG firms is probably predictable/planned/accepted by the ultimate owner, and it occurs primarily for firms that are less critical and not highly valued by their BG owners.

In Table 3, we present estimates of four specifications, starting with BG membership interacting with cash flow and omitting the legal regime of the bankruptcy law. The results indicate that business group membership significantly and positively affects the likelihood of liquidation across all specifications.

Ignoring the effect of legal origin in column (1) again leads to a substantially lower fit and omitted variable bias. Therefore, we observe a significant effect of legal origin on the choice between restructuring and liquidation. We observe that BG membership is associated with a higher likelihood of liquidation. While this result might seem counterintuitive, it is probable given that business group firms can access more resources than standalone firms. Beaver *et al.* (2023) show that business group firms have a lower likelihood of bankruptcy. We establish a framework to measure firm importance and argue that crucial firms will have a lower likelihood of bankruptcy and liquidation. While some essential firms can encounter financial distress, possibly due to delayed support, most business group firms that default will be unimportant to the ultimate owners. As such, we should expect those firms to have a lower likelihood of reorganization, and instead, they will go through quick liquidation.

Our results also contrast against the view of converging in bankruptcy law in the EU, as we observe persistent effects of bankruptcy law origin. The highest probability of restructuring is observed in countries with German legal regimes, followed by countries with English, French, and Nordic regimes. It is critical to note that the legal regime, which is the foundation of national bankruptcy laws, has a significant effect, especially in Nordic countries. Interestingly, while it is more common for Nordic-country SA firms to liquidate than reorganize, Nordic business-group firms are the opposite. Djankov *et al.* (2008) explain that Nordic countries do not use foreclosure and maintain defaulting firms as a going concern. Moreover, they describe Nordic countries as achieving the highest efficiency and recovery rates during financial distress. As a result, firms inside a business group with access to internal financing can better maintain operations and satisfy their debts. The estimates of BG membership do not significantly differ from the baseline estimates for other countries.

Table 3. Comparing Defaulting and Solvent Business Group Members

This table examines how BG characteristics and the firm's location within the group affect the likelihood of default. Columns (1) and (3) contain results from the LPM, and columns (2) and (4) contain marginal effects from the corresponding logit model (computed by the delta method). The set of controls is the same as in Table 2. Full estimation results and group control variable definitions are provided in the Internet Appendix. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Comparis	Comparison Between Defaulting and Solvent Firms				
Variables		1= Firms in the default stage				
Variables		0= Always solvent firms				
	(1) LPM	(2) Logit	(3) LPM	(4) Logit		
Bankruptcy law origin dummies (b	ase category Fr	ench law origi	in)			
German	0.024***	0.020***	0.023***	0.019***		
	(0.002)	(0.004)	(0.002)	(0.004)		
English	-0.057***	-0.063***	-0.057***	-0.063***		
	(0.003)	(0.004)	(0.003)	(0.004)		
Nordic	-0.006*	-0.003	-0.006*	-0.003		
	(0.004)	(0.005)	(0.004)	(0.005)		
BG Complexity=2	0.012***	0.012***	0.006**	0.007**		
$(2 \le BG \text{ depth} \le 3)$	(0.002)	(0.002)	(0.003)	(0.003)		
BG Complexity=3	0.013***	0.010***	0.011***	0.009**		
$(4 \le BG depth \le 5)$	(0.003)	(0.004)	(0.004)	(0.004)		
BG Complexity=4	0.010**	0.003	0.015***	0.009*		
(BG depth > 5)	(0.004)	(0.005)	(0.005)	(0.005)		
			-0.004***	-0.003***		
BG size (# firm)			(0.001)	(0.001)		
	-0.001	0.000	-0.003	-0.001		
BG Breadth	(0.003)	(0.004)	(0.004)	(0.004)		
	0.002***	0.003***				
Level	(0.001)	(0.001)				
Distance=2			0.009***	0.008***		
(2 ≤ level≤ 3)			(0.002)	(0.002)		
Distance=3			0.005	0.007*		
(4 ≤ level ≤ 5)			(0.003)	(0.004)		
Distance=4			0.014**	0.021***		
(level > 5)			(0.006)	(0.007)		
Endpoint (-1)	0.006***	0.006***	0.000	0.001		
	(0.002)	(0.002)	(0.002)	(0.002)		
Delation of a			-0.0001**	-0.0001*		
Relative value			(0.0003)	(0.00005)		
Public (=1)	0.014***	0.014***	0.016***	0.019***		
	(0.004)	(0.005)	(0.004)	(0.005)		
Adjusted or Pseudo R ²	0.087	0.087	0.150	0.151		
Observations (N)	299,564	299,564	299,564	299,564		
Percent of defaulting firms	8.4%	8.4%	8.4%	8.4%		

We also examine the effects of cash flow on the likelihood of reorganization of financially distressed firms. After controlling for the bankruptcy-law origin, we fail to find any significant cash flow results on the likelihood of reorganization, regardless of a business-group membership. Lastly, in column (4), we observe that controlling for the (direct) ownership type leads to a better fit (Kampouris *et al.* 2022; Lindemanis *et al.* 2022; Estrin *et al.* 2024) and some changes, primarily in the significance of the impact of the legal regime.

4.3 Business-Group Complexity, Subsidiary Criticality, and Incidence of Default

In the previous section, we analyzed BG firms compared to SA firms without distinguishing among BG members. We did not differentiate between the different structures of the business groups in our sample or how critical a subsidiary is to the ultimate owner. This section examines how the business group's complexity and the subsidiary's criticality might influence the incidence of default and bankruptcy. This analysis requires that we restrict our sample to business group (BG) subsidiaries.²⁵ To analyze business-group complexity, we use *BG Depth*, *BG Breadth*, and *BG Size* measures. Similarly, to test the effect of firm importance, we include the variables *Level*, *Endpoint*, and *Relative value*. All variables are defined in Section 2.

When comparing BG firms in a particular stage of financial distress, we face the empirical challenge that most BG firms are active/solvent. Defaulted firms represent 1.12%, reorganized 0.88%, and liquidated 5.6% of data. Thus, we downsize the solvent firms' (control) subsample using the nearest neighbor matching technique with their defaulting counterparts (Abadie & Imbens 2006, 2011).²⁶ We require an exact match for the country, industry, and period. We use approximate matching on firm size, defined as the natural logarithm of total assets, and tangibility, defined as tangible fixed assets scaled by total assets. Using this balanced sample, we conduct our analysis using both LPM and logit models with the following specifications:²⁷

$$P(K = default)_{it+1}$$

$$= \alpha_0 + \beta X_{it} + \gamma BGDepth_{it} + \theta BGBreadth_{it} + \delta BGSize_{it}$$

$$+ \vartheta Level_{it} + \mu Endpoint_{it} + \sigma Relative \ value_{it} + \Lambda_c Macro_{ct}$$

$$+ rPublic_{it} + PerFE + IndFE + \epsilon_{it}$$

$$(2)$$

The set of firm-specific control variables, vector X_{it} and the set of macroeconomic variables is identical to the specifications estimated in Equation (2). We also include a dummy variable, *Public*, that equals one if the group's ultimate owner is a public firm and zero otherwise. Publicly owned groups will be subject to greater disclosure and regulatory scrutiny than privately held groups, reducing the likelihood of tunneling and latitude for profit transfers. We use robust standard errors to control the heteroskedasticity resulting from the binary character of the dependent variable. We report the results of our analysis in Table 4.²⁸

Table 4. Business Group Membership and the Initial Resolution of Default

This table examines the effect of business group affiliation on the initial default resolution. The dependent variable is a dummy variable that assumes one if the firm is reorganized (after default) and zero if liquidated. It contains the 2SLS results for all firms using a linear probability model with an instrumented Business group membership dummy. The complete set of firm-level control variables includes cash flow/total assets, firm age, missing age indicator (=1), log (total assets), tangibility (=tangible/total assets), leverage (debt/total assets), zero debt indicator (=1), log (employees), CAPEX (investment ratio to total assets), cash/ total assets. French bankruptcy law origin and stand-alone firms are omitted (base) categories. See the (Online) Appendix for variable definition, detailed results, and alternative specifications. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Explanatory Variable, Resolving Default				
Variables		(Reorganized	=1, Liquidated=0)	
	(1)	(2)	(3)	(4)	
Bankruptcy law origin dummies					
German		0.088***	0.088***	0.085***	
		(0.010)	(0.010)	(0.010)	
English		0.035*	0.035	0.051**	
		(0.021)	(0.021)	(0.021)	
Nordic		-0.120***	-0.120***	-0.128***	
		(0.014)	(0.014)	(0.014)	
Business-group, BG (=1)	0.012	-0.085***	-0.085***	-0.076***	
(Below are interactions.)	(0.009)	(0.010)	(0.010)	(0.010)	
		0.050*	0.050*	0.042	
BG [*] German		(0.029)	(0.029)	(0.029)	
		-0.016	-0.016	-0.025	
BG [*] English		(0.032)	(0.032)	(0.032)	
		0.385***	0.385***	0.388***	
BG [*] Nordic		(0.023)	(0.023)	(0.023)	
Cash flow	0.007	-0.001	-0.001	-0.006	
	(0.010)	(0.010)	(0.010)	(0.010)	
Cash flow [*] BG (=1)	0.044		-0.000	-0.006	
	(0.053)		(0.052)	(0.051)	
Firm controls	Full	Full	Full	Full	
Direct ownership controls	no	no	no	yes	
Macro control, governance	yes	yes	yes	yes	
Period dummies, Industry FE	yes	yes	yes	yes	
Adjusted R ²	0.083	0.099	0.099	0.105	
Observations (N)	36,374	36,374	36,374	36,374	
Percent of reorganized firms	15.1%	15.1%	15.1%	15.1%	

Our results show that firm criticality is a significant predictor of bankruptcy. We see that firms more distant from the ultimate owners have a higher likelihood of financial distress. This effect is most

substantial for endpoint firms. This result is consistent with our expectation that more distant firms are more likely to be sacrificed to maximize group value. It is further supported by the estimated coefficient on *Relative value*, which decreases the likelihood that the firm will default. These results confirm that firms important to the business group have a lower likelihood of bankruptcy.

We further observe that the business group complexity impacts the likelihood of default. When we account for the size of the business group, the coefficients for the business-group complexity variables are all significantly positive, ranging between 0.006 and 0.015. This effect, however, is mitigated by the size of the group, with larger business groups generally decreasing the likelihood of financial distress. This result shows that more complex groups have a higher incidence of bankruptcy for subsidiaries, which is consistent with (Colli & Colpan 2016), as ultimate owners can better take advantage of limited liability protections. However, this result is mitigated by the size of the business group size also corresponds to the amount of capital the ultimate owners can provide to struggling subsidiaries.

4.4 Business-Group Design, Firm Importance, and Reorganization

We undertake our analysis using the same approach as in Section 4.3. We use a model specification identical to Equation (3), except that the dependent dummy variable equals 1 for reorganizing firms and 0 for solvent firms. We employ the same technique for matched samples and report the results in Table 5.

We observe that subsidiaries in less complex business groups, with a depth of less than three, are more likely to reorganize. This is consistent with our expectations since these business groups will have firms that are, on average, closer to the top and thus make the ultimate owners more liable for the cost of financial distress (Paligorova & Xu 2012). Moreover, transferring funds to struggling subsidiaries in less complex firms might be more manageable. The BG size somewhat mitigates this effect, suggesting that large business groups might be less inclined to reorganize defaulted firms.

Interestingly, while we observe that more distant firms (higher *Level*) are less likely to be reorganized, it is not valid for endpoint firms. While this might seem counter-intuitive, it is essential to note that endpoint firms are much more likely to default. This means that more are potentially available to enter reorganization. We also observe that *Relative Value*, i.e., the number of subsidiaries owned by the defaulted firms, does not significantly impact the likelihood of reorganization. It is implied from the defaulting stage that these critical subsidiaries are less likely to default. Therefore, there will be only a limited pool of potential candidates for reorganization. We offer tests regarding the sample of defaulted firms in Section 6.

Table 5. Comparing Reorganized and Solvent Business Group Members.

This table examines how BG's characteristics and the firm's location within the group affect the likelihood of restructuring. Columns (1) and (3) contain results from the LPM, and columns (2) and (4) contain marginal effects from the corresponding logit model (computed by the delta method). The set of controls is the same as in Table 2. Full estimation results, variables, and group control variable definitions are provided in the (Online) Appendix. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Solvent Firms				
Variables	1= Firms in the Reorganized stage				
		0= Always solv	vent firms		
	(1) LPM	(2) Logit	(3) LPM	(4) Logit	
Bankruptcy law origin dummies (base category French law origin)					
German	0.001	0.003	0.002	0.004	
	(0.005)	(0.005)	(0.005)	(0.005)	
English	-0.014***	-0.016***	-0.013***	-0.015***	
	(0.004)	(0.005)	(0.004)	(0.005)	
Nordic	0.043***	0.041***	0.043***	0.040***	
	(0.009)	(0.011)	(0.009)	(0.011)	
BG Complexity=2	0.011***	0.011***	0.015***	0.016***	
$(2 \leq BG \text{ depth } \leq 3)$	(0.003)	(0.003)	(0.004)	(0.004)	
BG Complexity=3	0.001	-0.002	0.020***	0.020***	
$(4 \le BG depth \le 5)$	(0.005)	(0.006)	(0.006)	(0.006)	
BG Complexity=4	-0.020***	-0.036***	0.014**	0.002	
(BG depth > 5)	(0.006)	(0.008)	(0.007)	(0.008)	
			-0.009***	-0.011***	
BG size (# firm)			(0.001)	(0.001)	
	0.014***	0.011**	0.005	0.001	
BG Breadth	(0.005)	(0.005)	(0.005)	(0.006)	
	-0.003***	-0.004**	((
level	(0.001)	(0.002)			
Distance=2		(0.002)	-0.007**	-0.009***	
$(2 \le \text{level} \le 3)$			(0.003)	(0.003)	
Distance=3			-0.011**	-0.014**	
$(4 \le \text{level} \le 5)$			(0.005)	(0.007)	
Distance=4			-0.021***	-0.025*	
(level > 5)			(0.007)	(0.014)	
	0.013***	0.015***	0.016***	0.019***	
Endpoint (= I)	(0.003)	(0.003)	(0.003)	(0.004)	
			0.00001	0.00001	
Relative value			(0.0001)	(0.0001)	
Public (=1)	0.002	-0.003	0.012**	0.009	
· ·	(0.006)	(0.009)	(0.006)	(0.009)	
Adjusted or Pseudo R ²	0.041	0.042	0.077	0.079	
Observations (N)	125.883	125,883	125,883	125,883	
Percent of reorganized firms	8.10%	8.10%	8.10%	8.10%	

4.5 Business Group Design, Firm Importance, and Liquidation

In this section, we compare the liquidated and solvent firms. We use a specification identical to Equation (3) in Sections 4.3 and 4.4, except that the dependent dummy variable equals 1 for liquidated firms and 0 for solvent firms. Our results are presented in Table 6.

Many of the outcomes presented in Table 6 are implied from the reorganization or defaulting stage results. For example, *BG Breadth*, which increases the likelihood of reorganization, decreases the possibility of liquidation. The result is consistent with our expectations. *BG Breadth* would be equal to one for a pure subsidiary structure. In this structure, we expect minimal barriers to internal capital markets. Moreover, in such a structure, the ultimate owners are more likely to be held liable for the debt obligations of their subsidiaries. We further find that business groups with higher complexity, namely with a depth of more than four, have a higher likelihood of liquidation. The results again confirm that business group complexity influences the resolution of bankruptcy.

We further find that being an endpoint firm significantly increases the likelihood of liquidation. These firms can be considered the most expendable. Any potential assets or critical employees can be transferred to a different firm in the business group. This is not true of any subsidiaries, as those will be more difficult to transfer. Therefore, we observe that the *Relative Value* of the firm significantly reduces the likelihood of liquidation. Similarly, as in the defaulting stage, those companies controlling a sub-group in the BG are important and will be shielded from any financial distress.²⁹

Table 6. Comparing Liquidated and Solvent Business Group Members.

This table examines how BG's characteristics and the firm's location within the group affect the likelihood of liquidation. Columns (1) and (3) contain results from the LPM, and columns (2) and (4) contain marginal effects from the corresponding logit model (computed by the delta method). The set of controls is the same as in Table 2. Full estimation results and group control variable definitions are provided in the (Online) Appendix. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Comparison Between Liquidated and Solvent Firms				
Variahles	1= Firms in the Liquidation stage				
Valiancs	0= Always solvent firms				
	(1) LPM	(2) Logit	(3) LPM	(4) Logit	
Bankruptcy law origin dummies					
German	0.047***	0.001***	0.047***	0.000***	
German	-0.047		-0.047	-0.062	
English	(0.002)	(0.003)	(U.UU2)	(U.UU3)	
English	-0.101	-0.119	-0.103	-0.121	
Nordia	(0.002)	(0.003)	(0.002)	(0.003)	
Nordic	0.027***	0.030***	0.027***	0.029	
	(0.003)	(0.004)	(0.003)	(0.004)	
BG Complexity=2 ($2 \leq BG$ dopth ≤ 3)	-0.000	-0.002	0.000	-0.001	
	(0.002)	(0.002)	(0.002)	(0.002)	
BG Complexity=3	0.007***	0.005*	0.008***	0.006**	
$(4 \le BG \text{ depth } \le 5)$	(0.003)	(0.003)	(0.003)	(0.003)	
BG Complexity=4	0.006*	0.003	0.007*	0.005	
(BG depth > 5)	(0.003)	(0.003)	(0.004)	(0.004)	
			-0.000	-0.001	
BG size (# firm)			(0.000)	(0.000)	
	-0.020***	-0.022***	-0.014***	-0.015***	
BG Breadth	(0.003)	(0.003)	(0.003)	(0.003)	
	0.003***	0.003***			
Level	(0.001)	(0.001)			
Distance=2			-0.003*	-0.001	
$(2 \le eve \le 3)$			(0.001)	(0.002)	
Distance=3			-0.004	-0.003	
$(4 \le \text{level} \le 5)$			(0.003)	(0.003)	
Distance=4			0.004	0.005	
(level > 5)			(0.005)	(0.005)	
	0.015***	0.017***	0.011***	0.012***	
Enapoint (= I)	(0.001)	(0.001)	(0.002)	(0.002)	
	- *	. ,	-0.0001***	-0.0001***	
Relative value			(0.00003)	(0.00003)	
Public (=1)	0.019***	0.017***	0.014***	0.014***	
- 、 ,	(0.004)	(0.003)	(0.004)	(0.003)	
Adjusted or Pseudo R ²	0.059	0.060	0.089	0.089	
Observations (N)	722,442	722,442	722,442	722,442	
Percent of liquidating firms	10.6%	10.6%	10.6%	10.6%	

5 Conclusion and Discussion

This study analyzes the incidence and resolution of default and bankruptcy in large sample of European public and private firms. We focus on a commonly excluded aspect of corporate insolvency: business group membership. Business groups are subsidiary structures prevalent worldwide. They account for roughly one-third of all European firms. Thus, it is important to understand how their membership influences the incidence and resolution of bankruptcy.

It seems as if almost a predestination effect exists for subsidiaries that experience financial distress. Business group subsidiaries can access far more resources than stand-alone firms. Given these resources, they should be far less likely to suffer from financial distress. Previous literature suggests that they have a lower likelihood of bankruptcy. Instead, we observe that business group subsidiary firms are more likely to liquidate. We contend that only disposable subsidiaries enter the default stage, and then they are most likely liquidated. We then explore what the identifying characteristics of these subsidies are. To undertake this analysis, we have created a framework for measuring a firm's importance within a business group. Not all firms are equally crucial to the ultimate owner. Some firms are more profitable or are large. These aspects, however, can be changed relatively easily by using transfer pricing or profit shifting. What is more challenging to change is the structure of the business group. If a subsidiary defaults, the ultimate owner loses control of the other firms the defaulting subsidiary controlled. Similarly, if the parent directly owns a subsidiary, that parent is more liable for any subsidiary debts during financial distress.

Consequently, we use the subsidiary's position within the business group to develop measures of its criticality to the business group. The benefit of this approach is two-fold. Firstly, it is easy to construct since the only information required is the ownership structure. Secondly, other measures of firm importance are either unavailable for private firms or are based on profits and assets, which can be transferred swiftly through internal capital markets. Given these circumstances, we then develop several variables to measure firms' criticality based on the number of subsidiaries the firm controls and its distance from the ultimate owner. Similarly, we create several measures to address the complexity of the BG structure. These indications of firm importance and business group complexity should be far more difficult to change than mere assets or profitability, as any change would require an expensive and lengthy legal process. Moreover, as we use BG's complexity and the subsidiary's criticality jointly with all relevant financial information, we confirm their prominence and relevance.

We find that essential subsidiaries have a negligible chance of default and bankruptcy. Less important firms, however, are more likely to default and liquidate. Firms that are more likely to be restructured

are those firms that are more important and located in less complex business groups. Our results suggest that the ultimate owners might decide on the future resolution of financial distress during the BG formation and the subsidiary's positioning within the group structure. Depending on its positioning, the subsidiary is either vital or expendable. Our findings confirm that a firm position in the BG structure is more relevant than its profitability for successful reorganization or the likelihood of default. We further observe the presence of country factors in our analysis of bankruptcy within a business group. Despite an effort to converge European bankruptcy law, significant differences still exist, and those differences in legal regimes affect all stages of financial distress. It is most likely that national differences in creditor and shareholder protections, information disclosure and transparency, and contract enforcement drive these effects.

Overall, our study offers a careful examination of how business group membership influences the bankruptcy process. Our new measures of firm importance and business group complexity can be used to answer other questions. How is risk managed within a business group, and what strategies are employed to mitigate or transfer that risk? How efficient are internal capital markets within a business group and whose interests do they serve? What is an effective organizational design for a business group, and how do the various group characteristics interact to impact value or profitability? All of these questions are promising avenues for future research.

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Appendix A: Variable Definitions

Variable	Definition
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Firm financial-distress indicators

Grouped status	lega	IWe aggregate company legal status (<i>Istatus</i>) into the following sub-categories: Active, Default of Payments, Internal steps taken (reorganization, rescue plan), and external actions taken (Insolvency, Bankruptcy/liquidation, Merger or take-over). We exclude missing/unknown status and active yet dormant companies.
Business-gro	oup c	haracteristics and firms' position within the business group
Business Gro	oup	A dummy equals one if a firm belongs to a business group.
BG depth		Business group depth – Maximum number of levels (ownership layers) in the BG
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.
Complex		Qualitative variable on complexity (number of levels within the business group).
		=1 for the business group with just one level
		=2 if 1< business group depth \leq 3
		=3 if 3< business group depth ≤ 5
		=4 if business group depth >5
BG Breadth		Business-group breadth is the ratio of the number of endpoints (firms that do not own any other firms) divided by the total number of firms within the business group.
		BGC_indx= Number of endpoints Number of firmsBGC_indx= ����@ � � � �� � � � � � o o o o o o o o o o
Level		The level (the distance from the top) where the firm is located within the BG
Endpoint		A firm that does not own any other firm within the business group
Relative valu	le	The number of subsidiaries a given firm owns in an ownership chain is standardized by the number of firms within the business group.

Ownership type

Source: Amadeus database provided by the Bureau van Dijk, authors' computation

D_type Direct ownership type. The categorical variable contains aggregated ownership type categories for the owner with the highest share. Based on variable *SH_TYPE*, which initially covered fifteen different categories, we created the following aggregated categories: Family, Corporate, Institutional, and Unknown (missing).

Firm-level control variables Source: Amadeus database provided by the Bureau van Dijk

Ln (Employees)	Natural logarithm of the number of employees (EMPL).
Ln (Total Assets)	Natural logarithm of total assets (TOAS) in millions of 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 ROA – Operational profit or loss (= OPPL) scaled by total assets (TOAS).
Cash Flow	Profits/loss plus depreciation (= CF) scaled by total assets (TOAS).
Leverage	Long-term debt (LTDB) plus bank loans (BL) scaled by total assets (TOAS).
Zero leverage	The dummy is equal to one if firm leverage is equal to zero (<i>levgt</i>)
Age	Firm age since the (local) incorporation. It is computed as <i>YEAR</i> minus the year of incorporation (<i>YEARINC</i>) plus 1. Winsorized at 50.
Missing Age	If age is missing, then missing age equals 1; otherwise, 0.
Cash	Cash reserves (=CASH) scaled by total assets (TOAS).
Gross Investment	Defined as fixed assets (<i>FIAS</i>) minus lagged fixed assets plus depreciation (<i>DEPRE</i>), scaled by total assets (<i>TOAS</i>).

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.
GDP Growth	The real GDP's percentage 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	The World Governance Indicators include Voice and Accountability (va), Political Stability, Absence of Violence (pv), Government Effectiveness (ge), Regulatory Quality (rq), the Rule of Law (rl), and Control of Corruption (cc). According to WGI construction, all indexes ranged from -2.5 to 2.5 higher means better.

Control Variables

*Macro Control*It consists of private credit to GDP, GDP growth, GDP in constant USD, GDP per *Variables* capita (constant USD), and the set of WGI indicators.

*Time period*The dummies set periods with breaks in the following years: 2000, 2005, 2008, 2010, 2013, and 2016.³⁰

FullFirmInclude cash flow/total assets, firm age, missing age indicator (=1), log (total
assets), tangibility (=tangible/total assets), leverage (debt/total assets), zero debt
indicator (=1), log (employees), CAPEX (investment ratio to total assets), cash/
total assets.

Appendix B: First-stage Regressions - Dependent Variable BG dummy

Explanatory 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. The 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. Detailed coefficient estimates are available upon request. The model in column (4) is the first stage regression used in Tables 2, 4, and 5.

Variables	(1)	(2)	(3)	(4)
Regulatory quality (rq)	-0.189***	-0.182***	-0.131***	-0.144***
	(0.001)	(0.001)	(0.003)	(0.003)
The rule of law (rl)	-0.116***	-0.108***	0.033***	0.017***
	(0.002)	(0.002)	(0.004)	(0.004)
Control of Corruption(cc)	-0.060***	-0.057***	-0.053***	-0.021***
	(0.001)	(0.001)	(0.001)	(0.002)
Voice and Accountability(va)	0.162***	0.173***	0.171***	0.172***
	(0.002)	(0.002)	(0.002)	(0.002)
Political stability (pv)	-0.111***	-0.102***	-0.105***	-0.105***
	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.995***	1.014***	0.676***	0.672***
	(0.005)	(0.053)	(0.053)	(0.053)
Country & industry FE	yes	yes	yes	yes
Size (quartiles) FE	yes	yes	yes	yes
Country & size interactions	no	yes	yes	yes
Industry & size interactions	no	yes	yes	yes
rq & size interactions	no	no	yes	yes
rl & size interactions	no	no	yes	yes
cc & size interactions	no	no	no	yes
F-statistics	20,092	6,426	6,224	6,114
R ²	0.075	0.083	0.083	0.083
R ² adjusted	0.075	0.083	0.083	0.083
N (Observations)	11,135,147			