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Bankruptcy in Groups

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Abstract
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Keywords: Bankruptcy, Credit risk, Business groups, Subsidiaries, Veil piercing, Related-party transactions, Regulation.

JEL Classification Numbers: G14, G15, G38, M41, M48.

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We examine bankruptcy *within* business groups. Groups have incentives to support financially distressed subsidiaries as the bankruptcy of a subsidiary may impose severe costs on the group as a whole. In several countries around the world, bankruptcy courts often "pierce the corporate veil" and hold groups liable for their distressed subsidiaries' obligations as if these were their own. Using a large cross-country sample of group-affiliated firms, we show that, by reallocating resources within the corporate structure, business groups actively manage intra-group credit risk to prevent costly within-group insolvencies. We find that large and diversified groups are more effective at insulating their subsidiaries from credit-risk shocks. Moreover, the pattern of capital reallocation appears consistent with groups supporting subsidiaries that are easier to monitor and whose insolvencies may spill over to other group firms. Finally, we document that recent regulatory changes on approval and disclosure of related-party transactions may limit groups' ability to shield their subsidiaries from credit-risk shocks.

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1. Introduction

We examine bankruptcy *within* business groups. Business groups are ubiquitous around the world (La Porta et al., 1999; Claessens et al., 2000) and constitute a common way for ultimate owners to exercise control over a large number of companies while containing their risk exposure through limited liability. Business groups often take advantage of internal capital markets to overcome difficulties in accessing external finance (Stein, 1997). Hence, the reallocation of resources among group firms is likely to be a channel through which groups manage credit risk and prevent insolvencies (Riyanto and Toolsema, 2008).

Group bankruptcies tend to be large (e.g., Global Crossing, Maxwell, MG Rover, Parmalat) and often affect a significant number of stakeholders. Therefore, understanding how the dynamics of internal capital markets help prevent within-group financial distress is of crucial importance. While the literature on internal capital markets has typically focused on multi-segment firms (i.e., conglomerates) (e.g., Berger and Ofek, 1995; Lamont, 1997; Shin and Stulz, 1998; Giroud and Mueller, 2015), business groups constitute a unique setting to study bankruptcy. Unlike divisions of conglomerates in fact, business group subsidiaries are separate legal entities that can individually file for bankruptcy. Also, because of their limited liability protection, groups may deliberately decide not to bail out distressed subsidiaries, whereas conglomerates have no choice but to absorb all of their divisions' losses to prevent their own bankruptcy (Khanna and Yafeh, 2007).

A group may be required to support its financially distressed subsidiaries as a result of explicit or implicit agreements such as guarantees and comfort letters (Merton and Bodie, 1992). In the absence of these agreements, a group's decision to support a subsidiary depends on whether the expected costs of subsidiary bankruptcy outweigh the costs of offering support. The costs of subsidiary bankruptcy may include operational disruption, reputational damage, default (if group firms' credit agreements contain cross-default clauses) or a direct

liability under *veil piercing* and breach of fiduciary duty (Erens et al., 2008; Mevorach, 2009).[1] In several countries in fact, bankruptcy courts often rule for "piercing the corporate veil" and hold entire business groups responsible for the obligations of their subsidiaries beyond the limited liability protection (Matheson, 2008).

Our study relies on the Orbis database which provides financial and ownership information for a large number of group-affiliated firms from around the world. We exploit granular data provided by financial statements of individual group entities to assess the extent to which business groups rely on their internal capital markets to actively manage credit risk and prevent within-group insolvencies. To this end, using sovereign rating downgrades and industry shocks as sources of exogenous variation in credit risk, we show that, compared to standalone entities, group subsidiaries are less sensitive to sudden increases in default risk.[2] This finding is consistent with business groups acting as "shock absorbers" in that they insure their subsidiaries against temporary liquidity shortfalls. Also, we find that, in line with theory, more diversified groups, groups with a bank in their corporate structure, groups with a large number of subsidiaries, and pyramidal groups are more effective at insulating their subsidiaries from credit-risk shocks.

[1] "Piercing the corporate veil" and "lifting the corporate veil" are two expressions used interchangeably in the law literature. They refer to judicially imposed exceptions to the general principle that corporations are legal entities separate from their shareholders, officers and directors (i.e., limited liability). Under veil *piercing*, shareholders (business group parent companies) are held responsible for the corporation's (subsidiary's) actions as if they were their own (Thompson, 1991). An example of veil piercing involves American Hydraulics, a wholly-owned subsidiary of MNP Corporation. When American Hydraulics ceased operations without paying the final invoice for goods received from Hystro Products Inc., Hystro sued MNP for payment of the bill and a jury found MNP liable (18 F.3d 1384). Another example of veil piercing involves a contract celebrated between Hair Programming Inc. (HPI), a 98%-owned subsidiary of Glemby Co., and Jean-Louis David to operate salons under the Jean-Louis David brand name in the U.S. Glemby was held liable when its subsidiary, HPI, failed to perform its contractual obligations, because Jean-Louis David was implicitly misled into extending credit to HPI on the basis of Glemby's involvement.

[2] Sovereign ratings typically constitute a strong "upper-bound" for corporate credit ratings as credit rating agencies rarely rate corporates above the sovereign (Almeida et al., 2016). Hence sovereign downgrades are usually accompanied by corporate downgrades which, by rendering access to credit markets more difficult, effectively increase bankruptcy risk. Similarly, increases in bankruptcy filings within an industry often negatively affect the bankruptcy probability of other firms in that same industry irrespective of their financial health (Lang and Stulz, 1992; Maksimovic and Phillips, 1998; Chava and Jarrow, 2004).

We then examine which subsidiaries are more likely to be sheltered from shocks to credit risk. Business groups presumably take into account the expected cost of subsidiary bankruptcy, as well as their ability to monitor the funds being transferred, when deciding whether to support distressed group members. The expected cost for a group is arguably a function of the extent of operational disruption, reputational damage and the likelihood of bankruptcy courts piercing the corporate veil and holding the business group liable for the whole obligations of the defaulted subsidiary.

We develop predictions based on indicators of subsidiary *integration* typically associated with higher expected costs of subsidiary bankruptcy and often considered in courts' decisions to pierce the corporate veil (Erens et al., 2008; Mevorach, 2009). We find that groups are more likely to shield: (i) subsidiaries that are wholly owned; (ii) subsidiaries with interlocked boards; (iii) subsidiaries named after their parents; (iv) large subsidiaries; and (v) subsidiaries that operate in the same industry of their parents. Moreover, we posit and find that better headquarters-subsidiary information sharing and ease of monitoring by the headquarters influence the propensity to support a distressed subsidiary.

To further understand why business groups choose to protect troubled subsidiaries, we examine the indirect effects of credit-risk shocks to *other* (non-shocked) subsidiaries within the same group. The *coinsurance hypothesis* (Khanna and Yafeh, 2005) posits that group firms may be willing to bail out other distressed subsidiaries in exchange for implicit insurance against their own future bankruptcy (Riyanto and Toolsema, 2008). Accordingly, we find evidence of significant credit-risk spillovers in that shocks to a subsidiary propagate to other group firms. This ripple effect is consistent with group firms absorbing (at least in part) credit-risk shocks affecting other subsidiaries.

To shed light on the mechanisms through which intra-group credit-risk management takes place, and to rule out alternative explanations for our findings, we then examine intra-

group loans for a sample of U.K. groups for which we are able to collect detailed intra-group loan data. Our evidence indicates that, following credit-risk shocks, affected subsidiaries experience increases in their intra-group loan liabilities (i.e., receive support), whereas other subsidiaries within the same group experience a corresponding increase in intra-group loan assets (i.e., offer support).

Intra-group loans, however, are likely not the only mechanism through which intra-group credit-risk management takes place. Groups may also support subsidiaries via guarantees (e.g., Merton and Bodie, 1992), abnormal purchases (e.g., Jian and Wong, 2010), asset transfers, and other forms of related-party transactions (RPTs). Concerns about the use of RPTs to expropriate minority shareholders (e.g., Bertrand et al., 2002) have placed RPT disclosure and approval on the agendas of securities regulators in several countries around the world. Stricter RPT regulation may, however, also affect groups' ability to manage credit risk. Our results support this hypothesis and show that, relative to standalone firms, subsidiaries domiciled in countries switching to stricter RPT regulation are less likely to be supported following these regulatory changes. This reduced likelihood of support translates into higher bankruptcy risk and is more pronounced for subsidiaries from countries with weak financial market development (i.e., where reliance on internal capital markets is more widespread).

Our study contributes to the body of literature that investigates group structures and the functioning of internal capital markets in four distinct ways. First, a unique contribution of our study is the use of ownership links between group-affiliated entities which allows us to avoid the limitations of segment-level data typically used in the study of conglomerates (Berger and Ofek, 1995; Lamont, 1997; Shin and Stulz, 1998). Because group subsidiaries, unlike divisions of conglomerates, are legally independent entities that report their individual financial information and can separately file for bankruptcy, we are able to directly examine

how the internal capital markets of business groups help protect subsidiaries from adverse credit-risk shocks. Most importantly, by showing how business groups rely on intra-group resource reallocation to manage credit risk and avoid bankruptcy, we extend prior work that examines financial distress in business groups. Specifically, while findings from individual-country studies in the existing literature (e.g., Claessens et al. (2003) for East Asian countries; Gopalan et al. (2007) for India) potentially hinge on the idiosyncratic features of their specific settings, our study leverages on the cross-country nature of our sample to show that intra-group credit-risk management extends beyond settings where the quality of country-level institutions likely renders reliance on internal capital markets more widespread (Khanna and Palepu, 2000).

Second, our evidence contributes to a better understanding of the working of internal capital markets. Our findings indicate that the decision to bail out a troubled subsidiary is a function of the expected negative spillover that the insolvency of that subsidiary may generate, namely as a result of potential veil piercing. While piercing the corporate veil has been labelled "*the most litigated issue in corporate law*" (Thompson, 1991), we are unaware of any study that empirically examines veil piercing as a driver of intra-group support and as a reason for credit-risk management. By highlighting the role of information sharing and ease of monitoring in the decision to support distressed subsidiaries, our study also contributes to an emerging stream of literature that has documented the effects of monitoring and ease of communication on productivity, investment and innovation within business groups (e.g., Giroud, 2013; Shroff et al., 2014; Giroud and Mueller, 2015; Bahar, 2016).

Third, by providing direct empirical evidence of default contagion within business groups, our study contributes to the literature on systemic risk and default cascades (e.g., Battiston et al., 2007; Elliott et al., 2013). Since business groups constitute the backbone of many emerging economies around the world (Faccio and Lang, 2002), understanding how

default risk propagates within groups is of fundamental importance for systemic risk assessment.

Fourth, by showing that changes in RPT regulation recently enacted in several jurisdictions may limit groups' ability to manage credit risk, our study complements prior literature that focuses on how RPT regulation addresses self-dealing and tunneling (e.g., Bertrand et al., 2002; Djankov et al., 2008), by offering an alternative angle.[3] Our evidence suggests that, in addition to curbing expropriation of minority investors, the requirement to disclose and approve RPTs may also constrain groups' ability to manage credit risk.

The remainder of the paper proceeds as follows. Section 2 reviews the literature and discusses the role of group affiliation in bankruptcy; Section 3 discusses our identification strategy; Section 4 describes our data; Section 5 examines whether business groups insulate their subsidiaries from credit-risk shocks; Section 6 examines which business groups are more likely to support their subsidiaries; Section 7 investigates which subsidiaries are shielded the most; Section 8 examines within-group bankruptcy propagation; Section 9 probes intra-group loans to pin down the channels of group support; Section 10 examines whether changes in RPT regulation affect intra-group credit-risk management; and Section 11 concludes.

2. Bankruptcy in Groups

Several studies investigate the value of group affiliation (for a review of this literature see Khanna and Yafeh (2007)) and examine its associated benefits (i.e., the "bright side") and costs (i.e., the "dark side").[4] The focus of these studies, however, is on the efficiency of intra-

[3] In particular, prior studies have emphasized the role of regulation in mitigating the extent to which business groups can divert corporate resources at the expense of minority shareholders and therefore hinder the development of capital markets (Djankov et al., 2008).

[4] The *bright side* posits that business groups can rely on their internal capital markets (Stein, 1997) to overcome market frictions and external financing constraints, especially in emerging market economies. For instance, Khanna and Yafeh (2005) show how weak affiliates suffering negative cash flow shocks can benefit from group

group capital allocations (e.g., Stein, 1997), whereas evidence on internal capital markets as a means of intra-group credit-risk management is surprisingly scant (Riyanto and Toolsema, 2008; Almeida et al., 2015). In the absence of data on international insolvencies and intra-group ownership structures, previous evidence potentially hinges on poor institutional-quality settings where internal capital markets are a frequent alternative to external finance (Khanna and Palepu, 2000; Claessens et al., 2003; Friedman et al., 2003; and Gopalan et al., 2007).

Bankruptcy is an extreme realization in the continuum of the default risk distribution which may trigger non-trivial legal consequences for all independent entities forming a business group. Group bankruptcies are important, namely because they may affect systemic risk, especially in emerging countries where groups represent a large fraction of the overall economy (Faccio and Lang, 2002).

Business groups may choose to bail out ailing subsidiaries for several reasons. First, groups typically have private information namely regarding their subsidiaries' investment opportunities and, as a result of that, may decide to fund distressed subsidiaries when external lenders are unable to do so because of information asymmetries and agency costs (Shin and Stulz, 1998). Second, groups may also be required to support financially distressed subsidiaries as a result of explicit or implicit agreements, such as guarantees and comfort letters (Merton and Bodie, 1992; Moody's, 1999). Third, in the absence of formal guarantees, groups may choose to support subsidiaries because they face significant direct and indirect costs in the event of subsidiary bankruptcy.

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affiliation. Gopalan et al. (2007; 2014) specifically examine how intra-group loans and dividend distributions in Indian business groups are used to support affiliates. Recently, Almeida et al. (2015) show that Korean business groups (*chaebols*) were able to support affiliated firms during the financial crises through equity capital contributions. The *dark side* highlights the potential misallocation of capital across group firms. Stein (2003) refers to "corporate socialism" to describe situations in which weak group firms receive more subsidies than stronger group firms. Other studies suggest that capital misallocation can be severe and take place through investments in unprofitable projects as well as through "tunneling," i.e., outright expropriation of resources from minority shareholders (Claessens et al., 1999; Johnson et al., 2000; Bertrand et al., 2002).

Group parents' credit agreements often include cross-default clauses whereby a bankruptcy filing by a material subsidiary may lead to the default of the entire group. There may also be joint contracts with suppliers or other creditors (e.g., a joint employee-benefit plan) and, even in the absence of such contracts, groups may face severe disruptions if there is strong operational integration and other group firms are major clients or suppliers of a troubled subsidiary (Elliott et al., 2013). If subsidiary creditors are also suppliers of the group parent company for example, they may use their negotiation power to force the group to reach a compromise and bail out the subsidiary (Erens et al., 2008). In the event of bankruptcy, loans made by the group to a subsidiary are typically subordinated and may, under certain circumstances, be re-characterized as equity by bankruptcy courts (Erens et al., 2008). As a result, in addition to losing the contributed equity capital, business groups are likely unable to recover any portion of the intra-group loans.

Groups may also face a direct liability if the creditors of a bankrupt subsidiary sue the parent company under *veil piercing* or breach of fiduciary duty (Thompson, 1991; Erens et al., 2008; Mevorach, 2009). Because the whole asset base of business groups is larger than that of an individual subsidiary, these actions can potentially generate high payoffs for subsidiaries' debtholders. Perhaps for this reason, piercing the corporate veil has been labeled as "*the most litigated issue in corporate law*" (Thompson, 1991). Code law countries such as Brazil, Germany and Portugal have traditionally taken an entity approach, whereby liability may be imposed on the parent company. Also, while the U.S., along with some other common law jurisdictions, has historically followed a limited liability approach, bankruptcy courts have recently moved towards regarding a group as a single entity in circumstances where the relationship between group members so justifies (Mevorach, 2009).[5] Macey and

[5] Even in countries where the probability of veil piercing is low, business groups may choose to settle with the subsidiary's creditors to avoid direct and indirect costs, such as legal fees, time spent in legal proceedings, an overhang on their own business, and the need to disclose a contingent liability or to record material provisions (Erens et al., 2008).

Mitts (2014) identify 9,380 federal and state cases discussing veil piercing. Matheson (2008) finds that U.S. bankruptcy courts have pierced the corporate veil in 20.56% of his sample cases involving parent-subsidiary veil piercing.[6]

The above discussion suggests that groups have strong incentive to manage credit risk by supporting distressed subsidiaries to avoid default contagion.[7] Support typically takes place through intra-group loans (Gopalan et al., 2007; Fisman and Wang, 2010; Buchuk et al., 2014), sales (e.g., Jian and Wong, 2010), and other RPTs.

In summary, while prior literature suggests that interdependency among group firms may influence credit risk, there is limited evidence on *how* business groups use their internal capital markets to manage credit risk. There is an extensive debate in the law literature on whether business groups should be held liable for a bankrupt subsidiary's debts (i.e., veil piercing) (Thompson, 1991; Mevorach, 2009). However, we are unaware of any study that empirically examines the extent to which the likelihood of veil piercing may affect intra-group credit-risk management. Also, concerns about the use of RPTs to expropriate minority shareholders (e.g., Bertrand et al., 2002) have recently led to the passage of stricter regulation on disclosure and approval of RPTs aimed at mitigating minority shareholders' expropriation. While prior studies examining RPT regulation mostly focus on the expected benefits of curbing self-dealing practices (e.g., Djankov et al., 2008), evidence on other potential effects is limited.

In line with the discussion above, we seek to answer the following questions: (1) Do business groups insulate their subsidiaries from credit-risk shocks? (2) Which business groups are more likely to support their subsidiaries? (3) Which subsidiaries are shielded the

[6] While empirical evidence on the frequency of veil piercing in other countries is sparse, Matheson's findings may, as he points out, have cross-country implications. First, this type of claims may be brought against a U.S. subsidiary of a multinational corporation headquartered in a foreign country. Second, legal systems of other countries often draw heavily on U.S. court decisions (Vandekerckhove, 2005; Matheson, 2008).

[7] Group support may also occur as a result of agency problems (Claessens et al., 2006). Managers may attach emotional value to prior acquisitions and/or want to avoid these acquisitions being perceived as bad business decisions.

most? (4) How does bankruptcy propagate within the group? (5) Do changes in RPT regulation affect intra-group credit-risk management?

3. Identification

We study whether business groups use their internal capital markets to manage credit risk. Specifically, we investigate the extent to which mutual insurance within business groups dampens the negative effects of credit-risk shocks on subsidiaries (Khanna and Yafeh, 2005). Our testing strategy is based on the idea that, if business groups insure their subsidiaries against diversifiable risk, all else equal, idiosyncratic shocks to credit risk should only exhibit a limited effect on subsidiary default probability. To this end, using non-group affiliated entities (i.e., standalone firms) as a benchmark, we examine changes in subsidiary bankruptcy risk following exogenous credit-risk shocks. If business groups actively manage intra-group credit risk, then the same shock should affect subsidiaries relatively less than comparable standalones.

Our identification relies on two exogenous shocks to credit risk: (1) sovereign rating downgrades and (2) industry shocks. The use of these shocks is key in our setting to address a potential endogeneity bias resulting from the non-random nature of group-affiliation (e.g., Campa and Kedia, 2002; Maksimovic and Phillips, 2002). Since our credit-risk shocks are largely unexpected, it is unlikely that business groups can change organizational structure in their anticipation. Hence, one can arguably assume group affiliation to be exogenous in the short run (Bertrand et al., 2002).

Sovereign ratings constitute a strong "upper-bound" for corporate credit ratings. Credit rating agencies only rate an entity above the sovereign foreign currency rating if they conclude, following a stress test, that *"there is appreciable likelihood that it would not default if the sovereign were to default"* (S&P, 2014). Even if an entity shows large

independence from the sovereign, it cannot be rated more than two to four notches above it. Sovereign downgrades are therefore often followed by downgrades in corporate credit ratings (Almeida et al., 2016). A corporate rating downgrade, on average, increases cost of capital and makes it difficult for firms to access bond markets and other sources of finance (Hand et al., 1992). Thus, firms from countries experiencing sovereign downgrades are likely to exhibit an increase in bankruptcy risk.

A potential concern with sovereign rating downgrades is, however, that they are relatively rare. Therefore, to complement this analysis, we also examine a more frequent type of shock, namely shocks to industry-level credit risk. Industry membership is likely to play an important role in bankruptcy (Chava and Jarrow, 2004). Not only do industry-demand conditions directly affect the financial health of firms (Maksimovic and Phillips, 1998), but an increase in bankruptcy filings within an industry may also lead to an increase in the bankruptcy probability of other firms in that same industry irrespective of their financial health (Lang and Stulz, 1992).

In sum, our identification relies on two different sources of exogenous variation in credit risk, each of which with relative advantages in our setting. By testing for consistent evidence using different credit-risk shocks, we provide assurance that the intra-group credit-risk management we document is not driven by the idiosyncrasies of a specific test design.

To capture subsidiaries' differential sensitivity to credit-risk shocks, we rely on a difference-in-differences matching estimator. Each year we match, without replacement, subsidiaries with standalones from the same country, industry and with similar size. This strategy effectively uses standalone entities as control observations. By using this approach, we account for unobservable time-invariant heterogeneity across the two types of firms. We compare changes in bankruptcy probability induced by credit-risk shocks across subsidiaries and matched standalones using the following discrete hazard model:

$$Pr(Y_{i,t+1} = 1) = f\big(\alpha_j + \alpha_c \times \alpha_t + \beta_1 Shock_{i,t} + \beta_2 Subsidiary_{i,t} + \beta_3\, Shock_{i,t} \times Subsidiary_{i,t} + \gamma' X_{i,t}\big), \quad (1)$$

where the subscripts i and t respectively denote the firm and the year; $Y_{i,t+1}$ is an indicator variable equal to one if the firm files for bankruptcy in year $t+1$, and zero otherwise; $Shock_{i,t}$ is an indicator variable set equal to one if the firm experiences a credit-risk shock (sovereign rating downgrade ($Downgrade_{i,t}$) or industry shock ($Industry\ shock_{i,t}$)), and zero otherwise; $Subsidiary_{i,t}$ is an indicator variable equal to one if the firm is affiliated to a business group, and zero if it is a standalone entity; and $X_{i,t}$ is a vector of control variables which includes a set of time-varying firm characteristics associated with credit risk (Beaver et al., 2010). Our coefficient of interest, β_3, captures the differential effect of credit-risk shocks on subsidiaries relative to standalones. We expect β_1 to be positive, consistent with shocks to credit risk increasing bankruptcy probability, and β_3 to be negative, in line with subsidiaries being less sensitive (than comparable standalones) to credit-risk shocks. The sign of the coefficient on $Subsidiary_{i,t}$ (β_2) is theoretically unclear. On the one hand, a negative coefficient would be consistent with a coinsurance effect, in that business groups support their financially distressed subsidiaries, whereas standalones enjoy no support. On the other hand, a positive coefficient would be consistent with standalones being innately less risky. While poorly performing standalones typically go bankrupt, poorly performing subsidiaries may remain in business longer (because of group support). Khanna and Yafeh (2005) describe this as a "*Darwinian selection of survivors*."

We choose to focus on bankruptcy, i.e., an extreme event along the continuum of the credit-risk distribution, because the bankruptcy of a subsidiary entails important costs and legal consequences for a group as a whole (e.g., veil piercing). However, an important implication of this choice is that the nature of our dependent variable prevents us from using a firm fixed effect estimation approach. Such an analysis would be biased, by construction, as

firms naturally drop out of the sample following their bankruptcy.[8] Nevertheless, to account for sources of potential heterogeneity that we may not be able to capture with our vector of firm-level controls, we resort to a comprehensive fixed effects structure. In particular, we include country-year fixed effects ($\alpha_c \times \alpha_t$) to control for country-level time-varying heterogeneity in bankruptcy risk (e.g., differences in bankruptcy regulations across countries over time). This approach ensures that any effect we document is only driven by within country-year variation. Further, as industry membership is an important driver of default risk (Chava and Jarrow, 2004), we control for industry-level heterogeneity in credit risk by including a set of industry fixed effects (α_j).

As previously mentioned, the endogeneity of organizational forms and, in particular, the endogenous selection of firms into business groups, poses an important identification challenge which we share with the literature examining the effects of group affiliation (e.g., Campa and Kedia, 2002; Maksimovic and Phillips, 2002). The non-random nature of group-affiliation may in fact represent a source of potential bias for our coefficient of interest. Business groups may choose to acquire (spin-off) firms with lower (higher) sensitivity to credit-risk shocks. As discussed above, this concern is alleviated by our research design. Business groups are unlikely to alter their corporate structure in anticipation of credit-risk shocks if these are largely unexpected, and hence it is reasonable to assume group affiliation to be exogenous in the short run (Bertrand et al., 2002). Nonetheless, below we discuss our empirical strategy to mitigate any residual concerns related to the endogeneity of group-affiliation, as well as to rule out possible alternative explanations for our findings.

[8] This is because firms filing for bankruptcy cannot be observed in the years after bankruptcy. Moreover, as we rely on a non-linear model to assess bankruptcy probability, the use of a firm fixed effect structure to control for time-varying firm-specific heterogeneity is unfeasible. First, the inclusion of such an extensive set of covariates would likely induce an incidental parameter problem (Neyman and Scott, 1948; Lancaster, 2000) that would potentially bias our coefficient of interest. Second, using conditional logit estimation with firm fixed effect would effectively limit the sample to groups that experience at least one subsidiary bankruptcy.

A possible alternative explanation for our findings is that subsidiaries are less affected by shocks than standalone firms because they receive favorable regulatory treatment (Almeida et al., 2015). This favorable treatment would be captured by our difference-in-differences design to the extent that it produces a constant stream of benefits over time (in terms of reduced bankruptcy risk). If, instead, subsidiaries are more likely than standalones to receive support when they experience a credit-risk shock (i.e., if preferential regulatory treatment is time-varying and correlated with credit-risk shocks), then a negative coefficient on $Shock_{i,t} \times Subsidiary_{i,t}$ could obtain even in the absence of intra-group credit-risk management. Another potential alternative explanation for the lower credit-risk sensitivity of subsidiaries compared to standalones is that creditors are less likely to ask for a subsidiary to be liquidated if they also hold debt issued by another firm within the same group.

To rule out these two alternative explanations, we examine intra-group loans as a potential channel through which business groups manage credit risk. Since there is no *ex ante* reason to expect changes in intra-group loans in the presence of: (i) favorable regulatory treatment of group-affiliated firms; or (ii) creditors holding debt in different group firms, an increased reliance on intra-group loans surrounding credit-risk shocks would rather be indicative of active credit-risk management.

We conduct several additional tests to document the extent of intra-group credit-risk management and to further understand the drivers of the decision to support distressed subsidiaries. First, we examine whether group characteristics that in theory should facilitate intra-group credit-risk management (e.g., diversification, presence of a bank in a group, financial constraints, etc.) indeed explain lower subsidiary sensitivity to credit-risk shocks. Second, we test whether subsidiary features proxing for: (i) higher expected costs of subsidiary bankruptcy; and (ii) better information sharing and subsidiary monitoring by the headquarters, indeed explain why certain subsidiaries are more likely to receive support.

Third, we focus on how bankruptcy risk propagates within the group structure by examining the spillover effects of credit-risk shocks to *other* group firms.

4. Data and Summary Statistics

For our main analyses, we source business group data from Orbis, a database published by Bureau van Dijk Electronic Publishing (BvDEP) that provides ownership, governance, and financial data for over 200 million public and private firms around the world. We compile several vintages of Orbis data to maximize coverage and to accurately identify bankruptcy events. These vintages, collectively labelled by BvDEP as *Orbis Historical*, reflect the content of the Orbis database at different points in time.

Table 1, Panel A presents the sample selection criteria. In line with Shroff et al. (2014), we begin by identifying "Global Ultimate Owners" (GUOs) following the Orbis criteria. These are independent firms where no single shareholder holds more than 25% of the shares. We rely on the Orbis ownership files to retrieve subsidiaries that are directly held by their respective GUOs (level 1 subsidiaries).[9] We then iterate this process for four additional levels (level 2, 3, 4, and 5 subsidiaries) following the sequential approach used in other studies (Shroff et al., 2014; Beaver et al., 2016; Beuselinck et al., 2016). We eliminate parents and subsidiaries whose Orbis legal form is labelled as "Other legal form." This effectively excludes cooperatives from the sample.[10] We further delete firms with U.S. SIC codes of 8000 to 9999. These include industries, such as *Museums and educational services*, *Private households*, *Membership organizations* (SIC codes 8000-8999) and *Public services* (SIC codes 9000-9999). Finally, we delete firms that do not have assets and turnover of at least U.S. $10,000 for at least one of the years 2004-2012 and with missing net income or EBIT

[9] For each parent-subsidiary pair, we compute control rights using the weakest link approach (La Porta et al., 1999; Claessens et al., 2000; and Nenova, 2003). We retain the parent with highest ownership in each subsidiary.

[10] The drivers of the bankruptcy decision for cooperatives might be significantly different from other types of businesses.

information for all of these years. This leaves us with 186,423 unique subsidiaries belonging to 68,831 unique business groups (Table 1, Panel A).

Based on historical financial data, we construct an eight-year time-series of bankruptcy data (2005-2012) for each subsidiary in our sample, as well as for a set of comparable standalones (i.e., non-group-affiliated). We identify bankrupt firms using the *status* variable from Orbis.[11] We create a bankruptcy firm-year indicator equal to one if a firm goes bankrupt in a given year. Following Shumway (2001), we delete all firm-years after bankruptcy from our sample.[12] This leaves us with 470,684 subsidiary-year observations, pertaining to 85,275 subsidiaries owned by 16,443 business groups. We refer to this as our *Full Sample* (Table 1, Panel A).

Table 1, Panel B presents the by-country distribution of subsidiary firm-year observations included in the *Full Sample*.[13] There are 117 countries represented in the sample: France, Sweden, Japan, Spain, Italy and Finland account for 69% of the subsidiary-firm-year observations.[14]

For our tests based on sovereign downgrades, we identify sovereign rating downgrades based on Almeida et al. (2016) and the Standard and Poor's (S&P) sovereign rating announcements available from the S&P website. We accordingly construct $Downgrade_{i,t}$, an indicator variable equal to one if a firm's country of domicile experiences a downgrade in

[11] By compiling status data from several annual editions of Orbis, we effectively reconstruct a time-series status variable starting in 2005 and ending in 2012.We classify as bankrupt firms with the following statuses: "Active (Insolvency proceedings)," "Bankruptcy," "Dissolved," "Dissolved (bankruptcy)," "Dissolved (litigation)," "In liquidation," and "Inactive (no precision)." Because we require lagged financial ratios for our analysis, we lose observations for the year 2004.

[12] We use the field "status date" to identify the year in which the firm becomes bankrupt. If the status date is missing, we set it equal to the first year in which the firm status changes to bankrupt.

[13] Following Shroff et al. (2014), Beaver et al. (2016), and Beuselinck et al. (2016), we keep in our sample also countries with very few group and/or subsidiary firm-year observations. We do so to avoid a potential "domino effect" in the sample selection procedure induced by the elimination of less populated countries (For further details on this issue, see Beuselinck et al. (2016)).

[14] The distribution of observations by country may not only reflect differences in the number of firms in each country but also cross-country differences in reporting requirements. For example, in the U.S. only public firms are required to file their annual financial statements.

the long-term foreign currency rating, and zero otherwise. Approximately 1% of the subsidiaries in our sample experience sovereign rating downgrades (Table 1, Panel C).

Each year we match, without replacement, subsidiaries with available sovereign rating downgrade information (408,858 subsidiary-year observations in our *Country Shock Sample*) to standalone entities based on country, industry, and size. The resulting sample of successful matches, our *Matched Country Shock Sample* (Table 1, Panel A), includes 362,376 firm-year observations (181,188 subsidiary-years and 181,188 matched standalone-years).

For our industry shock tests, we first compute $Industry\ shock_{i,t}$, a variable meant to capture large increases in industry-level bankruptcy rates.[15] Approximately 24% of subsidiaries experience industry shocks (Table 1, Panel C). We then match subsidiaries with available industry shock information (172,263 subsidiary-year observations in our *Industry Shock Sample*) to standalones, without replacement, based on country, industry and size. The resulting sample of successful matches, our *Matched Industry Shock Sample* (Table 1, Panel A), includes 247,486 firm-year observations (123,743 subsidiary-years and 123,743 matched standalone-years).[16]

Table 1, Panel C presents descriptive statistics for subsidiary and matched standalone firm-year observations. Subsidiaries exhibit an average bankruptcy rate of 1%, whereas the observed bankruptcy rate for standalones is 0.6%. Subsidiaries are on average larger, less profitable, and more leveraged than their standalone counterparts.

For our tests based on intra-group loan information, we collect data from Fame, the U.K.-specific BvDEP database that provides detailed data on intra-group loan assets and liabilities. Lastly, we hand-collect data on changes in RPT regulation from the 2008-2012 editions of the World Bank Doing Business Report.[17]

[15] Details on the computation of our industry shock variable are presented in Appendix.
[16] In all of our samples, we exclude business groups whose parents experience a credit-risk shock to ensure that the effect we document is solely driven by exogenous variation in credit risk at the subsidiary level.
[17] Reports are available for download at http://www.doingbusiness.org/.

5. Do Business Groups Insulate their Subsidiaries from Credit-Risk Shocks?

In this section we probe the extent to which business groups shelter their subsidiaries from credit-risk shocks. Using standalone firms as a benchmark, we examine changes in subsidiary bankruptcy probability following credit-risk shocks.

5.1. Sovereign Rating Downgrades

We first examine whether groups insulate their subsidiaries from sovereign rating downgrades. To this end, we estimate model (1) on our *Matched Country Shock Sample* using sovereign rating downgrades as a shock to credit risk. Table 2, Panel A reports the results from this analysis. The model specifications presented in Columns (1) and (2) do not include fixed effects. The specification in Column (3) adds country-year and industry fixed effects to control for unobservable factors at the country-year and industry level. The main effect of $Downgrade_{i,t}$ is omitted in the specification presented in Column (3) because perfectly collinear with the $Country \times Year$ fixed effects.

Subsidiaries are, on average, more likely to file for bankruptcy than standalone firms. This is in line with standalones being innately less risky than subsidiaries because, while poorly performing standalones typically go bankrupt, poorly performing subsidiaries remain in business longer. Consistent with our expectation and prior research (e.g., Almeida et al., 2016), sovereign rating downgrades produce non-trivial consequences for firms in downgraded countries. Both subsidiaries and standalones are on average more likely to file for bankruptcy in the year following a sovereign rating downgrade. The effect of sovereign downgrades is, however, attenuated for subsidiaries which, compared to standalones, experience lower increases in bankruptcy risk following a shock.

Figure 1 depicts the results from this analysis and highlights the economic significance of our findings. The upper left quadrant presents the estimated bankruptcy probability for

firms that experience and firms that do not experience sovereign rating downgrades. The estimated bankruptcy probability is based on the model specifications presented in Table 2, Panel A, Columns (1) (for all firms) and (2) (for standalones and subsidiaries), respectively, and is calculated holding all other covariates at their mean values. The average estimated bankruptcy probability for firms whose countries do not experience downgrades is 0.7% (0.4% for standalones and 0.9% for subsidiaries). This probability is 1.6% for firms whose countries experience sovereign rating downgrades (1.5% for standalones and 1.7% for subsidiaries). The bottom left quadrant presents the semi-elasticity of bankruptcy probability with respect to $Downgrade_{i,t}$, i.e., the proportional change in bankruptcy probability when firms experience a sovereign rating downgrade. Standalones on average experience a relative 120% increase in bankruptcy rates following a sovereign rating downgrade, whereas this relative increase is only 62% for subsidiaries.

5.2. Industry Shocks

Sovereign rating downgrades are inherently rare events. To ensure that our empirical results are not driven by the idiosyncrasies of this specific shock, we next examine changes in the default probability of subsidiaries following industry-wide increases in bankruptcy rates (i.e., industry shocks). Table 2, Panel B presents the results of this analysis conducted on our *Matched Industry Shock Sample*. Consistent with the evidence from sovereign downgrades, we find that, compared to standalones, subsidiaries experience lower increases in bankruptcy probability following an industry shock. While standalones exhibit a significant increase in bankruptcy probability following a shock (from 0.4% to 0.6%, representing a relative increase of close to 40%), subsidiaries do not (Figure 1, right panels).

Collectively, the evidence presented in Table 2 suggests that business groups act as "shock absorbers" and is in line with coinsurance within groups. These findings suggest that

business groups manage credit risk by reallocating resources to firms close to financial distress. Internal capital markets may thus provide an alternative financing source when firms suffer adverse shocks that limit their ability to raise external capital.

6. Which Business Groups Are More Likely to Support their Subsidiaries?

The extent to which business groups are able to provide insurance to subsidiaries to insulate them from adverse credit-risk shocks hinges, to a great degree, on their overall financial position. The *coinsurance hypothesis* rests on the premise that group firms have varying degrees of exposure to credit-risk shocks (Khanna and Yafeh, 2005), hence country and industry diversification should be important determinants of a group's ability to manage credit risk. Furthermore, to the extent that bank relationships relax firms' liquidity constraints by increasing their ability to raise debt and avoid equity issues (Hoshi et al., 1990), groups with a bank in their corporate structure should also be better at absorbing credit-risk shocks. Finally, credit-risk management may be easier in groups with a pyramidal ownership structure where control takes place through a chain of companies (Faccio and Lang, 2002). Prior theoretical studies in fact show that pyramidal groups, vis-à-vis horizontal groups, are better able to provide intra-group insurance to their subsidiaries (Riyanto and Toolsema, 2008).

In order to examine which groups are more likely to shelter their subsidiaries from shocks to credit risk, we partition our business groups based on the characteristics discussed above, and, specifically, on the number of industries and countries in which they operate, the presence of a bank, the extent of financial constraints, the number of subsidiaries, and the number of levels in the group's ownership structure (which measures the extent to which group structures are pyramidal). We then test whether the magnitude of β_3 (i.e., the differential effect of a credit-risk shock on subsidiaries vis-à-vis standalones in model (1)) is

significantly different across these partitions. A more negative β_3 for subsidiaries of groups where internal capital markets are expected to be more active would provide additional reassurance that the lower sensitivity to credit-risk shocks is attributable to credit-risk management and not to unobservable subsidiary characteristics we fail to control for.[18]

Consistent with our expectations, we find that, relative to their standalone benchmarks, subsidiaries of groups with a large number of subsidiaries, high operational and geographical diversification, and with a bank in the corporate structure, experience significantly lower increases in bankruptcy probability following sovereign rating downgrades (Table 3, Panel A). Similarly, the presence of a bank within the corporate structure and the extent of pyramidal ownership (proxied by the maximum number of subsidiary levels, i.e., 1 to 5) are associated with a lower sensitivity to industry shocks (Table 3, Panel B).

Figure 2 depicts the differential effect of sovereign rating downgrades and industry shocks on the bankruptcy probability of subsidiaries and standalones as a function of the group characteristics discussed above. We estimate model (1) for different levels of business group characteristics. We then plot the estimated coefficients on the interaction term $Subsidiary_{i,t} \times Shock_{i,t}$ and the respective two-tailed 95% confidence bands. Relative to standalone firms, subsidiaries are less affected by shocks if they belong to groups with a large number of subsidiaries, diversified groups (both industry and geographic diversification), and groups with a bank in the corporate structure. The difference is smaller for subsidiaries of financially constrained groups.

[18] Of course, it might still be the case that subsidiaries that are less sensitive to shocks are more likely to be part of groups with an active internal capital market. However, we believe that the combination of the results of our tests and, in particular, the results reported in Section 9 indicating that these groups also exhibit higher levels of intra-group loans, provide us with reasonable reassurance that the effects we document are attributable to intra-group credit-risk management.

7. Which Subsidiaries Are Shielded the Most?

In this section we move from subsidiary/standalone comparisons to examine, within the subsidiary sample, which subsidiaries are more likely to be shielded from credit-risk shocks. Specifically, we test whether the decision to aid a subsidiary depends on: (i) expected costs of subsidiary bankruptcy for the group; and (ii) information sharing and headquarters' ability to monitor subsidiaries and the funds being transferred.

7.1. Expected Costs of Subsidiary Bankruptcy

In the absence of formal guarantees, a group's decision to support a subsidiary depends on whether the expected costs of supporting that subsidiary outweigh the marginal return from the required investment. The bankruptcy of a subsidiary may result in operational disruption, reputational damage, default (if group firms' credit agreements contain cross-default clauses) or a direct liability under veil piercing and breach of fiduciary duty (e.g., Erens et al., 2008; Mevorach, 2009). We use the degree of subsidiary *integration* (i.e., the extent to which subsidiaries collectively carry out common business and are dependent on their parent company) as a proxy for the expected costs of subsidiary bankruptcy for a group. The degree of subsidiary integration is not only associated with potential reputational damage and operational disruption but is also an important consideration in courts' decisions to pierce the corporate veil (Thompson, 1991; Matheson, 2008).[19] We thus expect highly-integrated subsidiaries to be more protected against adverse credit-risk shocks.

We measure the degree of subsidiary integration along several dimensions: (1) full control ($Wholly\ owned_{i,t}$); (2) board interlocks ($Interlock_{i,t}$); (3) shared name ($Shared\ name_i$); (4) relative size within the group ($Relative\ size_{i,t}$); and (5) overlap with

[19] In fact, Matheson (2008) finds that parent control is explicitly identified by courts as a factor relevant to their piercing determinations in 82% of the cases in which the corporate veil is pierced.

parent industry ($Same\ industry_i$). Detailed variable definitions are provided in the Appendix.

A group parent holding 100% of its subsidiary's capital typically elects the subsidiary's board of directors, initiates and approves fundamental corporate changes, and is the sole beneficiary of the subsidiary's profits. Ownership and interlocking directorates therefore imply that a group is in a position to make decisions affecting its subsidiaries' operations (Matheson, 2008). Furthermore, the bankruptcy of a wholly-owned subsidiary, or a subsidiary with an interlocked board, is likely to generate high reputational costs for a group and its directors (Moody's, 1999; S&P, 2004; 2013).[20]

Similarly, subsidiaries named after their parent companies may be perceived by courts, capital providers, and other stakeholders, as the same entity as their group. The bankruptcy of such subsidiaries is thus likely to generate reputational damage and potential obligations beyond limited liability. The relative size of a subsidiary is also likely to be a relevant factor. We expect the bankruptcy of larger subsidiaries to generate higher expected costs. Likewise, subsidiaries that are in the same industry as their parents may share the parents' clients and suppliers and may themselves be a client or supplier of their parents. We thus expect the bankruptcy of these subsidiaries to be particularly costly for a group.

To test this conjecture, we estimate the following model on our *Country Shock Sample* (*Industry Shock Sample*) to examine which subsidiaries are more likely to be sheltered from sovereign downgrades (industry shocks):

$$Pr(Y_{i,t+1} = 1) = f(\alpha_j + \alpha_c \times \alpha_t + \beta_1 Shock_{i,t} + \beta_2 Subsidiary\ Integration_{i,t}^{k} + \beta_3 Subsidiary\ Integration_{i,t}^{k} \times Shock_{i,t} + \gamma' X_{i,t}, \quad (2)$$

where $Subsidiary\ Integration_{i,t}^{k}$, with $k = 1$ to 5, corresponds to the five measures of subsidiary integration discussed above. While we make no prediction regarding β_2, the main

[20] Both of these factors are listed in Powell (1931). Powell's list of factors relevant in a veil piercing decision is often reiterated (partially or in full) in veil piercing cases (Rands, 1998).

effect of each integration proxy on subsidiary bankruptcy probability, we expect β_3 to be negative and significant across all measures.[21]

Table 4, Panel A presents the results of the analysis employing sovereign rating downgrades. We find that subsidiaries that are wholly owned, have interlocked boards and are named after their parents are less likely than other subsidiaries to file for bankruptcy following a sovereign rating downgrade. Similarly, subsidiaries that are larger relative to other firms within the same group, and subsidiaries operating in the same industry of their parents, are also more likely to be sheltered.

The results of the analysis using industry shocks (Table 4, Panel B) are qualitatively similar. However, while still negative, the coefficients on the interactions of $Wholly\ owned_{i,t}$, $Interlock_{i,t}$, and $Relative\ size_{i,t}$, with the industry shock variable are not significant. Nevertheless, and in line with the sovereign credit rating tests, we find that subsidiaries named after their parents and operating in the same industry of their parents are significantly less likely to file for bankruptcy following an industry shock.

Taken together, these findings show that groups take into account the expected costs of subsidiary bankruptcy (e.g., the likelihood of veil piercing) when deciding whether to support a distressed subsidiary.[22]

7.2. Information Sharing and Ease of Monitoring

The decision to bail out a subsidiary likely takes into account not only the magnitude of the spillover effects (i.e., the expected costs) that the bankruptcy of that subsidiary potentially generates for the group, but also the ability to monitor the subsidiary and the use of the funds

[21] Table 1, Panel D presents descriptive statistics for the different subsidiary characteristics. Approximately 41% of the sample subsidiaries are wholly owned, 23% have interlocked boards, 25% are named after their parents and 18% are in the same 3-digit SIC industry code as their parents.

[22] In untabulated robustness tests, we include all subsidiary integration proxies and their respective interactions with the credit-risk shock variables simultaneously in the regression. We choose not to report these results because they are plagued by multicollinearity, as the interactions between the subsidiary integration proxies and credit-risk shocks exhibit very high correlations.

being transferred. We accordingly examine whether geographic and language proximity, as well as ease of real-time communication (either in person or remotely) are positively associated with the decision to allocate resources to a distressed subsidiary.

The survey evidence presented by Graham et al. (2005) suggests that headquarters' CEOs rely on divisional information for capital allocation purposes. Shroff et al. (2014) find that internal information asymmetries between parents and their foreign subsidiaries affect the extent of subsidiary investment. Giroud (2013) shows that proximity between subsidiaries and headquarters lowers information asymmetries and facilitates monitoring. This is because geographic, cultural and language proximity increases the likelihood and frequency of headquarters managers' visits to subsidiaries which, in turn, enable information sharing and more effective monitoring.

Following Giroud (2013) and Bahar (2016), we capture information sharing and ease of subsidiary monitoring by examining: (i) whether the countries of both a subsidiary and its parent have a common geographic border ($Common\ border_i$); (ii) whether the countries of both a subsidiary and its parent share an official language ($Common\ language_i$); (iii) the existence of a direct flight connection between the cities in which the subsidiary and the respective parent are domiciled ($Direct\ flight_i$); and (iv) the number of working hours overlap between the time zones of subsidiary and parent countries ($Working\ hours\ overlap_i$).[23] Details on the construction of these variables are presented in the Appendix.[24]

[23] In our tests we scale the number of working hours overlap between the time zone of a foreign subsidiary and the time zone of the business group headquarters by one plus the minimum working hours overlap of all subsidiaries within the same group. This scaling effectively allows us to capture the working hours overlap of a specific subsidiary *relative* to the other subsidiaries within the same group.

[24] Table 1, Panel C presents descriptive statistics for the different ease of monitoring proxies. Approximately 7% (5%) of the sample subsidiaries are domiciled in countries that have common border (language) with their respective parent firms' countries and 25% of the subsidiaries are reachable by direct flight from their groups' headquarters.

We use the existence of a common geographic border and official spoken language since they capture geographic and cultural proximity which enhances the ability and effectiveness of communication between the group's headquarters and its subsidiary. We use the existence of non-stop flights as higher frequency of business trips facilitates face-to-face interactions and the transmission of knowledge. Lastly, overlap in working hours is meant to capture the possibility of "real-time" communication and monitoring.

Information sharing and effective monitoring decrease information asymmetries regarding subsidiaries' financial health which, in turn, allows business groups to better assess whether it is worth supporting a certain subsidiary. We thus expect the extent to which groups shield their subsidiaries from adverse credit-risk shocks to be increasing in the factors discussed above. To test this conjecture, we estimate the following model for the subset of foreign subsidiaries included in our *Country Shock Sample* (*Industry Shock Sample*) to examine which subsidiaries are more likely to be sheltered from sovereign rating downgrades (industry shocks):

$$Pr(Y_{i,t+1} = 1) = f(\alpha_j + \alpha_c \times \alpha_t + \beta_1 Shock_{i,t} + \beta_2 Ease\ of\ Monitoring_{i,t}^{k} + \beta_3 Ease\ of\ Monitoring_{i,t}^{k} \times Shock_{i,t} + \gamma' X_{i,t}, \quad (3)$$

where $Ease\ of\ Monitoring_{i,t}^{k}$, with $k = 1$ to 4 corresponds to the four proxies discussed above. While we make no prediction regarding β_2, the main effect of each group ease of monitoring proxy on subsidiary bankruptcy probability, we expect β_3 to be negative and significant across all proxies.

Table 5, Panel A presents the results of the analysis employing sovereign rating downgrades. We find that subsidiaries that are connected to their headquarters by a direct flight, or have a larger working hours overlap, are less likely than other subsidiaries to file for bankruptcy following a sovereign rating downgrade. Although negative, the coefficients on $Common\ border_i$ and $Common\ language_i$ are not significant.

The results of the analysis using industry shocks (Table 5, Panel B) are qualitatively similar with the coefficients on $Common\ border_i$ and $Direct\ flight_i$ being negative and significant as expected. Although negative, the coefficients on $Common\ language_i$ and $Working\ hours\ overlap_i$ are not significant.

Collectively, the evidence from these tests is consistent with the idea that subsidiaries that share information with the headquarters and that are easier to monitor exhibit lower sensitivity to credit-risk shocks. Hence, the ability to monitor the use of funds being transferred appears to be another important consideration in the decision to support an ailing subsidiary.[25]

8. Within-Group Bankruptcy Propagation

When a credit-risk shock affecting a subsidiary is particularly severe and a group's overall financial position is weak, the group may decide to let that subsidiary file for bankruptcy.[26] The risk of a *deepening insolvency* lawsuit (whereby a parent company may be held liable for wrongfully prolonging the life of its subsidiary allowing it to take on additional debt) may also limit a parent's incentives to provide support to extend its subsidiary's survival.[27] In the event that a group decides not to bail out a distressed subsidiary and a bankruptcy takes place within the group, subsidiaries may face significant negative spillovers over the course of several years.

In order to examine the extent of within-group bankruptcy contagion, and the period over which contagion takes place, we estimate the following model:

[25] In untabulated robustness tests, we include all ease of monitoring proxies simultaneously in the regression. We choose not to report these results because they are plagued by multicollinearity, as the interactions between the ease of monitoring proxies and credit-risk shocks exhibit very high correlations.

[26] Gamber (1988) shows that when the provision of insurance in an implicit contract faces bankruptcy constraints, persistent shocks are less likely to be insured than temporary shocks.

[27] A seminal case of *deepening insolvency* is Shacht vs. Brown (711 F .2d 1343) where allegations were brought against the directors of the parent company (ARC) that allowed its subsidiary (Reserv) to continue in business and to take on additional liabilities despite its insolvency.

$$Pr(Y_{i,t+k} = 1) = f(\alpha_j + \alpha_c \times \alpha_t + \beta_1 Post\ bankruptcy_{i,t} + \gamma' X_{i,t}), \quad (4)$$

where $k = 0\ to\ 5$ and $Post\ bankruptcy_{i,t}$ is an indicator variable set equal to one if at least another firm belonging to the same business group of subsidiary i files for bankruptcy in year t, and zero otherwise.

Table 6 presents the results from the estimation of model (4) on the *Full Sample* of subsidiary-year observations. We find that the bankruptcy of a subsidiary increases the probability of bankruptcy of other subsidiaries in the group both in the same year and in each of the following three years. This suggests that one of the reasons why groups may shelter a subsidiary from a credit-risk shock is that the bankruptcy of a subsidiary has a ripple effect within the group.

The above analysis focuses on the extreme case in which a bankruptcy ultimately takes place within a group. In general, however, if resources are indeed reallocated within the group to provide insurance to a distressed firm, we should observe an increase in the bankruptcy probability of other subsidiaries, even if no bankruptcy takes place. In order to test this conjecture, we examine how a credit-risk shock to a group-firm spills over to *other* subsidiaries within the same group. Specifically, we estimate the following model on our *Country Shock Sample* (*Industry Shock Sample*) to examine whether the sovereign rating downgrades (industry shocks) affect other (i.e., *non-shocked*) subsidiaries within the same group of a *shocked* subsidiary:

$$Pr(Y_{i,t+1}) = f(\alpha_j + \alpha_c \times \alpha_t + \beta_1 Shock_{i,t} + \beta_2 Other\ shock_{i,t} + \gamma' X_{i,t}), \quad (5)$$

where $Other\ shock_{i,t}$ is either $Other\ downgrade_{i,t}$ or $Other\ industry\ shock_{i,t}$. $Other\ downgrade_{i,t}$ is an indicator variable set equal to one if subsidiary i belongs to the same business group of another subsidiary whose country of domicile experiences a downgrade in the long-term foreign currency rating in year t ($Downgrade_{i,t}$), and zero otherwise. $Other\ industry\ shock_{i,t}$ is an indicator variable set equal to one if subsidiary i

belongs to the same business group of another subsidiary whose industry experiences a large increase in bankruptcy rates in year t ($Industry\ shock_{i,t}$), and zero otherwise.

Table 7 presents the results of this analysis. As shown in Panel A (Panel B), we find that $Other\ downgrade_{i,t}$ ($Other\ industry\ shock_{i,t}$) is positive and significant, suggesting that shocks to credit risk spill over to other subsidiaries within the group. This result is robust to controlling for $Country \times Year$ fixed effects and $Industry$ fixed effects. Our evidence is consistent with subsidiaries providing support to other group firms possibly in exchange for insurance against (future) shocks to their own credit risk (Riyanto and Toolsema, 2008).

9. Pinning Down the Channels of Group Support: Intra-Group Loan Evidence

If the lower credit-risk sensitivity of subsidiaries compared to standalone firms is indeed attributable to intra-group credit-risk management, and intra-group loans are one of the mechanisms through which groups manage credit risk, we should observe changes in intra-group loans surrounding credit-risk shocks. Documenting an increase in the amount of group loans extended by *non-shocked* to *shocked* subsidiaries would help rule out alternative explanations for our findings by providing direct evidence on the mechanisms that groups use to shield distressed subsidiaries. Accordingly, we examine changes in the balances of group loan liabilities (i.e., group loans received) and group loan assets (i.e., group loans provided) surrounding credit-risk shocks. We rely on Fame, a database of U.K. companies published by BvDEP, to obtain data on intra-group loan balances. Our analysis focuses on a sub-sample of "purely domestic" U.K. groups, i.e., we exclude U.K. groups with foreign subsidiaries to make sure all entities have intra-group loan data available. As the U.K. does not experience

any sovereign credit downgrades during our sample period, this analysis is based on industry shocks only.[28]

Table 8, Panel A presents descriptive statistics for our *U.K. Sample*, which includes 18,957 subsidiary-year observations. Intra-group loan balances represent a non-trivial fraction of subsidiaries' assets and liabilities (17% and 36%, respectively). 57% of subsidiaries are net receivers (i.e., they receive more group loans than they provide).

Table 8, Panel B presents the results of the analysis on group loans received. We regress the ratio of intra-group loan liabilities to total liabilities ($Group\ loan\ liab_{i,t}$) on $Industry\ shock_{i,t}$ and a vector of control variables which includes size ($Size_{i,t}$), sales growth ($Growth_{i,t}$), profitability ($Profitability_{i,t}$), leverage ($Leverage_{i,t}$), and asset pledgeability ($Tangibility_{i,t}$) (Columns (1) and (2)). We find that subsidiaries with high investment opportunities (i.e., high growth) experiencing difficulties in accessing external capital markets (e.g., because they are small and exhibit high leverage and low performance) receive higher group loans on average. Most importantly, subsidiaries receive higher group loans following an industry shock. This increase in group loans is consistent with subsidiaries being supported by other group firms and is driven by an increase in short-term group loan liabilities ($ST\ Group\ loan\ liab_{i,t}$) (Column (4)). This suggests that other group firms provide "emergency" short-term support to distressed subsidiaries. Our results are robust to replacing the continuous dependent variable by an indicator variable equal to one if the firm increases its reliance on intra-group loans in year t ($\Delta^{+}Received_{i,t}$) (Columns (5) and (6)).

Table 8, Panel C presents the results of the analysis of group loans received. We regress the ratio of intra-group loan assets to total assets ($Group\ loan\ assets_{i,t}$) on $Industry\ shock_{i,t}$, $Other\ industry\ shock_{i,t}$, and the same set of control variables

[28] The S&P long-term foreign currency credit rating for the U.K. has remained AAA throughout the sample years. S&P has downgraded the U.K. sovereign credit rating to AA on June 27th, 2016 following the Brexit vote, and thus after the end of our sample period.

(Columns (1) and (2)). The coefficient on $Industry\ shock_{i,t}$ is negative, indicating that shocked subsidiaries provide on average less loans to other group firms. Conversely, the coefficient on $Other\ industry\ shock_{i,t}$ is positive, suggesting that, within the same group, subsidiaries unaffected by industry shocks transfer resources to distressed firms. Our results are robust to replacing the continuous dependent variable by an indicator variable equal to one if the firm increases the amount of intra-group loans provided in year t ($\Delta^{+}Received_{i,t}$) (Columns (3) and (4)).

To investigate whether groups previously shown to be more effective at insulating subsidiaries from shocks to credit risk (Section 6) do engage in more active credit-risk management, we examine whether certain group characteristics are associated with higher intra-group loan asset and liability balances (Table 8, Panel D). We find that subsidiaries of large and financially unconstrained groups receive more intra-group loans on average (i.e., have higher (short-term and total) intra-group loan liability balances (Columns (1) and (3)). Subsidiaries of pyramidal groups have on average less group loan liabilities but more group loan assets (Column (4)).

Finally, we examine whether more integrated subsidiaries receive higher intra-group loans (Table 8, Panel E). We include group and year fixed effects in these tests. We find that: (i) subsidiaries that are small relative to the median subsidiary within the same group; (ii) wholly-owned subsidiaries; (iii) subsidiaries with interlocked boards; and (iv) subsidiaries that named after their parents, receive more group loans and, in particular, more short-term group loans (Columns (1) and (3)). These subsidiaries are also more likely to be net receivers, i.e., to have positive net intra-group loan liabilities (Column (5)), despite the fact that wholly-owned subsidiaries with interlocked boards also exhibit higher balances of group loan assets (Column (4)).

10. Do Changes in RPT Regulation Affect Intra-Group Credit-Risk Management?

Prior studies typically advocate stringent regulation of RPTs to curb self-dealing transactions aimed at expropriating minority shareholders (Dyck and Zingales, 2004). The expected benefit of RPT regulation manifests itself in improved country-level financial development and more efficient capital allocation (e.g., Djankov et al., 2008). However, very little is known about other potential consequences of stricter RPT regulation. We posit that stricter regulation may affect the ability and/or willingness of business groups to engage in intra-group credit-risk management. Consistent with our conjecture, anecdotal evidence suggests that business groups refrain from engaging in RPTs aimed at financing certain subsidiaries to avoid breaching anti-self-dealing regulation.[29]

We examine the effect of changes in RPT regulation on the ability of groups to manage credit risk by constructing an index capturing the cumulative change in RPT regulation since 2008 ($RPT\ Score$). Each year, we create three indicator variables equal to one when a country-level reform affecting either: (1) disclosure of RPTs; (2) shareholders' approval of RPTs; or (3) director liability, is enacted, and zero otherwise. We then sum the three indicator variables to calculate the cumulative change in RPT regulation as follows: $RPT\ Score_{i,t} = \sum_{j=2008}^{t} \sum_{l=1}^{3} \Delta RPT_{i,j,l}$, where l = 1 to 3 are the three RPT reform indicators above.

Figure 3 plots changes in RPT regulation for the eighteen countries that experienced changes in RPT regulation during our sample period. While many of these countries have weak financial market infrastructures, others, namely Norway and Sweden, do not.

[29] As an example, following the enactment of OECD regulation aimed at reducing the extent of self-dealing, U.S. firms in the oil and gas industry have experienced problems in financing difficult-to-value projects which otherwise would have received intra-group support. This is because whether RPTs are compliant with OECD regulations is subject to a non-trivial level of judgement (OECD Guidelines, Art. 9, Paragraphs 1.6 and 7.9). Uncertainty about the risk of potential non-compliance discourages firms from engaging in intra-group transactions (e.g., intra-group loans). *Intra-group financing: Transfer pricing and intra-group financing* (International Tax Review). Available at: http://www.internationaltaxreview.com/IssueArticle/3057688/Supplements/Intra-group-financing-Transfer-pricing-and-intra-group-financing.html?supplementListId=86030.

To test whether changes in RPT regulation constrain groups' ability to manage credit risk, we estimate the following model on a matched sample of subsidiaries and standalone firms:

$$Pr(Y_{i,t+1} = 1) = f(\alpha_j + \alpha_c + \alpha_t + \beta_1 RPT\ Score_{i,t} + \beta_2 Subsidiary_{i,t} + \beta_3 RPT\ Score_{i,t} \times Subsidiary_{i,t} + \gamma' X_{i,t}), \quad (6)$$

where the $RPT\ Score$ is as previously defined. If stricter RPT regulation constrains credit-risk management and, consequently, groups are less likely to provide support to their subsidiaries, then β_3 should be positive and significant.

Table 9 presents the results of this analysis. We seek to identify the effect of changes in RPT regulation on the extent of credit-risk management in groups by comparing the effect of changes in RPT regulation on the bankruptcy probability across subsidiaries and standalone firms (Panel A). While RPT regulation may have an effect on bankruptcy probabilities of all firms, there is no reason to expect a differential effect on subsidiaries and standalone firms other than as a result of group dynamics. We find that, relative to standalones, subsidiaries experience an increase in bankruptcy probability following changes in RPT regulation. This is consistent with groups being less likely to provide support to subsidiaries following the enactment of this type of regulation.

In countries with weak financial market development, where access to external capital is constrained, the effect of reduced reliance on internal capital markets on subsidiary bankruptcy probability should be stronger. Accordingly, we further test whether the increase in bankruptcy probability resulting from changes in RPT regulation is more pronounced for subsidiaries domiciled in countries with weak financial market development by estimating the following model on a subset of subsidiaries whose countries experience changes in RPT regulation:

$$Pr(Y_{i,t+1} = 1) = f(\alpha_j + \alpha_c + \alpha_t + \beta_1 RPT\ Score_{i,t} + \beta_2 Weak\ fin\ mkt\ develop_{i,t} + \beta_3 RPT\ Score_{i,t} \times Weak\ fin\ mkt\ develop_{i,t} + \gamma' X_{i,t}), \quad (7)$$

where $Weak\ fin\ mkt\ develop_{i,t}$ is the ratio of total market capitalization of all firms in a country to the country's GDP. We expect the coefficients β_1 and β_3 to be positive and significant.

Consistent with our expectations, in Table 9, Panel B we find that subsidiaries from countries with weak levels of financial market development experience higher increases in bankruptcy probability following the enactment of stricter RPT regulation. This finding suggests that more stringent RPT regulation may affect groups' ability to protect subsidiaries especially when domiciled in countries that offer limited access to external capital markets.

11. Conclusion

We investigate how bankruptcy takes place *within* business groups and find that groups take advantage of their internal capital markets to allocate resources within the corporate structure thereby managing intra-group credit risk and preventing insolvencies.

Group bankruptcies are often large and usually involve different legal entities within the corporate structure. Unlike divisions of conglomerates on which most of prior studies have focused (e.g., Berger and Ofek, 1995; Lamont, 1997; Shin and Stulz, 1998; Giroud and Mueller, 2015), business group subsidiaries are separate legal entities that can individually file for bankruptcy. This peculiarity highlights the importance of understanding how financial distress takes place within a group.

Business groups may be required to support their distressed subsidiaries as a result of explicit or implicit agreements (Merton and Bodie, 1992). Absent these agreements, the decision to help a troubled subsidiary rests on whether the expected costs of offering support outweigh the costs of letting the subsidiary file for bankruptcy. An important consequence of subsidiary bankruptcy that groups may take into account is a potential liability under *veil piercing* (Erens et al., 2008; Mevorach, 2009). In several countries around the world,

bankruptcy courts often "pierce the corporate veil" and hold business groups liable for their distressed subsidiaries' obligations as if these were their own (Matheson, 2008).

Our study relies on the Orbis database which provides financial and ownership information for a large number of group-affiliated firms from around the world. Our evidence supports the idea that business groups actively manage intra-group credit risk by reallocating resources within the corporate structure. Using sovereign rating downgrades and industry shocks as sources of exogenous variation in credit risk, we document that, compared to similar standalone entities, subsidiaries are less sensitive to sudden increases in bankruptcy risk. Our findings are therefore consistent with business groups providing their subsidiaries with intercorporate insurance against adverse liquidity shocks.

The pattern of capital reallocation appears in line with business groups supporting subsidiaries whose bankruptcies are expected to be more costly (e.g., because of risk of veil piercing) and that parent companies can more easily monitor. Further, we find that large and diversified groups are more effective at insulating their subsidiaries from credit-risk shocks. Finally, while prior studies have focused on the potential benefits of stricter anti-self-dealing regulation (Bertrand et al., 2002; Djankov et al., 2008), we show that recent regulatory changes on approval and disclosure of RPTs may hinder business groups' ability to manage credit risk.

One caveat that our study shares with earlier studies (e.g., Claessens et al., 2003; Friedman et al., 2003; Gopalan et al., 2007) is that group affiliation is taken as exogenous (Almeida et al., 2011). While this concern is alleviated by our research design as business groups are unlikely to change their organizational structure in anticipation of unexpected shocks to credit risk, we conduct a number of tests to assess the robustness of our findings to residual endogeneity concerns. Although we cannot completely rule out the possibility that credit-risk shocks have differential effects on subsidiaries and standalones that are unrelated

to intra-group credit-risk management, we believe that the combined evidence of our extensive sets of tests collectively substantiates our conjecture that business groups actively manage intra-group credit risk.

While our analysis indicates that internal capital markets also serve the purpose of managing intra-group credit risk, our findings do not speak to the overall efficiency of such capital reallocations. Rather than attempting to test whether internal capital markets are efficient on net, we show if, and to what extent, they are used for credit-risk management. Similarly, our findings do not imply that stricter RPT regulation is welfare decreasing since its overall effect on economic welfare depends on other general equilibrium considerations.[30]

In sum, our study contributes to the literature by shedding light on how bankruptcy takes place *within* business groups and how internal capital markets are used to manage intra-group credit risk and prevent bankruptcies. By suggesting that cross-country differences in RPT regulation plays an important role for within-group credit-risk management, our evidence can also inform the regulatory debate on cross-border insolvencies.

[30] Any potential benefits of intra-group credit-risk management might in fact be in part offset by the social costs of self-dealing which stricter regulations on approval and disclosure of RPTs are meant to discourage.

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Appendix: Variable Description

Variable	*Definition*
$Y_{i,t+1}$	Indicator variable set equal to one if firm i files for bankruptcy in year $t+1$, and zero otherwise (Source: Orbis).
$Loss_{i,t}$	Indicator variable set equal to one if firm i's return on assets in year t is negative, and zero otherwise (Source: Orbis).
$Profitability_{i,t}$	Return on assets for firm i in year t, defined as net income divided by total assets at the beginning of the year (Source: Orbis).
$Leverage_{i,t}$	Book leverage ratio for firm i in year t, defined as total liabilities divided by total assets (Source: Orbis).
$Debt\ coverage_{i,t}$	Ratio of earnings before interest and taxes to total liabilities for firm i in year t (Source: Orbis).
$Size_{i,t}$	Natural logarithm of total assets for firm i in year t (Source: Orbis).
$Subsidiary_i$	Indicator variable set equal to one if firm i is a subsidiary of a business group, and zero if it is a standalone entity (Source: Orbis).
$Downgrade_{i,t}$	Indicator variable set equal to one if the country in which firm i is domiciled experiences a downgrade in the long-term foreign currency rating in year t, and zero otherwise (Source: Almeida et al., 2016; Standard and Poor's).
$Industry\ shock_{i,t}$	Indicator variable set equal to one if firm i's industry experiences a large increase in bankruptcy rates in year t, and zero otherwise. In order to compute this variable, we first calculate $Bankruptcy\ rate_{c,k,i,t}$, the asset-weighted bankruptcy rate for firm i's country c and (three-digit SIC code) industry k (excluding firm i) as follows: $Bankruptcy\ rate_{c,k,i,t} = \frac{\sum_{j\neq i}^{J} Total\ assets_{c,k,j,t} \times Y_{j,t}}{\sum_{j\neq i}^{J} Total\ assets_{c,k,j,t}}$, where $j = 1\ to\ J$ are all other firms in the same country c and industry k as firm i. We then rank the change in the industry bankruptcy rate ($\Delta Bankruptcy\ rate_{c,k,i,t} = Bankruptcy\ rate_{c,k,i,t} - Bankruptcy\ rate_{c,k,i,t-1}$) by country and year. $Industry\ shock_{i,t}$ is equal to one if $\Delta Bankruptcy\ rate_{c,k,i,t}$ is in the top three deciles of the distribution, and zero otherwise (Source: Orbis).
$Num\ of\ industries_{g,t}$	Natural logarithm of the number of unique one-digit SIC code industries in which business group g's subsidiaries operate in year t (Source: Orbis).
$Num\ of\ countries_{g,t}$	Natural logarithm of the number of unique countries in which business group g's subsidiaries operate in year t (Source: Orbis).
$Bank\ in\ group_{g,t}$	Indicator variable set equal to one if one of the firms in business group g in year t is a bank (two-digit SIC codes 60 and 61), and zero otherwise (Source: Orbis).
$Fin\ constraints_{g,t}$	Measure of financial constraints for business group g in year t, based on Whited and Wu (2006) and calculated as follows: $-0.091 \times \frac{Cash\ flow}{Total\ assets} - 0.062 \times Positive\ dividend + 0.021 \times \frac{Long\ term\ debt}{Total\ assets} - 0.044 \times \log(Total\ assets) + 0.102 \times Industry\ sales\ growth - 0.035 \times Sales\ growth$ (Source: Orbis).
$Num\ of\ subs_{g,t}$	Natural logarithm of the number of subsidiaries belonging to the same business group g in year t (Source: Orbis).
$Num\ of\ levels_{g,t}$	Natural logarithm of the maximum number of levels (1 to 5) in which subsidiaries appear in business group g's ownership structure in year t (Source: Orbis).

Appendix: Variable Description

(continued)

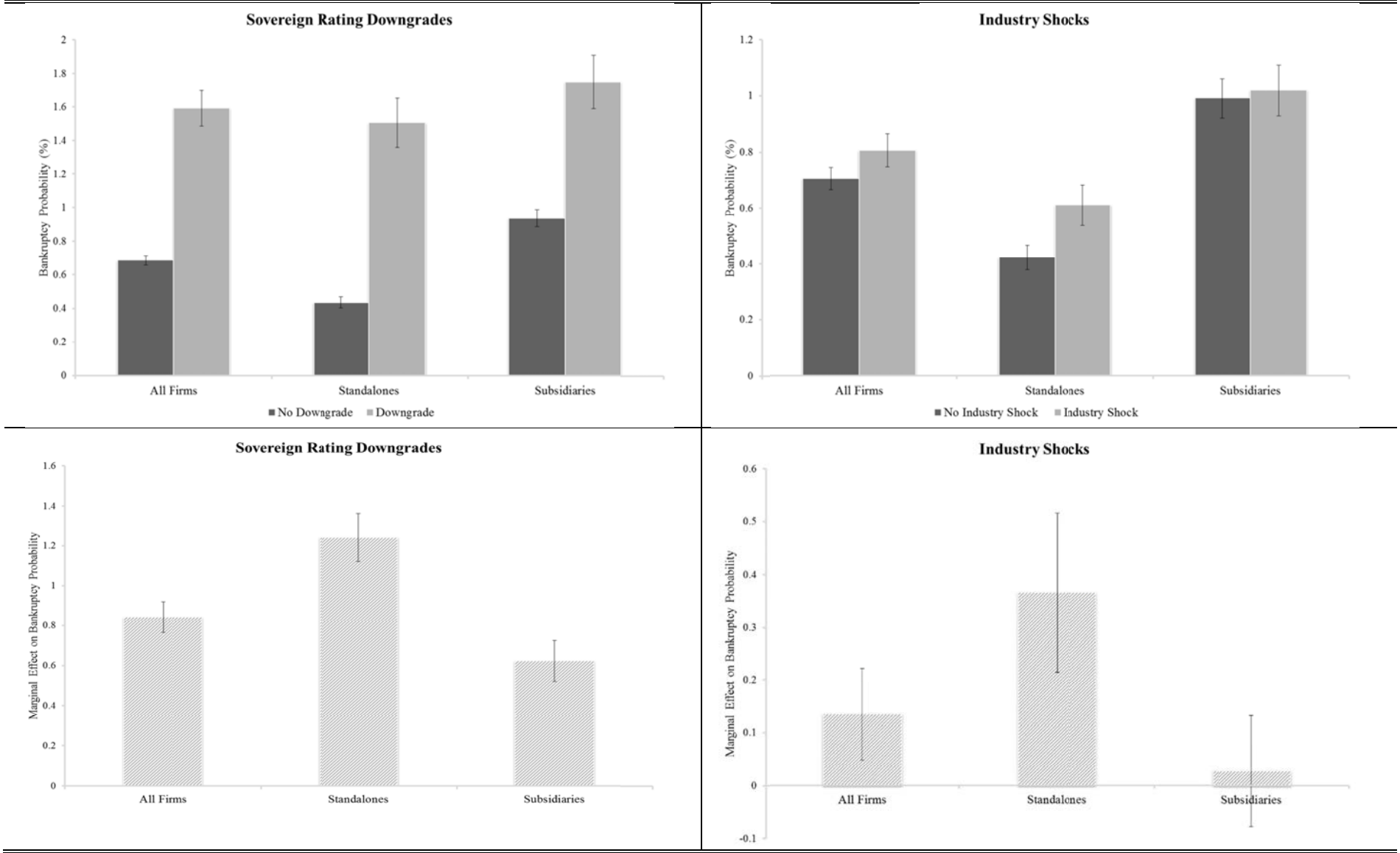
Variable	*Definition*
$Wholly\ owned_{i,t}$	Indicator variable set equal to one if subsidiary i is wholly owned in year t, and zero otherwise (Source: Orbis).
$Interlock_{i,t}$	Indicator variable set equal to one in case of overlap in year t between (i) the board of directors of subsidiary i and (ii) the board of directors of its parent, and zero otherwise (Source: Orbis).
$Shared\ name_i$	Indicator variable set equal to one if subsidiary i is named after its parent, and zero otherwise (Source: Orbis).
$Relative\ size_{i,t}$	Indicator variable set equal to one if the size of subsidiary i in year t (proxied by total assets) is above the median size of all other subsidiaries belonging to the same business group, and zero otherwise (Source: Orbis).
$Same\ industry_i$	Indicator variable set equal to one if subsidiary i is in the same three-digit SIC industry as its parent, and zero otherwise (Source: Orbis).
$Common\ border_i$	Indicator variable set equal to one if subsidiary i's country and the country of its parent have a common border (Source: GeoDist database at CEPII).
$Common\ language_i$	Indicator variable set equal to one if subsidiary i's country and the country of its parent have a common official language (Source: CIA World Factbook).
$Direct\ flight_{i,t}$	Indicator variable set equal to one if there is a commercial non-stop air route between airports within 100Km (conditional on being in the same country) of a foreign subsidiary i in year t and of the business group headquarters, and zero otherwise. To compute distances, we use the geocoded latitude and longitude of the city in which each firm is domiciled. The computation of this indicator follows the approach of Bahar (2016) (Source: http://openflights.org/data.html).
$Working\ hours\ overlap_i$	Number of overlapping working hours calculated as the difference (in number of hours) between the time zone of a foreign subsidiary i and the time zone of the business group headquarters, scaled by one plus the minimum working hours overlap between the time zone of all subsidiaries belonging to the same business group and the time zone of the headquarters. Following Bahar (2016) we assume that working hours run from 8:00am to 6:00pm. To compute working hour differences, we use the geocoded latitude and longitude of the city in which each firm is domiciled.
$Post\ bankruptcy_{i,t}$	Indicator variable set equal to one if at least another firm belonging to the same business group of subsidiary i files for bankruptcy in year t, and zero otherwise.
$Other\ downgrade_{i,t}$	Indicator variable set equal to one if subsidiary i belongs to the same business group of another subsidiary whose country of domicile experiences a downgrade in the long-term foreign currency rating in year t ($Downgrade_{i,t}$), and zero otherwise (Source: Almeida et al. (2016); Standard and Poor's).
$Other\ industry\ shock_{i,t}$	Indicator variable set equal to one if subsidiary i belongs to the same business group of another subsidiary whose industry experiences a large increase in bankruptcy rates in year t ($Industry\ shock_{i,t}$), and zero otherwise (Source: Orbis).
$Growth_{i,t}$	Sales growth for firm i in year t, calculated as the annual percentage change in sales (Source: Fame).
$Tangibility_{i,t}$	Ratio of tangible assets to total assets for firm i in year t (Source: Fame).
$Group\ loan\ liab_{i,t}$	Ratio of the total short-term and long-term intra-group loan liabilities to total liabilities for firm i in year t (Source: Fame).

Appendix: Variable Description

(continued)

Variable	*Definition*
$LT\ Group\ loan\ liab_{i,t}$	Ratio of long-term intra-group loan liabilities to total liabilities for firm i in year t (Source: Fame).
$ST\ Group\ loan\ liab_{i,t}$	Ratio of short-term intra-group loan liabilities to total liabilities for firm i in year t (Source: Fame).
$\Delta^{+}Received_{i,t}$	Indicator variable set equal to one if subsidiary i's reliance on intra-group loan liabilities increases between years $t-1$ and t, and zero otherwise. Firm i's reliance on intra-group loan liabilities increases if the change in the balance of intra-group loan liabilities is larger than the change in the balance of total liabilities (Source: Fame).
$Group\ loan\ assets_{i,t}$	Ratio of intra-group loan assets to total assets for firm i in year t (Source: Fame).
$\Delta^{+}Provided_{i,t}$	Indicator variable set equal to one if subsidiary i's intra-group loan assets in year t increase between years $t-1$ and t, and zero otherwise (Source: Fame).
$Receiver_{i,t}$	Indicator variable set equal to one if subsidiary i's net intra-group loan liabilities in year t are positive (i.e., if intra-group loan liabilities are higher than intra-group loan assets) and zero otherwise (Source: Fame).
$RPT\ Score_{i,t}$	Count variable that measures the cumulative change in related-party transaction (RPT) regulation since 2008. Each year, we create three indicator variables equal to one if there has been a country-level reform affecting either: (1) the disclosure of RPT ($\Delta RPT_{i,t,1}$); (2) the requirement of shareholder approval of RPT ($\Delta RPT_{i,t,2}$); or (3) director liability ($\Delta RPT_{i,t,3}$), and zero otherwise. We then sum the three indicator variables to calculate the cumulative change in RPT regulation indicator as follows: $RPT\ Score_{i,t} = \sum_{j=2008}^{t}\sum_{l=1}^{3}\Delta RPT_{i,j,l}$, where $l = 1\ to\ 3$ are the three RPT reform indicators above (Source: World Bank Doing Business Reports 2008-2012).
$Weak\ fin\ mkt\ develop_{i,t}$	Indicator variable set equal to one if firm i's country of domicile exhibits a weak level of financial market development in year t (i.e., if the ratio of total market capitalization of all firms in a country to the country's GDP is above the sample median), and zero otherwise (Source: World Bank).

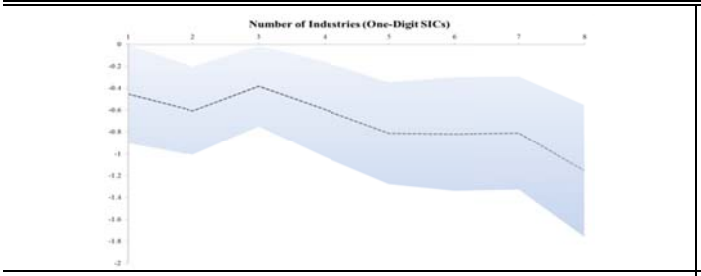
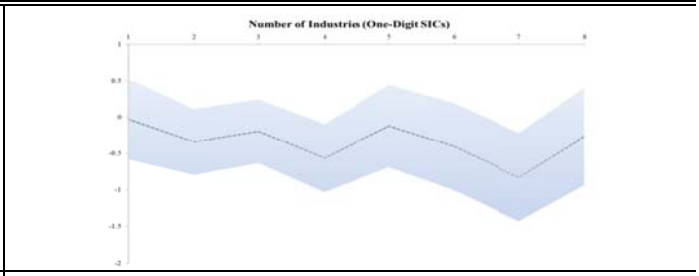
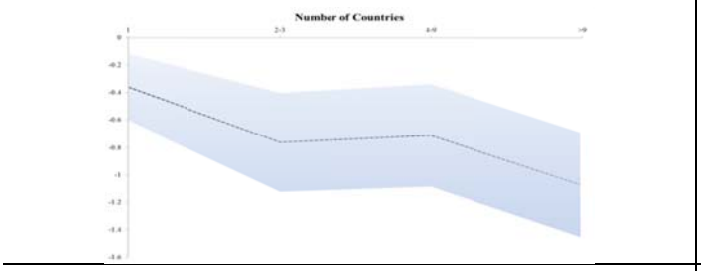
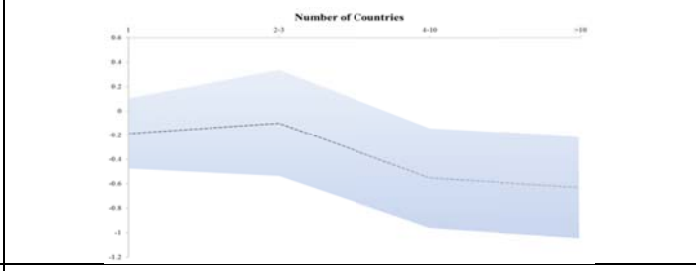
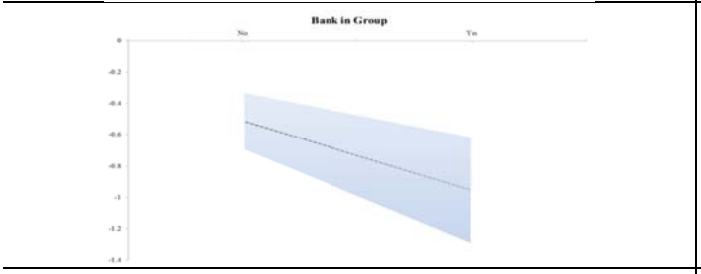
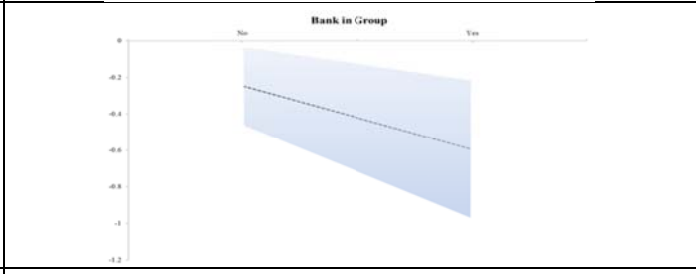
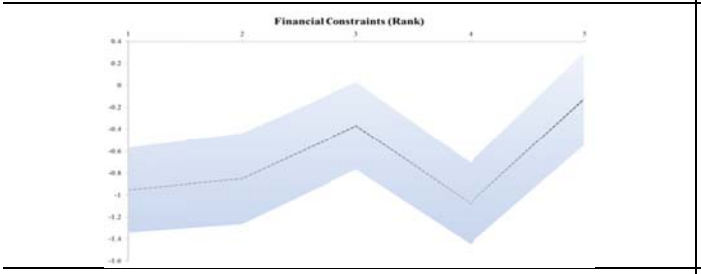
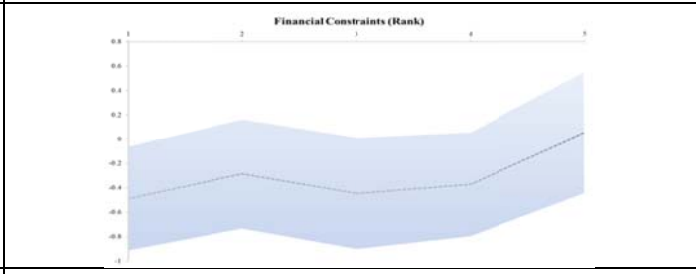
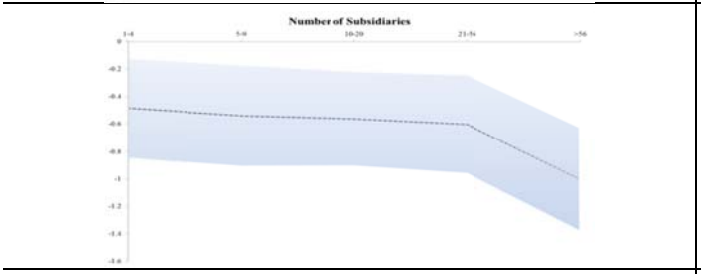
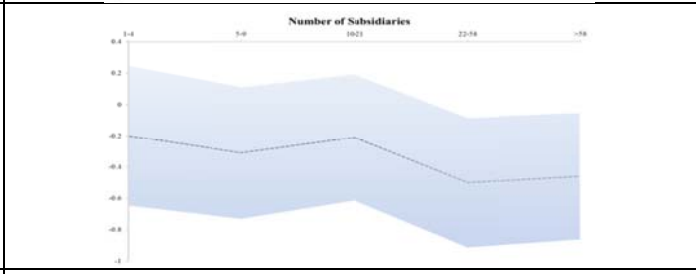
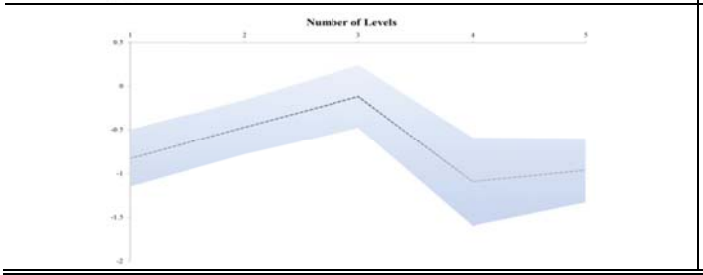
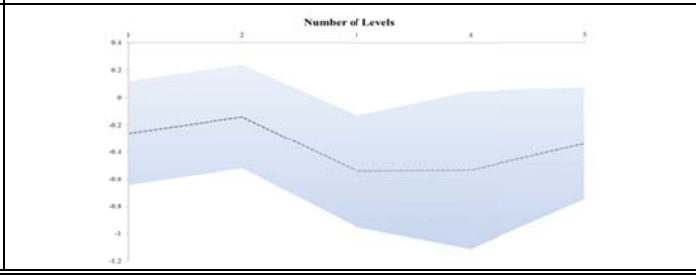
Figure 1: Differential Effects of Credit-Risk Shocks to Subsidiaries and Standalones



This figure depicts the differential effect of credit-risk shocks (i.e., sovereign rating downgrades and industry shocks) on the estimated bankruptcy probability of subsidiaries and standalone firms. The upper left quadrant presents the estimated bankruptcy probability for firms whose countries experience and do not experience sovereign rating

downgrades. The plot bars labeled "All firms" are based on the estimation of the following model: $Pr(Y_{i,t+1} = 1) = f(Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}, Downgrade_{i,t})$ (Table 2, Panel A, Column (1)), whereas the plot bars labelled "Standalones" and "Subsidiaries" are based on the estimation of a different specification of the previous model that includes a subsidiary indicator ($Subsidiary_i$) and its interaction with $Downgrade_{i,t}$: $Pr(Y_{i,t+1} = 1) = f(Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}, Downgrade_{i,t}, Subsidiary_{i,t}, Subsidiary_{i,t} \times Downgrade_{i,t})$ (Table 2, Panel A, Column (2)). In both cases, probabilities are calculated holding all other covariates ($Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}$) at their mean value. The lower left quadrant presents the semi-elasticity of the estimated bankruptcy probability with respect to $Downgrade_{i,t}$, (i.e., the proportional change in the estimated bankruptcy probability as the firm experiences a sovereign rating downgrade ($\partial ln(Y_{i,t+1})/\partial Downgrade_{i,t}$). The upper right quadrant presents the estimated bankruptcy probability for firms that experience and firms that do not experience an industry shock ($Industry\ Shock_{i,t}$). The plot bars labeled "All firms" are based on the estimation of the following model: $Pr(Y_{i,t+1} = 1) = f(Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}, Industry\ Shock_{i,t})$ (Table 2, Panel B, Column (1)), whereas the plot bars labelled "Standalones" and "Subsidiaries" are based on the estimation of a different specification of the previous model that includes a subsidiary indicator ($Subsidiary_{i,t}$) and its interaction with $Industry\ Shock_{i,t}$: $Pr(Y_{i,t+1} = 1) = f(Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}, Industry\ shock_{i,t}, Subsidiary_{i,t}, Subsidiary_{i,t} \times Industry\ shock_{i,t})$ (Table 2, Panel B, Column (2)). In both cases, estimated bankruptcy probabilities are calculated holding all other covariates ($Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}$) at their mean values. The lower right quadrant presents the semi-elasticity of the estimated bankruptcy probability with respect to $Industry\ shock_{i,t}$ (i.e., the proportional change in the estimated bankruptcy probability as the firm experiences an industry shock ($\partial ln(Y_{i,t+1})/\partial Industry\ shock_{i,t}$). The error bars show the 95% confidence intervals of the respective means.

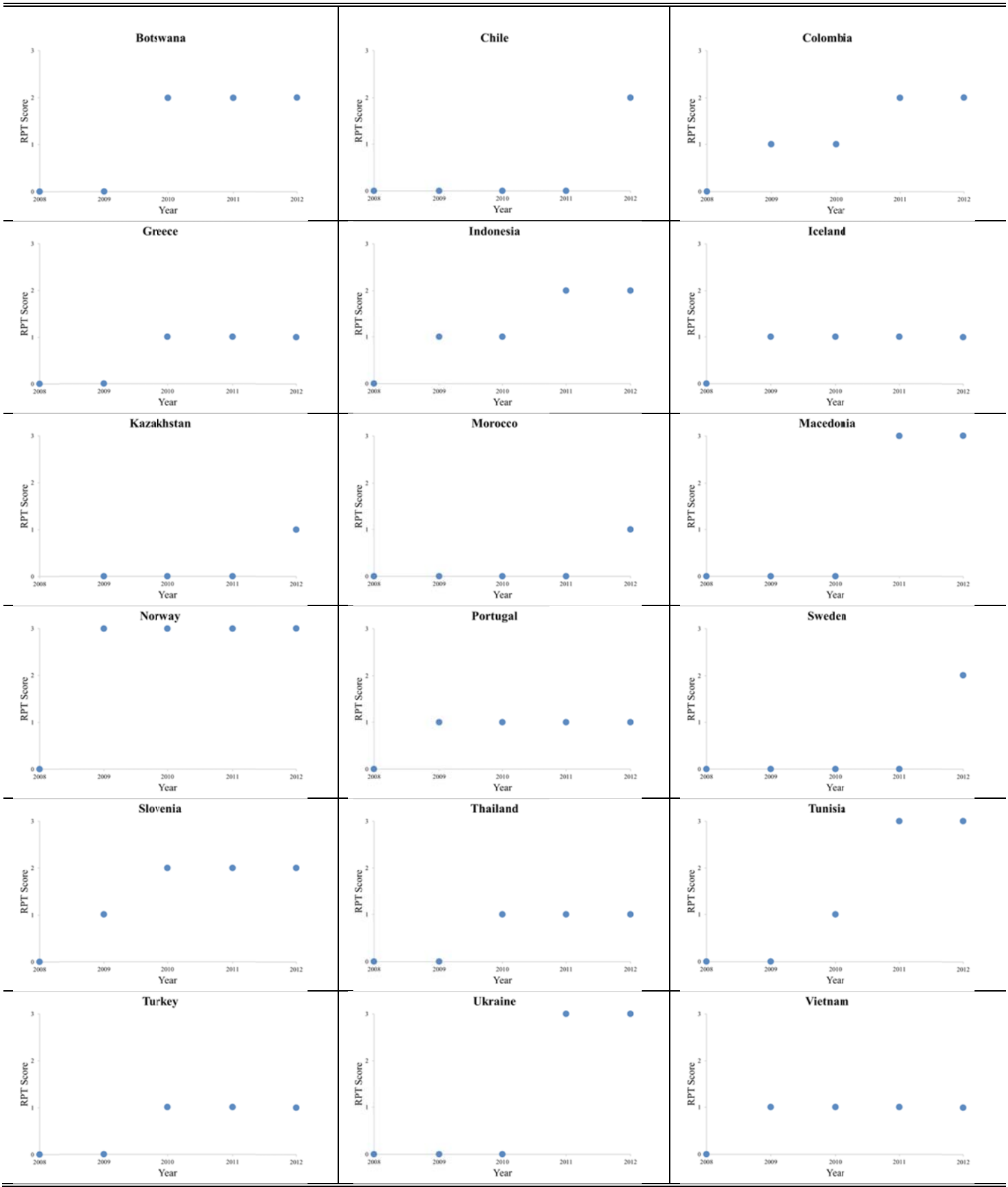
Figure 2: Differential Effects of Credit-Risk Shocks to Subsidiaries and Standalones by Group Characteristics

Sovereign Rating Downgrades	*Industry Shocks*
	
	
	
	
	
	

This figure depicts the differential effect of credit-risk shocks (i.e., sovereign rating downgrades and industry shocks) to subsidiaries and standalones as a function of business group characteristics (i.e., number of industries, number of countries, presence of a bank in the corporate structure, financial constraints, number of subsidiaries, and number of subsidiary levels) .

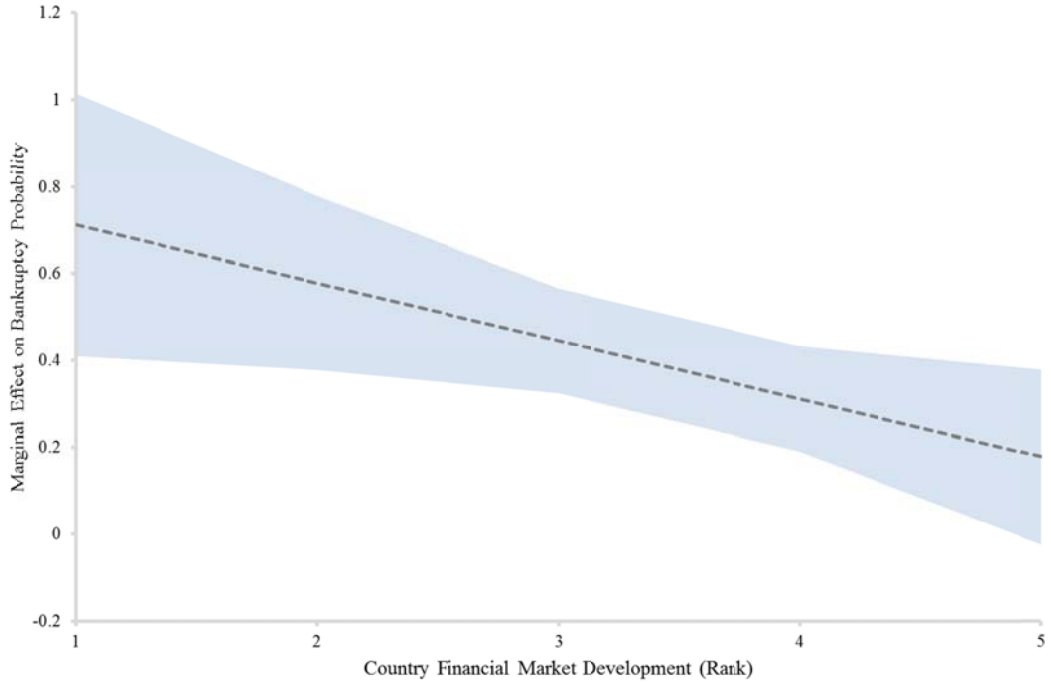
The plots on the left show the effect of sovereign rating downgrades by reporting the coefficients on the interaction term $Subsidiary_{i,t} \times Downgrade_{i,t}$ and the respective two-tailed 95% confidence bands (blue-shaded areas) based on the estimation of the following model: $Pr(Y_{i,t+1} = 1) = f(Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}, Downgrade_{i,t}, Subsidiary_{i,t}, Subsidiary_{i,t} \times Downgrade_{i,t})$ estimated separately for different levels of business group characteristics. The plots on the right show the effect of industry shocks by reporting the coefficients on the interaction term $Subsidiary_{i,t} \times Industry\ Shock_{i,t}$ and the respective two-tailed 95% confidence bands (blue-shaded areas) based on the estimation of the following model: $Pr(Y_{i,t+1} = 1) = f(Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}, Industry\ Shock_{i,t}, Subsidiary_{i,t}, Subsidiary_{i,t} \times Industry\ Shock_{i,t})$ estimated separately for different levels of business group characteristics.

Figure 3: Changes in RPT Regulation



This figure presents related-party transaction (RPT) score ($RPT\ Score_{i,t}$) plots for all sample countries that experience changes in RPT regulation from 2008 to 2012. $RPT\ Score_{i,t}$ is the cumulative change in RPT regulation since 2008. Details on the score computation are presented in the Appendix.

Figure 4: Differential Effect of Changes in Related-Party Transaction (RPT) Regulation on Subsidiary Bankruptcy Probability for Different Degrees of Financial Market Development



This figure depicts the effect of changes in related-party transaction (RPT) regulation on subsidiary bankruptcy probability for different degrees of financial market development. We estimate the following model: $Pr(Y_{i,t+1} = 1) = f(Loss_{i,t}, Profitability_{i,t}, Leverage_{i,t}, Debt\ coverage_{i,t}, Size_{i,t}, RPT\ Score_{i,t}, Rank\ fin\ mkt\ develop_{i,t}, RPT\ Score_{i,t} \times Rank\ fin\ mkt\ develop_{i,t})$ with country, industry and year fixed effects. This is a modified specification of model (7) where $Weak\ fin\ mkt\ develop_{i,t}$ is replaced by the quintile of financial market development ($Rank\ fin\ mkt\ develop_{i,t}$). Financial market development is proxied by the ratio of total market capitalization of all firms in a country to the country's GDP. The plot shows the semi-elasticity of subsidiary estimated bankruptcy probability with respect to $RPT\ Score_{i,t}$ and the respective two-tailed 95% confidence bands (blue-shaded areas). The semi-elasticity represents the proportional change in estimated subsidiary bankruptcy probability of as a subsidiary country experiences an improvement in RPT regulation ($\partial ln(Y_{i,t+1})/\partial RPT\ Score_{i,t}$).

Table 1: Sample Selection and Composition

Panel A: Sample Selection Criteria

Unique business group parents (ultimate owners) with available ownership data, with total assets and sales greater than U.S. $10,000, excluding *Other legal form* entities, *Museums and educational services, Private households, Membership organizations* (SIC codes 8000-8999) and *Public services* (SIC code 9000-9999)	68,831
Unique subsidiaries (levels 1 to 5) with available ownership data, with total assets and sales greater than U.S. $10,000, excluding *Other legal form* entities, *Museums and educational services, Private households, Membership organizations* (SIC codes 8000-8999) and *Public services* (SIC code 9000-9999)	186,423
Initial subsidiary-year observations	1,279,769
- Exclude business groups that do not report consolidated financial statements	(632,971)
- Exclude parent-subsidiary pairs where the parent is not the major shareholder	(162,348)
- Exclude years after bankruptcy for bankrupt subsidiaries	(13,766)
Full Sample of subsidiary-year observations	470,684
Unique subsidiaries	85,275
Unique business groups	16,443
Country Shock Sample of subsidiary-year observations (excludes business groups whose parents are from countries that experience a sovereign credit rating downgrade)	408,858
Unique subsidiaries	82,630
Unique business groups	16,201
Industry Shock Sample of subsidiary-year observations (excludes business groups whose parents experience an industry shock)	172,263
Unique subsidiaries	59,818
Unique business groups	12,283
Matched Country Shock Sample of firm-year observations (subsidiaries from the *Country Shock Sample* with successful matches to standalone firms based on country, industry and closest size)	362,376
Subsidiary-year observations	181,188
Standalone-year observations	181,188
Matched Industry Shock Sample of firm-year observations (subsidiaries from the *Industry Shock Sample* with successful matches to standalone firms based on country, industry and closest size)	247,486
Subsidiary-year observations	123,743
Standalone-year observations	123,743
U.K. Sample of subsidiary-year observations ("purely domestic" business groups with available intra-group loan data)	18,957
Unique subsidiaries	1,648
Unique business groups	4,457

Table 1 (continued)

Panel B: Sample Composition by Country

Country	Business Groups		Subsidiaries		Standalones	
	Obs.	%	Obs.	%	Obs.	%
Algeria	0	0.00	25	0.01	0	0.00
Argentina	9	0.01	453	0.10	10	0.01
Australia	770	0.81	1,038	0.22	235	0.13
Austria	172	0.18	1,828	0.39	495	0.27
Bahamas	9	0.01	0	0.00	0	0.00
Bahrain	12	0.01	18	0.00	0	0.00
Bangladesh	4	0.00	10	0.00	0	0.00
Barbados	6	0.01	17	0.00	0	0.00
Belgium	1,952	2.05	17,100	3.63	1,241	0.68
Bermuda	145	0.15	187	0.04	7	0.00
Bolivia	0	0.00	3	0.00	0	0.00
Bosnia and Herzegovina	0	0.00	296	0.06	0	0.00
Botswana	7	0.01	13	0.00	0	0.00
Brazil	107	0.11	1,058	0.22	58	0.03
Bulgaria	27	0.03	958	0.20	882	0.49
Burkina Faso	0	0.00	2	0.00	0	0.00
Canada	797	0.84	951	0.20	415	0.23
Cayman Islands	72	0.08	180	0.04	0	0.00
Chile	68	0.07	167	0.04	7	0.00
China	869	0.91	1,924	0.41	1,378	0.76
Colombia	0	0.00	1,143	0.24	1,140	0.63
Costa Rica	0	0.00	4	0.00	0	0.00
Côte d'Ivoire	0	0.00	15	0.00	0	0.00
Croatia	45	0.05	1,382	0.29	464	0.26
Curaçao	14	0.01	7	0.00	0	0.00
Cyprus	63	0.07	114	0.02	34	0.02
Czech Republic	90	0.09	4,463	0.95	3,678	2.03
Denmark	1,615	1.70	4,608	0.98	225	0.12
Dominica	0	0.00	6	0.00	0	0.00
Ecuador	0	0.00	13	0.00	5	0.00
Egypt	47	0.05	109	0.02	42	0.02
El Salvador	0	0.00	6	0.00	0	0.00
Estonia	14	0.01	2,320	0.49	1,398	0.77
Fiji	7	0.01	7	0.00	0	0.00
Finland	7,518	7.90	21,347	4.54	1,364	0.75
France	6,709	7.05	70,865	15.06	31,231	17.24
Gabon	0	0.00	8	0.00	0	0.00
Germany	2,040	2.14	14,337	3.05	4,225	2.33
Ghana	0	0.00	15	0.00	0	0.00
Gibraltar	10	0.01	0	0.00	0	0.00
Greece	641	0.67	3,488	0.74	2,234	1.23
Guatemala	0	0.00	4	0.00	0	0.00
Guyana	0	0.00	6	0.00	0	0.00
Hong Kong	58	0.06	89	0.02	0	0.00
Hungary	75	0.08	273	0.06	212	0.12
Iceland	78	0.08	347	0.07	321	0.18
India	1,412	1.48	5,938	1.26	2,958	1.63
Indonesia	50	0.05	194	0.04	4	0.00
Iran	1	0.00	1	0.00	0	0.00
Ireland	301	0.32	737	0.16	500	0.28

(continued)

Table 1 (continued)

(continued)

Country	Business Groups		Subsidiaries		Standalones	
	Obs.	%	Obs.	%	Obs.	%
Israel	269	0.28	244	0.05	32	0.02
Italy	3,694	3.88	28,883	6.14	26,067	14.39
Jamaica	17	0.02	16	0.00	0	0.00
Japan	8,718	9.16	43,310	9.20	1,036	0.57
Jordan	120	0.13	338	0.07	59	0.03
Kazakhstan	0	0.00	16	0.00	4	0.00
Kenya	9	0.01	43	0.01	0	0.00
Korea	1,495	1.57	5,622	1.19	5,281	2.91
Kuwait	142	0.15	259	0.06	17	0.01
Latvia	265	0.28	623	0.13	212	0.12
Liberia	4	0.00	0	0.00	0	0.00
Lithuania	31	0.03	885	0.19	438	0.24
Luxembourg	91	0.10	814	0.17	256	0.14
Macedonia	11	0.01	10	0.00	3	0.00
Malaysia	242	0.25	416	0.09	341	0.19
Malta	88	0.09	302	0.06	46	0.03
Marshall Islands	13	0.01	3	0.00	0	0.00
Mauritius	24	0.03	29	0.01	0	0.00
Mexico	73	0.08	717	0.15	5	0.00
Moldova	0	0.00	11	0.00	0	0.00
Monaco	0	0.00	7	0.00	0	0.00
Montenegro	0	0.00	22	0.00	2	0.00
Morocco	1	0.00	30	0.01	0	0.00
Namibia	0	0.00	3	0.00	0	0.00
Nepal	0	0.00	11	0.00	0	0.00
Netherlands	4,811	5.06	10,197	2.17	238	0.13
New Zealand	19	0.02	360	0.08	25	0.01
Nigeria	13	0.01	91	0.02	0	0.00
Norway	1,985	2.09	21,212	4.51	10,935	6.04
Oman	40	0.04	95	0.02	21	0.01
Pakistan	58	0.06	178	0.04	113	0.06
Palestine	12	0.01	64	0.01	0	0.00
Panama	0	0.00	3	0.00	0	0.00
Paraguay	0	0.00	6	0.00	0	0.00
Peru	22	0.02	69	0.01	14	0.01
Philippines	21	0.02	106	0.02	0	0.00
Poland	1,415	1.49	10,937	2.32	5,689	3.14
Portugal	863	0.91	9,414	2.00	8,474	4.68
Qatar	6	0.01	13	0.00	0	0.00
Romania	0	0.00	2,602	0.55	2,427	1.34
Russia	293	0.31	5,238	1.11	4,767	2.63
Saudi Arabia	65	0.07	78	0.02	10	0.01
Serbia and Montenegro	8	0.01	909	0.19	761	0.42
Singapore	209	0.22	310	0.07	13	0.01
Slovakia	9	0.01	1,221	0.26	975	0.54
Slovenia	30	0.03	1,188	0.25	956	0.53
South Africa	148	0.16	124	0.03	0	0.00
Spain	4,445	4.67	40,305	8.56	29,035	16.02
Sri Lanka	76	0.08	277	0.06	0	0.00
Sweden	21,001	22.07	66,766	14.18	1,397	0.77

(continued)

Table 1 (continued)

(continued)

Country	Business Groups		Subsidiaries		Standalones	
	Obs.	%	Obs.	%	Obs.	%
Switzerland	588	0.62	452	0.10	77	0.04
Taiwan	1,864	1.96	3,687	0.78	144	0.08
Tanzania	0	0.00	8	0.00	0	0.00
Thailand	121	0.13	352	0.07	302	0.17
Trinidad and Tobago	4	0.00	12	0.00	0	0.00
Tunisia	0	0.00	14	0.00	0	0.00
Turkey	78	0.08	447	0.09	314	0.17
Ukraine	8	0.01	727	0.15	694	0.38
United Arab Emirates	21	0.02	10	0.00	0	0.00
United Kingdom	11,031	11.59	51,572	10.96	24,875	13.73
United States	4,681	4.92	809	0.17	314	0.17
Uruguay	0	0.00	3	0.00	0	0.00
Venezuela	4	0.00	19	0.00	0	0.00
Vietnam	54	0.06	102	0.02	56	0.03
Virgin Islands	20	0.02	6	0.00	0	0.00
Zambia	0	0.00	7	0.00	0	0.00
Zimbabwe	0	0.00	6	0.00	0	0.00
Total	95,144	100.00	470,684	100.00	181,188	100.00

Table 1 (continued)

Panel C: Descriptive Statistics for Variables Used in the Main Models

	Obs.	Mean	Std. Dev.	P25	Median	P75
<u>*Subsidiary bankruptcy-related variables*</u>:						
$Y_{i,t+1}$	470,684	0.010	0.097	0.000	0.000	0.000
$Loss_{i,t}$	470,684	0.262	0.439	0.000	0.000	1.000
$Profitability_{i,t}$	470,684	0.037	0.173	-0.005	0.027	0.090
$Leverage_{i,t}$	470,684	0.671	0.370	0.437	0.679	0.873
$Debt\ coverage_{i,t}$	470,684	0.137	0.453	-0.003	0.065	0.213
$Size_{i,t}$	470,684	9.095	2.227	7.589	9.039	10.545
<u>*Standalone bankruptcy-related variables*</u>:						
$Y_{i,t+1}$	181,188	0.006	0.079	0.000	0.000	0.000
$Loss_{i,t}$	181,188	0.248	0.432	0.000	0.000	0.000
$Profitability_{i,t}$	181,188	0.057	0.245	-0.002	0.023	0.089
$Leverage_{i,t}$	181,188	0.646	0.403	0.387	0.649	0.859
$Debt\ coverage_{i,t}$	181,188	0.176	0.918	0.001	0.066	0.223
$Size_{i,t}$	181,188	7.327	1.865	6.195	7.394	8.587
<u>*Subsidiary integration variables*</u>:						
$Wholly\ owned_{i,t}$	470,684	0.410	0.492	0.000	0.000	1.000
$Interlock_{i,t}$	447,259	0.228	0.420	0.000	0.000	0.000
$Shared\ name_{i}$	470,684	0.250	0.433	0.000	0.000	0.000
$Relative\ size_{i,t}$	470,684	0.444	0.497	0.000	0.000	1.000
$Same\ industry_{i}$	470,684	0.178	0.383	0.000	0.000	0.000
<u>*Subsidiary ease of monitoring variables*</u>:						
$Common\ border_{i}$	466,995	0.074	0.262	0.000	0.000	0.000
$Common\ language_{i}$	466,995	0.052	0.222	0.000	0.000	0.000
$Direct\ flight_{i,t}$	300,524	0.251	0.434	0.000	0.000	1.000
$Working\ hours\ overlap_{i}$	300,524	1.394	1.197	0.909	0.909	1.000
<u>*Sovereign rating downgrade variables*</u>:						
$Downgrade_{i,t}$	408,858	0.007	0.086	0.000	0.000	0.000
$Other\ downgrade_{i,t}$	408,858	0.233	0.423	0.000	0.000	0.000
<u>*Industry shock variables*</u>:						
$Industry\ shock_{i,t}$	174,263	0.242	0.428	0.000	0.000	0.000
$Other\ industry\ shock_{i,t}$	174,263	0.677	0.468	0.000	1.000	1.000

This table presents sample selection criteria, sample composition and descriptive statistics for business group, subsidiary and standalone firm-year observations. Panel A presents the sample selection criteria. We build six different samples: (1) the *Full Sample* of subsidiary-year observations; (2) the *Country Shock* sample of subsidiary-year observations; (3) the *Industry Shock Sample* of subsidiary-year observations; (4) the *Matched Country Shock Sample* of subsidiary and standalone firm-year observations; (5) the *Matched Industry Shock Sample* of subsidiary and standalone firm-year observations; and (6) the *U.K. Sample* of subsidiary-year observations. The *Matched Country Shock Sample* and the *Matched Industry Shock Sample* respectively represent subsets of observations from the *Country Shock Sample* and the *Industry Shock Sample* for which a successful match between subsidiaries and standalone obtains. Standalones are matched (without replacement) to subsidiaries based on country, industry and closest size. Panels B presents the *Full Sample* distribution by country. The Columns "Subsidiaries" and "Business Groups" refer to subsidiary-year observations in the *Full Sample* and their respective (business group) parent-year observations. The Column "Standalones" refers to standalone-year observations in the *Matched Country Shock Sample*. Panel C presents descriptive statistics for the variables used in the main bankruptcy models, the different measures of subsidiary integration, ease of monitoring, sovereign rating downgrade and industry shock variables. All variables are defined in the Appendix.

Table 2: Country and Industry Shocks

Panel A: Sovereign Rating Downgrades

		Dependent variable: $Y_{i,t+1}$		
Independent variables:		(1)	(2)	(3)
$Loss_{i,t}$	(+)	0.487***	0.458***	0.449***
		(5.73)	(5.30)	(5.95)
$Profitability_{i,t}$	(–)	-0.295***	-0.229***	-0.278***
		(-4.27)	(-3.93)	(-3.75)
$Leverage_{i,t}$	(+)	0.131***	0.100***	0.093***
		(9.32)	(5.63)	(4.37)
$Debt\ coverage_{i,t}$	(–)	-0.134***	-0.130***	-0.149***
		(-5.53)	(-5.59)	(-9.83)
$Size_{i,t}$	(–)	-0.035	-0.069*	-0.074***
		(-0.99)	(-1.80)	(-3.35)
$Downgrade_{i,t}$	(+)	0.851**	1.253***	
		(2.38)	(3.85)	
$Subsidiary_{i,t}$	(?)		0.774***	0.799***
			(4.04)	(4.38)
$Subsidiary_{i,t} \times Downgrade_{i,t}$	(–)		-0.622***	-0.641***
			(-4.04)	(-3.95)
Country × Year fixed effects		No	No	Yes
Industry fixed effects		No	No	Yes
Obs.		362,376	362,376	327,700
Pseudo R^2		0.0305	0.0386	0.1663

Table 2 (continued)

Panel B: Industry Shocks

		Dependent variable: $Y_{i,t+1}$		
Independent variables:		(1)	(2)	(3)
$Loss_{i,t}$	(+)	0.949***	0.914***	0.857***
		(11.82)	(11.53)	(15.19)
$Profitability_{i,t}$	(–)	-0.449***	-0.346***	-0.369***
		(-8.66)	(-4.56)	(-2.74)
$Leverage_{i,t}$	(+)	0.137***	0.098***	0.095***
		(5.30)	(2.73)	(2.93)
$Debt\ coverage_{i,t}$	(–)	-0.049**	-0.047**	-0.061**
		(-2.01)	(-2.26)	(-2.53)
$Size_{i,t}$	(–)	-0.018	-0.062	-0.095**
		(-0.30)	(-0.84)	(-2.35)
$Industry\ shock_{i,t}$	(+)	0.136	0.367**	0.457***
		(1.53)	(2.41)	(6.78)
$Subsidiary_{i,t}$	(?)		0.858***	0.933***
			(3.03)	(3.85)
$Subsidiary_{i,t} \times Industry\ shock_{i,t}$	(–)		-0.339**	-0.364***
			(-2.55)	(-2.89)
Country × Year fixed effects		No	No	Yes
Industry fixed effects		No	No	Yes
Obs.		247,486	247,486	223,370
Pseudo R^2		0.0358	0.0456	0.1725

This table presents the results of the analysis that examines the effect of sovereign rating downgrades (Panel A) and industry shocks (Panel B) on the estimated bankruptcy probability of subsidiary and standalone firms. The table reports coefficients and (in parentheses) *z*-statistics from the estimation of a discrete hazard model for subsidiary and standalone observations included in the *Matched Country Shock Sample* (Panel A) and in the *Matched Industry Shock Sample* (Panel B). These samples respectively represent subsets of observations from the *Country Shock Sample* and the *Industry Shock Sample* for which a successful match between subsidiaries and standalone obtains. Standalones are matched (without replacement) to subsidiaries based on country, industry and closest size. The dependent variable is equal to one if the respective firm (subsidiary or standalone) files for bankruptcy in year $t + 1$, and zero otherwise. $Subsidiary_{i,t}$ is an indicator variable equal to one if the firm is affiliated to a business group (i.e., a subsidiary), and zero if it is a standalone entity. Model specifications presented in Column (3), Panels A and B include country × year and industry fixed effects. In Panel A, Column (3), the main effect of $Downgrade_{i,t}$ is omitted because perfectly collinear with the country × year fixed effects. All models are estimated with an intercept (not tabulated). All variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the subsidiary and year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 3: Group Characteristics

Panel A: Sovereign Rating Downgrades

	Dependent variable: $Y_{i,t+1}$											
	Number of industries		*Number of countries*		*Bank in group*		*Financial constraints*		*Number of subsidiaries*		*Number of levels*	
	Low	*High*	*Low*	*High*	*No*	*Yes*	*Low*	*High*	*Low*	*High*	*Low*	*High*
Independent variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Loss_{i,t}$	0.401***	0.500***	0.443***	0.461***	0.447***	0.455***	0.465***	0.363***	0.376***	0.436***	0.385***	0.507***
	(5.89)	(5.54)	(5.68)	(4.92)	(7.10)	(4.10)	(5.21)	(5.10)	(6.32)	(4.97)	(5.25)	(5.77)
$Profitability_{i,t}$	-0.270**	-0.277***	-0.405***	-0.104	-0.329***	-0.142	-0.149	-0.257***	-0.288**	-0.179***	-0.324***	-0.213**
	(-2.48)	(-4.84)	(-5.89)	(-0.54)	(-4.34)	(-1.50)	(-0.84)	(-3.54)	(-2.52)	(-2.66)	(-4.65)	(-2.16)
$Leverage_{i,t}$	0.094***	0.096***	0.081***	0.112***	0.091***	0.100***	0.137***	0.068***	0.088***	0.095***	0.080***	0.115***
	(4.45)	(3.64)	(4.47)	(4.03)	(4.40)	(4.20)	(5.41)	(5.23)	(4.86)	(3.95)	(3.05)	(5.61)
$Debt\ coverage_{i,t}$	-0.154***	-0.143***	-0.145***	-0.159***	-0.163***	-0.114***	-0.197***	-0.113***	-0.095***	-0.161***	-0.140***	-0.154***
	(-15.48)	(-4.27)	(-15.73)	(-4.44)	(-8.57)	(-3.54)	(-5.88)	(-4.11)	(-3.84)	(-7.72)	(-10.28)	(-5.66)
$Size_{i,t}$	-0.066***	-0.081***	-0.047***	-0.096***	-0.060***	-0.111***	-0.051	-0.085***	-0.045**	-0.091***	-0.049*	-0.090***
	(-2.72)	(-2.87)	(-2.59)	(-2.89)	(-2.83)	(-3.25)	(-1.30)	(-5.28)	(-2.03)	(-3.08)	(-1.93)	(-3.16)
$Subsidiary_{i,t}$	0.743***	0.857***	0.782***	0.830***	0.709***	1.056***	0.705***	0.675***	0.529***	0.846***	0.748***	0.791***
	(5.71)	(3.40)	(4.14)	(4.32)	(5.38)	(3.12)	(3.50)	(3.39)	(3.19)	(3.34)	(4.75)	(3.43)
$Subsidiary_{i,t} \times Downgrade_{i,t}$	-0.482***	-0.791***	-0.402***	-0.995***	-0.535***	-0.952***	-0.864***	-0.511***	-0.291**	-0.780***	-0.592***	-0.624***
	(-4.12)	(-3.29)	(-2.74)	(-4.36)	(-4.37)	(-2.93)	(-3.50)	(-3.30)	(-1.96)	(-3.19)	(-5.47)	(-2.74)
Country × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test for difference in $Subsidiary_{i,t} \times Downgrade_{i,t}$ χ^2 (p-value)	3.29 (0.0698)		11.60 (0.0007)		4.05 (0.0443)		1.75 (0.1860)		8.58 (0.0034)		0.03 (0.8520)	
Obs.	165,184	146,424	184,082	129,934	246,958	71,582	112,942	115,572	157,566	156,314	160,642	151,384
Pseudo R^2	0.1631	0.1665	0.1620	0.1732	0.1617	0.1886	0.1425	0.1018	0.1088	0.1702	0.1443	0.1610

Table 3 (continued)

Panel B: Industry Shocks

	Dependent variable: $Y_{i,t+1}$											
	Number of industries		*Number of countries*		*Bank in group*		*Financial constraints*		*Number of subsidiaries*		*Number of levels*	
	Low	High	Low	High	No	Yes	Low	High	Low	High	Low	High
Independent variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Loss_{i,t}$	0.937***	0.797***	0.906***	0.806***	0.943***	0.614***	0.883***	0.671***	0.934***	0.790***	0.955***	0.753***
	(13.60)	(13.32)	(12.12)	(12.44)	(12.40)	(14.39)	(28.67)	(6.35)	(11.33)	(14.97)	(13.80)	(13.99)
$Profitability_{i,t}$	-0.167	-0.554**	-0.559**	-0.160	-0.461***	-0.216	-0.157	-0.357*	-0.576***	-0.210	-0.350**	-0.372***
	(-1.04)	(-2.55)	(-2.09)	(-1.43)	(-3.02)	(-1.30)	(-1.13)	(-1.90)	(-3.56)	(-1.33)	(-2.11)	(-3.38)
$Leverage_{i,t}$	0.104***	0.091***	0.080**	0.117***	0.089***	0.105***	0.154***	0.071**	0.097***	0.089***	0.078**	0.125***
	(2.63)	(2.95)	(2.34)	(3.91)	(2.65)	(3.66)	(5.25)	(2.49)	(2.68)	(3.06)	(2.05)	(4.10)
$Debt\ coverage_{i,t}$	-0.050**	-0.064**	-0.067**	-0.058	-0.039	-0.098	-0.094	-0.051	-0.017	-0.095***	-0.013	-0.113***
	(-2.32)	(-1.97)	(-2.30)	(-1.26)	(-0.78)	(-1.51)	(-1.49)	(-1.51)	(-0.50)	(-2.66)	(-0.31)	(-3.54)
$Size_{i,t}$	-0.104***	-0.091**	-0.096***	-0.092*	-0.087**	-0.122***	-0.048	-0.115***	-0.089***	-0.101**	-0.093***	-0.091**
	(-2.63)	(-2.22)	(-2.62)	(-1.95)	(-2.24)	(-3.32)	(-0.95)	(-5.29)	(-3.14)	(-2.01)	(-2.66)	(-2.00)
$Industry\ shock_{i,t}$	0.377***	0.530***	0.363***	0.519***	0.438***	0.519***	0.494***	0.315***	0.428***	0.486***	0.359***	0.530***
	(5.30)	(8.47)	(4.66)	(7.24)	(7.03)	(3.54)	(10.09)	(3.07)	(4.13)	(4.98)	(4.33)	(9.33)
$Subsidiary_{i,t}$	0.870***	0.992***	0.925***	0.941***	0.781***	1.375***	0.799***	0.754***	0.888***	0.976***	0.919***	0.911***
	(4.16)	(3.63)	(3.01)	(4.76)	(3.24)	(5.80)	(3.32)	(3.00)	(4.87)	(3.08)	(4.22)	(3.14)
$Subsidiary_{i,t} \times Industry\ shock_{i,t}$	-0.220**	-0.491***	-0.210**	-0.526**	-0.260**	-0.645***	-0.473***	-0.216	-0.222	-0.488***	-0.183	-0.519***
	(-1.97)	(-3.19)	(-2.19)	(-2.47)	(-2.07)	(-3.13)	(-3.96)	(-1.17)	(-1.16)	(-2.95)	(-1.52)	(-3.96)
Country × Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test for difference in $Subsidiary_{i,t} \times Industry\ shock_{i,t}$ χ^2 (p-value)	1.87 (0.1710)		2.56 (0.1093)		2.80 (0.0941)		0.12 (0.7290)		1.76 (0.1849)		2.96 (0.0855)	
Obs.	111,670	103,540	125,932	92,006	168,480	45,786	87,794	93,644	111,486	103,390	113,784	102,068
Pseudo R^2	0.1765	0.1699	0.1752	0.1740	0.1714	0.1795	0.1635	0.1233	0.1742	0.1698	0.1752	0.1718

This table presents the results of the analysis that examines whether the effect of sovereign rating downgrades (Panel A) and industry shocks (Panel B) on subsidiary estimated bankruptcy probability varies with specific business group characteristics. The table reports coefficients and (in parentheses) *z*-statistics from the estimation of a discrete hazard model for subsidiary and standalone observations included in the *Matched Country Shock Sample* (Panel A) and in the *Matched Industry Shock Sample* (Panel B). These samples respectively represent subsets of observations from the *Country Shock Sample* and the *Industry Shock Sample* for which a successful match between subsidiaries and standalone obtains. Standalones are matched (without replacement) to subsidiaries based on country, industry and closest size. Observations are partitioned into sub-samples ("Low" and "High" or "No" and "Yes") based on different business group characteristics. The "Low" ("High") Column presents estimates based on subsidiaries belonging to business groups where each characteristic is below (above) the respective sample median. Similarly, the "Yes" ("No") Column presents estimates based on subsidiaries belonging to business groups with (without) a specific characteristic. The dependent variable is equal to one if the

respective firm (subsidiary or standalone) files for bankruptcy in $t + 1$, and zero otherwise. $Subsidiary_{i,t}$ is an indicator variable equal to one if the firm is affiliated to a business group (i.e., a subsidiary), and zero if it is a standalone entity. All models include country × year and industry fixed effects and are estimated with an intercept (not tabulated). In Panel A, the main effect of $Downgrade_{i,t}$ is omitted because perfectly collinear with the country × year fixed effects. All variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the subsidiary and year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 4: Expected Costs of Subsidiary Bankruptcy

Panel A: Sovereign Rating Downgrades

	Dependent variable: $Y_{i,t+1}$				
Independent variables:	(1)	(2)	(3)	(4)	(5)
$Loss_{i,t}$	0.263***	0.289***	0.262***	0.260***	0.262***
	(5.27)	(3.40)	(5.29)	(5.21)	(5.27)
$Profitability_{i,t}$	-0.619***	-0.521*	-0.622***	-0.623***	-0.620***
	(-3.17)	(-1.89)	(-3.18)	(-3.19)	(-3.19)
$Leverage_{i,t}$	0.135*	0.107	0.138*	0.140*	0.135*
	(1.88)	(1.09)	(1.89)	(1.95)	(1.90)
$Debt\ coverage_{i,t}$	-0.184**	-0.120*	-0.183**	-0.186**	-0.184**
	(-2.11)	(-1.68)	(-2.10)	(-2.11)	(-2.10)
$Size_{i,t}$	-0.178***	-0.194***	-0.176***	-0.148***	-0.177***
	(-6.12)	(-7.70)	(-5.81)	(-4.89)	(-6.12)
$Wholly\ owned_{i,t}$	0.022				
	(0.41)				
$Downgrade_{i,t} \times Wholly\ owned_{i,t}$	-0.282*				
	(-1.67)				
$Interlock_{i,t}$		-0.064			
		(-0.96)			
$Downgrade_{i,t} \times Interlock_{i,t}$		-1.373***			
		(-8.77)			
$Shared\ name_i$			-0.078		
			(-1.05)		
$Downgrade_{i,t} \times Shared\ name_i$			-0.401***		
			(-6.97)		
$Relative\ size_{i,t}$				-0.193***	
				(-5.75)	
$Downgrade_{i,t} \times Relative\ size_{i,t}$				-1.282***	
				(-5.40)	
$Same\ industry_i$					0.004
					(0.16)
$Downgrade_{i,t} \times Same\ industry_i$					-1.117***
					(-6.33)
Country × Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Obs.	344,281	312,761	344,281	344,281	344,281
Pseudo-R^2	0.1762	0.1894	0.1763	0.1769	0.1763

Table 4 (continued)

Panel B: Industry Shocks

	Dependent variable: $Y_{i,t+1}$				
Independent variables:	(1)	(2)	(3)	(4)	(5)
$Loss_{i,t}$	0.613***	0.530***	0.612***	0.611***	0.612***
	(4.34)	(2.81)	(4.36)	(4.28)	(4.35)
$Profitability_{i,t}$	-0.510***	-0.315**	-0.516***	-0.516***	-0.514***
	(-4.07)	(-2.24)	(-4.16)	(-4.15)	(-4.18)
$Leverage_{i,t}$	0.315***	0.310***	0.318***	0.319***	0.315***
	(3.55)	(7.82)	(3.53)	(3.69)	(3.59)
$Debt\ coverage_{i,t}$	-0.244***	-0.256***	-0.243***	-0.246***	-0.245***
	(-3.93)	(-3.46)	(-3.92)	(-3.98)	(-3.96)
$Size_{i,t}$	-0.176***	-0.160***	-0.172***	-0.145***	-0.176***
	(-5.62)	(-6.37)	(-5.16)	(-4.49)	(-5.53)
$Industry\ shock_{i,t}$	0.118	0.075	0.123*	0.097***	0.128**
	(1.46)	(1.49)	(1.92)	(4.31)	(2.10)
$Wholly\ owned_{i,t}$	0.036				
	(0.58)				
$Industry\ shock_{i,t} \times Wholly\ owned_{i,t}$	-0.150				
	(-1.42)				
$Interlock_{i,t}$		-0.282***			
		(-4.04)			
$Industry\ shock_{i,t} \times Interlock_{i,t}$		-0.038			
		(-0.30)			
$Shared\ name_i$			-0.115		
			(-1.24)		
$Industry\ shock_{i,t} \times Shared\ name_i$			-0.407**		
			(-2.32)		
$Relative\ size_{i,t}$				-0.180***	
				(-2.84)	
$Industry\ shock_{i,t} \times Relative\ size_{i,t}$				-0.116	
				(-0.61)	
$Same\ industry_i$					0.170***
					(2.91)
$Industry\ shock_{i,t} \times Same\ industry_i$					-0.886***
					(-3.68)
Country × Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Obs.	151,622	136,269	151,622	151,622	151,622
Pseudo-R^2	0.1793	0.1832	0.1801	0.1798	0.1800

This table presents the results of the analysis that examines whether factors increasing expected cost of subsidiary bankruptcy explain why certain subsidiaries are more likely than others to be shielded from bankruptcy following a sovereign rating downgrade (Panel A) or an industry shock (Panel B). The table reports coefficients and (in parentheses) *z*-statistics from the estimation of a discrete hazard model for subsidiary observations included in the *Country Shock Sample* (Panel A) and in the *Industry Shock Sample* (Panel B). The dependent variable is equal to one if the respective subsidiary files for bankruptcy in year $t+1$, and zero otherwise. All models include country × year and industry fixed effects and are estimated with an intercept (not tabulated). In Panel A, the main effect of $Downgrade_{i,t}$ is omitted because perfectly collinear with the country × year fixed effects. All variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the subsidiary and year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 5: Information Sharing and Ease of Subsidiary Monitoring

Panel A: Sovereign Rating Downgrades

	Dependent variable: $Y_{i,t+1}$			
Independent variables:	(1)	(2)	(3)	(4)
$Loss_{i,t}$	0.052	0.054	0.112**	0.109**
	(0.91)	(0.96)	(2.28)	(2.06)
$Profitability_{i,t}$	-0.320*	-0.322	-0.224	-0.231
	(-1.65)	(-1.61)	(-0.53)	(-0.55)
$Leverage_{i,t}$	0.076	0.076	0.050	0.052
	(0.94)	(0.92)	(0.49)	(0.49)
$Debt\ coverage_{i,t}$	-0.161**	-0.157**	-0.290*	-0.287*
	(-2.18)	(-2.15)	(-1.72)	(-1.68)
$Size_{i,t}$	-0.110**	-0.110**	-0.215***	-0.214***
	(-2.20)	(-2.22)	(-6.61)	(-6.17)
$Common\ border_i$	-0.197*			
	(-1.91)			
$Downgrade_{i,t} \times Common\ border_i$	-0.184			
	(-0.30)			
$Common\ language_i$		-0.143*		
		(-1.65)		
$Downgrade_{i,t} \times Common\ language_i$		-0.019		
		(-0.02)		
$Direct\ flight_{i,t}$			-0.098	
			(-1.22)	
$Downgrade_{i,t} \times Direct\ flight_{i,t}$			-0.624***	
			(-7.22)	
$Working\ hours\ overlap_i$				0.017
				(0.51)
$Downgrade_{i,t} \times Working\ hours\ overlap_i$				-0.447***
				(-14.24)
Country × Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Obs.	84,790	84,790	65,034	65,034
Pseudo-R^2	0.1678	0.1680	0.2192	0.1555

Table 5 (continued)

Panel B: Industry Shocks

	Dependent variable: $Y_{i,t+1}$			
Independent variables:	(1)	(2)	(3)	(4)
$Loss_{i,t}$	0.596***	0.595***	0.564***	0.569***
	(5.97)	(6.06)	(5.53)	(5.60)
$Profitability_{i,t}$	0.208	0.193	0.292	0.290
	(0.74)	(0.71)	(1.09)	(1.03)
$Leverage_{i,t}$	0.258***	0.254***	0.142	0.139
	(2.95)	(2.88)	(1.48)	(1.47)
$Debt\ coverage_{i,t}$	-0.450***	-0.439***	-0.513***	-0.505***
	(-9.62)	(-9.73)	(-7.94)	(-8.04)
$Size_{i,t}$	-0.244***	-0.240***	-0.233***	-0.235***
	(-5.03)	(-5.08)	(-6.99)	(-6.83)
$Industry\ shock_{i,t}$	0.078	-0.041	0.277***	0.162
	(1.04)	(-0.57)	(2.68)	(1.33)
$Common\ border_i$	-0.194**			
	(-2.39)			
$Industry\ shock_{i,t} \times Common\ border_i$	-0.394*			
	(-1.75)			
$Common\ language_i$		0.006		
		(0.04)		
$Industry\ shock_{i,t} \times Common\ language_i$		-0.068		
		(-0.36)		
$Direct\ flight_{i,t}$			0.111***	
			(4.90)	
$Industry\ shock_{i,t} \times Direct\ flight_{i,t}$			-0.456**	
			(-2.19)	
$Working\ hours\ overlap_i$				0.078***
				(2.86)
$Industry\ shock_{i,t} \times Working\ hours\ overlap_i$				-0.083
				(-0.98)
Country × Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Obs.	26,668	26,668	22,562	22,562
Pseudo-R^2	0.1760	0.1740	0.2021	0.2020

This table presents the results of the analysis that examines whether factors associated with information sharing and ease of subsidiary monitoring explain why certain subsidiaries are more likely than others to be shielded from bankruptcy following a sovereign rating downgrade (Panel A) or an industry shock (Panel B). The table reports coefficients and (in parentheses) *z*-statistics from the estimation of a discrete hazard model for a sab-sample of *foreign* subsidiary observations included in the *Country Shock Sample* (Panel A) and in the *Industry Shock Sample* (Panel B). The dependent variable is equal to one if the respective subsidiary files for bankruptcy in year $t+1$, and zero otherwise. All models include country × year and industry fixed effects and are estimated with an intercept (not tabulated). In Panel A, the main effect of $Downgrade_{i,t}$ is omitted because perfectly collinear with the country × year fixed effects. All variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the subsidiary and year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 6: Within Group Bankruptcy Contagion

		Dependent variable:					
		$Y_{i,t}$	$Y_{i,t+1}$	$Y_{i,t+2}$	$Y_{i,t+3}$	$Y_{i,t+4}$	$Y_{i,t+5}$
Independent variables:		(1)	(2)	(3)	(4)	(5)	(6)
$Loss_{i,t}$	(+)	0.251***	0.511***	0.408***	0.297***	0.359***	0.195***
		(5.48)	(8.99)	(3.89)	(5.46)	(5.11)	(6.03)
$Profitability_{i,t}$	(–)	-0.686***	-0.107	-0.061	0.074	0.237***	0.195
		(-3.83)	(-0.82)	(-0.48)	(0.73)	(7.84)	(1.38)
$Leverage_{i,t}$	(+)	0.238***	0.186*	0.221**	0.270***	0.390***	0.408***
		(3.77)	(1.81)	(2.31)	(3.80)	(14.02)	(15.90)
$Debt\ coverage_{i,t}$	(–)	-0.228***	-0.191	-0.223***	-0.213***	-0.128	-0.066
		(-3.06)	(-1.55)	(-3.89)	(-2.92)	(-1.50)	(-1.22)
$Size_{i,t}$	(–)	-0.164***	-0.151***	-0.135***	-0.116***	-0.101***	-0.116***
		(-5.94)	(-8.13)	(-7.79)	(-4.00)	(-2.95)	(-5.08)
$Post\ bankruptcy_{i,t}$	(+)	0.849***	0.289***	0.217**	0.192***	0.023	-0.019
		(22.76)	(10.46)	(2.04)	(3.64)	(0.20)	(-0.26)
Country × Year fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Obs.		399,489	330,572	271,104	208,772	152,987	102,270
Pseudo R^2		0.1814	0.1716	0.1645	0.1470	0.1283	0.0966

This table presents the results of the analysis that examines how within group bankruptcies affect affiliated firms' bankruptcy probabilities. The table reports coefficients and (in parentheses) *z*-statistics from the estimation of a discrete hazard model for subsidiary observations included in the *Full Sample*. The dependent variable is equal to one if the respective subsidiary files for bankruptcy in year t to $t+5$, and zero otherwise. $Post\ Bankruptcy_{i,t}$ is an indicator variable set equal to one if at least another firm belonging to the same business group of subsidiary i files for bankruptcy in year t, and zero otherwise. All models include country × year and industry fixed effects and are estimated with an intercept (not tabulated). All variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the subsidiary and year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 7: Testing Intra-Group Credit-Risk Management - Spillover Effects to Other Firms in the Group

Panel A: Sovereign Rating Downgrades

		Dependent variable: $Y_{i,t+1}$		
Independent variables:		(1)	(2)	(3)
$Loss_{i,t}$	(+)	0.290***	0.294***	0.264***
		(7.03)	(7.37)	(5.28)
$Profitability_{i,t}$	(–)	-0.554**	-0.533**	-0.604***
		(-2.17)	(-2.05)	(-3.09)
$Leverage_{i,t}$	(+)	0.151**	0.148**	0.141**
		(2.31)	(2.27)	(1.98)
$Debt\ coverage_{i,t}$	(–)	-0.186***	-0.188***	-0.186**
		(-5.61)	(-5.96)	(-2.14)
$Size_{i,t}$	(–)	-0.193***	-0.210***	-0.188***
		(-4.05)	(-4.33)	(-6.48)
$Downgrade_{i,t}$	(+)	0.532**	0.230	
		(2.42)	(1.24)	
$Other\ downgrade_{i,t}$	(?)		0.581***	0.296***
			(6.19)	(8.95)
Country × Year fixed effects		No	No	Yes
Industry fixed effects		No	No	Yes
Obs.		408,858	408,858	344,281
Pseudo R^2		0.0281	0.0336	0.1774

Panel B: Industry shocks

		Dependent variable: $Y_{i,t+1}$		
Independent variables:		(1)	(2)	(3)
$Loss_{i,t}$	(+)	0.681***	0.674***	0.614***
		(3.60)	(3.55)	(4.32)
$Profitability_{i,t}$	(–)	-0.436***	-0.433***	-0.509***
		(-3.75)	(-3.74)	(-4.08)
$Leverage_{i,t}$	(+)	0.294***	0.291***	0.311***
		(3.85)	(3.81)	(3.59)
$Debt\ coverage_{i,t}$	(–)	-0.245***	-0.242***	-0.244***
		(-5.23)	(-5.11)	(-3.94)
$Size_{i,t}$	(–)	-0.170***	-0.181***	-0.178***
		(-3.04)	(-3.25)	(-5.67)
$Industry\ shock_{i,t}$	(+)	0.153**	0.099	0.052
		(2.41)	(1.59)	(1.09)
$Other\ industry\ shock_{i,t}$	(?)		0.321***	0.064*
			(9.00)	(1.85)
Country × Year fixed effects		No	No	Yes
Industry fixed effects		No	No	Yes
Obs.		174,263	174,263	151,622
Pseudo R^2		0.0423	0.0442	0.1793

This table presents the results of the analysis that examines how sovereign downgrades (Panel A) and industry shocks (Panel B) spill over from subsidiaries to *other* firms belonging to the same business group. The table reports coefficients and (in parentheses) *z*-statistics from the estimation of a discrete hazard model for subsidiary observations included in the *Country Shock Sample* (Panel A) and the *Industry Shock Sample* (Panel B). The dependent variable is equal to one if the respective subsidiary files for bankruptcy in year $t+1$, and zero otherwise. All models include country × year and industry fixed effects and are estimated with an intercept (not tabulated). In Panel A, the main effect of $Downgrade_{i,t}$ is omitted because perfectly collinear with the country × year fixed effects. All variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the subsidiary and year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 8: Intra-Group Loans

Panel A: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	P25	Median	P75
$Size_{i,t}$	18,957	8.8690	2.1704	7.5783	8.9613	10.2389
$Growth_{i,t}$	18,957	0.1700	0.8449	-0.1051	0.0236	0.1778
$Profitability_{i,t}$	18,957	0.0352	0.2859	-0.0074	0.0265	0.1003
$Leverage_{i,t}$	18,957	1.0368	1.7265	0.4670	0.7522	0.9717
$Tangibility_{i,t}$	18,957	0.1810	0.2805	0.0000	0.0343	0.2316
$Industry\ shock_{i,t}$	12,904	0.3684	0.4824	0.0000	0.0000	1.0000
$Group\ loan\ liab_{i,t}$	18,957	0.3606	0.3619	0.0004	0.2479	0.6960
$LT\ Group\ loan\ liab_{i,t}$	18,957	0.0692	0.2065	0.0000	0.0000	0.0000
$ST\ Group\ loan\ liab_{i,t}$	18,957	0.2914	0.3486	0.0000	0.1054	0.5620
$\Delta^{+}Received_{i,t}$	18,957	0.4920	0.4999	0.0000	0.0000	1.0000
$Group\ loan\ assets_{i,t}$	18,957	0.1717	0.2699	0.0000	0.0174	0.2406
$\Delta^{+}Provided_{i,t}$	18,957	0.3845	0.4865	0.0000	0.0000	1.0000
$Receiver_{i,t}$	18,957	0.5660	0.4956	0.0000	1.0000	1.0000

Table 8 (continued)

Panel B: Intra-Group Loans Received

		Dependent variable:					
		$Group\ loan\ liab_{i,t}$	$Group\ loan\ liab_{i,t}$	$LT\ Group\ loan\ liab_{i,t}$	$ST\ Group\ loan\ liab_{i,t}$	$\Delta^{+}Received_{i,t}$	$\Delta^{+}Received_{i,t}$
Independent variables:		(1)	(2)	(3)	(4)	(5)	(6)
$Size_{i,t}$	(–)	-0.010***	-0.011***	0.003***	-0.014***	-0.046***	-0.055***
		(-4.21)	(-4.18)	(2.75)	(-5.43)	(-4.16)	(-5.38)
$Growth_{i,t}$	(?)	0.023***	0.022***	0.004*	0.018***	-0.377***	-0.374***
		(18.40)	(22.80)	(1.76)	(17.06)	(-4.87)	(-5.08)
$Profitability_{i,t}$	(–)	-0.059***	-0.060***	-0.030***	-0.031	0.032	0.045
		(-3.29)	(-3.43)	(-3.28)	(-1.57)	(0.62)	(0.84)
$Leverage_{i,t}$	(+)	0.045***	0.045***	0.012***	0.033***	0.003	0.004
		(9.58)	(9.29)	(3.90)	(7.67)	(0.17)	(0.25)
$Tangibility_{i,t}$	(?)	0.027	0.034	0.063***	-0.029	0.128*	0.163**
		(1.20)	(1.61)	(4.65)	(-1.24)	(1.87)	(2.43)
$Industry\ shock_{i,t}$	(+)	0.014**	0.011***	-0.003	0.014***	0.220***	0.138***
		(2.10)	(2.77)	(-0.58)	(2.60)	(3.19)	(5.71)
Year fixed effects		No	Yes	Yes	Yes	No	Yes
Industry fixed effects		No	Yes	Yes	Yes	No	Yes
Obs.		12,904	12,904	12,904	12,904	12,904	12,904
Adj. R^2		0.0707	0.0785	0.0334	0.0587	0.0152	0.0194

Table 8 (continued)

Panel C: Intra-Group Loans Provided

		Dependent variable:			
		$Group\ loan\ assets_{i,t}$	$Group\ loan\ assets_{i,t}$	$\Delta^{+}Provided_{i,t}$	$\Delta^{+}Provided_{i,t}$
Independent variables:		(1)	(2)	(3)	(4)
$Size_{i,t}$	(+)	0.004	0.004	0.132***	0.136***
		(1.31)	(1.53)	(6.50)	(6.99)
$Growth_{i,t}$	(?)	-0.013**	-0.014**	-0.040	-0.036
		(-2.50)	(-2.54)	(-1.50)	(-1.40)
$Profitability_{i,t}$	(+)	0.042***	0.042***	0.672***	0.666***
		(3.58)	(3.39)	(10.43)	(9.73)
$Leverage_{i,t}$	(–)	-0.010***	-0.010***	-0.117***	-0.120***
		(-4.32)	(-4.43)	(-5.37)	(-5.19)
$Tangibility_{i,t}$	(?)	-0.233***	-0.237***	-0.600***	-0.684***
		(-20.84)	(-20.47)	(-6.61)	(-7.75)
$Industry\ shock_{i,t}$	(–)	-0.019***	-0.023**	-0.139***	-0.149***
		(-4.29)	(-2.32)	(-2.81)	(-3.26)
$Other\ industry\ shock_{i,t}$	(+)	0.043***	0.042***	0.083*	0.125***
		(5.07)	(4.98)	(1.75)	(2.65)
Year fixed effects		No	Yes	No	Yes
Industry fixed effects		No	Yes	No	Yes
Obs.		12,904	12,904	12,904	12,904
Adj. R^2		0.0683	0.0731	0.0307	0.0351

Table 8 (continued)

Panel D: Group Characteristics

		Dependent variable:			
		$Group\ loan\ liab_{i,t}$	$LT\ Group\ loan\ liab_{i,t}$	$ST\ Group\ loan\ liab_{i,t}$	$Group\ loan\ assets_{i,t}$
Independent variables:		(1)	(2)	(3)	(4)
$Size_{i,t}$	(?)	-0.010***	0.004***	-0.014***	-0.001
		(-3.09)	(3.03)	(-4.43)	(-0.56)
$Growth_{i,t}$	(+)	0.014***	0.003	0.011***	-0.016***
		(3.73)	(1.23)	(2.99)	(-3.79)
$Profitability_{i,t}$	(–)	-0.079***	-0.026**	-0.053**	0.049***
		(-3.79)	(-2.34)	(-2.06)	(3.73)
$Leverage_{i,t}$	(+)	0.041***	0.010***	0.031***	-0.012***
		(9.35)	(3.77)	(8.14)	(-4.67)
$Tangibility_{i,t}$	(+)	0.042**	0.057***	-0.015	-0.230***
		(2.03)	(3.44)	(-0.64)	(-24.33)
$Bank\ in\ group_{g,t}$		-0.028	0.005	-0.033**	-0.018
		(-1.57)	(0.50)	(-1.97)	(-1.07)
$Num\ of\ subs_{g,t}$		0.026***	-0.004	0.030***	0.009
		(3.60)	(-0.77)	(4.23)	(1.36)
$Num\ of\ industries_{g,t}$		-0.003	-0.009	0.006	-0.008
		(-0.19)	(-0.95)	(0.36)	(-0.74)
$Num\ of\ levels_{g,t}$		-0.029*	-0.012	-0.017	0.038***
		(-1.86)	(-1.02)	(-1.04)	(3.20)
$Fin\ constraints_{g,t}$		-0.024**	0.009	-0.033***	-0.006
		(-2.43)	(1.35)	(-3.18)	(-0.22)
Year fixed effects		Yes	Yes	Yes	Yes
Industry fixed effects		Yes	Yes	Yes	Yes
Obs.		12,259	12,259	12,259	12,259
Adj. R^2		0.0805	0.0335	0.0649	0.0758

Table 8 (continued)

Panel E: Subsidiary Integration

		Dependent variable:				
		$Group\ loan\ liab_{i,t}$	$LT\ Group\ loan\ liab_{i,t}$	$ST\ Group\ loan\ liab_{i,t}$	$Group\ loan\ assets_{i,t}$	$Receiver_{it}$
Independent variables:		(1)	(2)	(3)	(4)	(5)
$Size_{i,t}$	(?)	-0.003	0.006***	-0.009***	-0.011***	0.028***
		(-0.75)	(3.06)	(-2.79)	(-3.09)	(5.20)
$Growth_{i,t}$	(+)	0.008***	0.002**	0.006**	-0.015***	0.017***
		(3.42)	(2.03)	(1.97)	(-4.71)	(4.18)
$Profitability_{i,t}$	(–)	-0.069***	-0.021***	-0.048***	0.040***	-0.108***
		(-4.39)	(-4.66)	(-3.10)	(3.45)	(-6.64)
$Leverage_{i,t}$	(+)	0.038***	0.011***	0.027***	-0.025***	0.061***
		(7.89)	(4.37)	(6.98)	(-7.50)	(7.97)
$Tangibility_{i,t}$	(+)	0.040*	0.020*	0.020	-0.240***	0.232***
		(1.87)	(1.94)	(0.92)	(-17.94)	(9.73)
$Wholly\ owned_{i,t}$		0.083***	0.004	0.078***	0.048***	0.036*
		(5.25)	(0.46)	(5.29)	(3.79)	(1.94)
$Interlock_{i,t}$		0.059***	-0.003	0.062***	0.047***	0.061***
		(3.12)	(-0.30)	(3.33)	(3.04)	(2.77)
$Shared\ name_i$		0.026**	0.001	0.025*	0.009	0.050***
		(1.96)	(0.16)	(1.89)	(0.72)	(2.85)
$Relative\ size_{i,t}$		-0.036***	-0.006	-0.030***	-0.007	-0.028**
		(-4.39)	(-0.83)	(-3.64)	(-1.02)	(-2.38)
$Same\ industry_i$		-0.026*	-0.006	-0.020	-0.006	-0.016
		(-1.76)	(-0.76)	(-1.52)	(-0.57)	(-0.85)
Business group fixed effects		Yes	Yes	Yes	Yes	Yes
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Obs.		18,591	18,591	18,591	18,591	18,591
Adj. R^2		0.4702	0.5293	0.4718	0.3970	0.3650

This table presents the analysis of intra-group loans for the *U.K. Sample* of subsidiaries belonging to "purely-domestic" U.K. business groups. Panel A presents descriptive statistics for this sample. Panels B, C, D and E report OLS coefficient estimates and (in parentheses) *t*-statistics from several models in which dependent variables respectively capture: (i) the extent to which intra-group loans are received ($Group\ loan\ liab_{i,t}$, $LT\ Group\ loan\ liab_{i,t}$ and $ST\ Group\ loan\ liab_{i,t}$) and provided ($Group\ loan\ assets_{i,t}$) by a subsidiary, and (ii) how intra-group loans change following an industry shock to the subsidiary or to other firms belonging to the same business group ($\Delta^{+}Received_{i,t}$ and $\Delta^{+}Provided_{i,t}$). Panels D and E respectively examine how business group and subsidiary characteristics affect intra-group loan balances. All models are estimated with an intercept (not tabulated). Model specifications presented in Panels B, Columns (2), (3), (4) and (6), Panel C, Columns (2) and (4), and Panel D include industry and year fixed effects. Model specifications presented in Panel E include business group and year fixed effects. All variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the subsidiary and year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Table 9: Changes in Related-Party Transaction (RPT) Regulation

Panel A: Subsidiaries vs. Standalones

		Dependent variable: $Y_{i,t+1}$	
Independent variables:		(1)	(2)
$Loss_{i,t}$	(+)	0.260	0.275
		(1.10)	(1.22)
$Profitability_{i,t}$	(–)	-0.779***	-0.719***
		(-8.05)	(-10.02)
$Leverage_{i,t}$	(+)	0.400***	0.354***
		(6.13)	(4.77)
$Debt\ coverage_{i,t}$	(–)	-0.176***	-0.144***
		(-3.87)	(-4.38)
$Size_{i,t}$	(–)	0.033	0.011
		(0.56)	(0.21)
$RPT\ Score_{i,t}$	(+)	-0.008	-0.522**
		(-0.06)	(-2.17)
$Subsidiary_{i,t}$	(?)		-0.130
			(-0.72)
$RPT\ Score_{i,t} \times Subsidiary_{i,t}$	(+)		0.737**
			(1.97)
Country fixed effects		Yes	Yes
Industry fixed effects		Yes	Yes
Year fixed effects		Yes	Yes
Obs.		79,880	79,880
Pseudo R^2		0.0887	0.1012

Panel B: Subsidiary Country Financial Market Development

		Dependent variable: $Y_{i,t+1}$	
Independent variables:		(1)	(2)
$Loss_{i,t}$	(+)	0.261***	0.262***
		(9.15)	(9.23)
$Profitability_{i,t}$	(–)	-0.578	-0.575
		(-1.46)	(-1.44)
$Leverage_{i,t}$	(+)	0.264**	0.262**
		(2.07)	(2.02)
$Debt\ coverage_{i,t}$	(–)	-0.245***	-0.244***
		(-2.96)	(-2.94)
$Size_{i,t}$	(–)	-0.129***	-0.130***
		(-3.99)	(-3.99)
$RPT\ Score_{i,t}$	(+)	0.392*	0.287*
		(1.74)	(1.73)
$Weak\ fin\ mkt\ develop_{i,t}$	(?)		-0.381
			(-1.63)
$RPT\ Score_{i,t} \times Weak\ fin\ mkt\ develop_{i,t}$	(+)		0.471***
			(2.90)
Country fixed effects		Yes	Yes
Industry fixed effects		Yes	Yes
Year fixed effects		Yes	Yes
Obs.		124,169	124,169
Pseudo R^2		0.1161	0.1169

This table presents the results of the analysis that examines the association between changes in related-party transaction (RPT) regulation and within-group credit-risk management. Panel A reports coefficients and (in

parentheses) z-statistics from the estimation of a discrete hazard model for a subset of subsidiaries from the *Full Sample* and matched standalone firms domiciled in countries in which changes in RTP regulation take place since 2008. Standalones are matched (without replacement) to subsidiaries based on country, industry and closest size. The dependent variable is equal to one if the respective firm (subsidiary or standalone) files for bankruptcy in year $t + 1$, and zero otherwise. $Subsidiary_{i,t}$ is an indicator variable equal to one if the firm is affiliated to a business group (i.e., a subsidiary), and zero if it is a standalone entity. $RPT\ Score_{i,t}$ is the cumulative change in RPT regulation since 2008. Panel B reports results from the estimation of a similar specification of the same model estimated within a subset of *Full Sample* of subsidiaries from countries in which changes in RTP regulation take place. This analysis examines to what extent the effect of changes in RPT regulation varies with subsidiary-country degree of financial market development (proxied by the ratio of total market capitalization of all firms in a country to the country's GDP). All models are estimated with an intercept (not tabulated) and include country, industry and year fixed effects. All variables are defined in the Appendix. Heteroskedasticity-robust standard errors are clustered at the subsidiary and year level. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

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