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Bankruptcy in groups

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Abstract

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. This is in part because, in several countries, bankruptcy courts often "pierce the corporate veil" and hold groups liable for their distressed subsidiaries' obligations as if they 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. Moreover, we document that recent regulatory changes in the approval and disclosure of related party transactions are costly for business groups in that they constrain their ability to shield their subsidiaries from credit-risk shocks. Our study informs the current regulatory debate on related party transactions by highlighting an important cost of anti-self-dealing regulation.

Keywords Bankruptcy · Credit risk · Business groups · Subsidiaries · Veil piercing · Related party transactions · Regulation

JEL Classification G14 · G15 · G38 · M41 · M48

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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 firms. The bankruptcy of a group-affiliated firm often affects many stakeholders and can impose severe costs on other group firms, ultimately threatening the survival of the group as a whole (e.g., Global Crossing, Maxwell, MG Rover, Parmalat). Therefore, understanding how business groups manage credit risk to prevent within-group bankruptcy is of crucial importance.

Several studies have highlighted a *bright side* of business groups. Business groups may take advantage of their internal capital markets and reallocate resources among group firms to overcome difficulties in accessing external finance, especially in emerging market economies (e.g., Stein 1997; Khanna and Yafeh 2005). This financing advantage is likely to play an important role when group-affiliated firms experience financial distress and have limited access to intermediated funds (Riyanto and Toolsema 2008). Yet evidence on the use of internal capital markets to manage credit risk and prevent insolvencies is limited.

Other studies, in contrast, have emphasized a *dark side* of business groups by showing that ultimate owners may abuse related party transactions (RPTs) among group firms to expropriate resources at the expense of minority investors (e.g., Johnson et al. 2000; Bertrand et al. 2002; Jiang et al. 2010). This concern has recently led, in several countries, to the passage of stricter regulation of the approval and disclosure of RPTs, to curb the potential harm that self-dealing can engender (Dyck and Zingales 2004; Djankov et al. 2008). However, whether the benefits of regulatory interventions aimed at curbing abusive RPTs outweigh the costs for business groups, including their ability and willingness to use RPTs to manage credit risk, is largely an empirical matter.

In this paper, we leverage the Orbis database, which provides financial and ownership information for a large number of group-affiliated firms from around the world, to assess the extent to which business groups rely on their internal capital markets to prevent within-group insolvencies and whether regulatory changes that introduce stricter approval and disclosure requirements for RPTs impair their ability to do so.

Using episodes of industry distress as sources of exogenous variation in credit risk, we first show that, compared to standalone entities, group subsidiaries are less sensitive to sudden increases in default risk. The effect of group affiliation is economically meaningful. While the likelihood that a standalone firm files for bankruptcy increases by 75% following a credit-risk shock, the bankruptcy probability of a subsidiary only increases by 29%. This finding is consistent with business groups acting as "shock absorbers" in that they insure their subsidiaries against temporary liquidity shortfalls. Importantly, we also find that, while, as expected, the effect of group affiliation is more pronounced in countries where access to external finance is constrained, business groups use their internal capital markets to support subsidiaries domiciled in countries with developed capital markets as well.

Next, we examine whether the staggered introduction of RPT reforms in several countries around the world affects business groups' ability and willingness

to use their internal capital markets to insulate their subsidiaries from credit-risk shocks. These reforms effectively strengthen the approval and disclosure requirements for RPTs and are aimed at curbing the diversion of resources from minority investors through self-dealing transactions. We exploit cross-country variation in the timing of RPT reforms, in a generalized difference-in-differences (DiD) research design, to compare the sensitivity to credit-risk shocks of subsidiaries domiciled in countries that adopt RPT reforms with that of subsidiaries domiciled in countries that have not (yet) adopted RPT reforms, using standalone firms as a benchmark. We find that, following the introduction of RPT reforms, the sensitivity of subsidiaries to credit-risk shocks increases relative to their standalone counterparts, which is consistent with a reduction in intra-group support. In terms of economic magnitude, we find that, relative to standalones, the sensitivity of subsidiaries to credit-risk shocks increases by 0.7 percentage points, which corresponds to approximately 50% of their pretreatment average bankruptcy probability—that is, the advantage that internal capital markets confer to subsidiaries significantly declines when RPT reforms come into force.

The identifying assumption underlying our DiD design is that, absent RPT reforms, the differential sensitivity of subsidiaries and standalones to credit-risk shocks across treated and control countries would have moved in parallel. We assess the validity of this assumption by testing for differences in pretreatment trends. We find that, before the adoption of RPT reforms, treatment effect magnitudes are economically small and statistically indistinguishable from zero. Moreover, we find no evidence of differential trends across treated and control units over time. In contrast, treatment effects experience a sharp increase in the years following RPT reforms that persists over time.

We perform extensive sensitivity analyses to rule out alternative explanations for our findings. First, we conduct placebo tests where we randomly assign RPT reform implementation dates. We find that the average placebo effects are indistinguishable from zero, which provides reassurance that the increased sensitivity of subsidiaries to credit-risk shocks that we document is not due to random chance. Second, to alleviate concerns that unobservable time-varying factors, concurrent but unrelated to RPT reforms, may be driving our results, we follow the bounding methodology developed by Oster (2019) to assess the stability of our treatment effects. The evidence from this analysis suggests that the effect of RPT reforms that we document in our main analysis is unlikely to be driven by unobservable factors. Third, we conduct a series of tests where we examine the sensitivity of our results to (i) excluding the period of the global financial crisis of 2007-2008, (ii) using narrower bankruptcy definitions, and (iii) measuring bankruptcy over a longer horizon. The results of these tests confirm the inferences we draw from our main analysis.

We next conduct cross-sectional tests to explore treatment effect heterogeneity. We find that more diversified groups, groups with a bank in the corporate structure, and less financially constrained groups provide more support to subsidiaries that experience credit-risk shocks. Moreover, groups that are more diversified and groups that have a large number of subsidiaries, long control chains, or low financial constraints are disproportionately more affected by the adoption of RPT reforms.

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 a direct liability under *veil piercing*—that is, a judicially imposed exception to the principle of limited liability, whereby a parent company can be held liable for its subsidiaries' debts (e.g., Powell 1931; Erens et al. 2008; Mevorach 2009; Belenzon et al. 2018). Accordingly, we posit, and consistently find, that business groups are more prone to support subsidiaries whose insolvencies imply a higher risk of veil piercing. However, the passage of RPT reforms reduces the support these subsidiaries receive, thus rendering internal capital markets a less effective tool for mitigating the risk of veil piercing.

To provide more evidence on the use of internal capital markets to manage credit risk, we examine the indirect effects of credit-risk shocks to *other* subsidiaries within the same group. The *coinsurance hypothesis* (Lewellen 1971; 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 in line with group firms absorbing (at least in part) credit-risk shocks affecting other subsidiaries. Moreover, consistent with our main results, we find that the adoption of RPT reforms leads to a decline in the extent to which credit-risk shocks spill over to other group firms.

Our evidence supports the bright side of business groups and highlights an important cost of RPT regulation. Prior to RPT reforms, within-group transactions are used to shelter troubled subsidiaries from credit-risk shocks, but this advantage that internal capital markets confer to subsidiaries significantly declines when RPT reforms come into force. A potential concern, however, is that the intra-group transactions we document could merely be a form of *tunneling*—that is, a diversion of resources away from minority investors—and thus their curtailment may be a positive effect of RPT reforms. To allay this concern, we conduct an additional set of tests based on the premise that intra-group transfers that harm minority investors typically flow from low cash flow rights (i.e., high wedge) group firms to high cash flow rights (i.e., low wedge) group firms.[1] The results of these tests are instead consistent with resource reallocation mainly occurring among high cash flow rights subsidiaries, which suggests that our findings cannot be explained by tunneling alone. RPT reforms thus appear to curb intra-group credit-risk management transactions that are harmless to minority investors, which reinforces the idea that these reforms are costly for business groups.

Finally, we show that business groups are more likely to support subsidiaries that are "worth helping," that is, highly profitable subsidiaries experiencing credit-risk shocks. This finding mitigates the concern that within-group credit-risk management leads to inefficient cross-subsidization. Importantly, we find that, when RPT reforms come into force, the subsidiaries worth helping are the ones that suffer the most. As such, our evidence suggests that these reforms impose a nontrivial cost on business groups.

[1] The control-ownership wedge captures the divergence between voting rights (i.e., control) and cash flow rights (i.e., ownership) (e.g., Claessens et al. 2000).

Our study makes four distinct contributions. First, we shed light on the long-standing, yet unsettled, debate on the value of group affiliation (e.g., Claessens et al. 2006; Khanna and Yafeh 2007; Masulis et al. 2011; Siegel and Choudhury 2012). A number of studies highlight the abuse of intra-group transactions by insiders to syphon resources from minority investors (e.g., Johnson et al. 2000; Bertrand et al. 2002; Jiang et al. 2010). In contrast, other studies show that groups reallocate resources to overcome external capital market frictions, thus allowing group firms to access finance that would otherwise be unavailable to them (e.g., Stein 1997; Khanna and Yafeh 2005; Almeida et al. 2015). The inferences emerging from these studies are, however, mostly limited to developing countries and specific events (e.g., Claessens et al. 2003) and hence potentially hinge on the idiosyncratic features of these settings. We rely on a large sample of group-affiliated firms from more than 100 countries observed over a 15-year period (from 2004 to 2018) and show that the financing advantages of group affiliation extend beyond settings where (i) the quality of country-level institutions likely renders firms' reliance on internal capital markets more widespread (Khanna and Palepu 2000), and (ii) extreme credit-risk events exacerbate external financing frictions (e.g., the 1997 Asian financial crisis). We also show that the pattern of resource reallocation within business groups is consistent with the objective of preventing the insolvency of troubled subsidiaries rather than with the tunneling of resources from minority investors.

Second, our paper contributes to the literature on the real effects of transparency regulation (e.g., Leuz and Wysocki 2016; Leuz 2018). We show that regulatory changes that introduce stricter approval and disclosure requirements for RPTs—changes originally designed to deter self-dealing and tunneling—severely constrain business groups' ability to manage credit risk. Thus, while prior studies have focused on the potential abuses of RPTs and on the benefits of regulation (e.g., Djankov et al. 2008), our study, to the best of our knowledge, is the first to document a key cost of RPT regulation. As such, our findings can inform the ongoing regulatory debate on the design and implementation of financial market reforms (Shleifer 2005; Leuz 2010). Our evidence suggests that RPT regulation that curbs self-dealing can also constrain group-affiliated firms' access to internal funds and thus impose nontrivial costs on business groups if it is unaccompanied by concurrent capital market reforms that improve access to external finance.

Third, by delving into the inner workings of internal capital markets to assess the factors that drive the decision to bail out a troubled subsidiary and avoid its bankruptcy, we contribute to the literature that examines financial distress in business groups (Claessens et al. 2003; Gopalan et al. 2007; Beaver et al. 2019). Specifically, by exploiting cross-country differences in legal regimes, we show that the propensity of courts to pierce the corporate veil and to regard a business group as a single legal entity shapes intra-group resource allocation. 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 motivation for credit-risk management.

Finally, 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.

2 Institutional background

2.1 Bankruptcy in groups

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; Dimitrov and Tice 2006; Giroud and Mueller 2015). Business groups constitute, however, a unique setting in which to study bankruptcy. Unlike divisions of conglomerates, 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).

Business groups may choose to bail out ailing subsidiaries for several reasons.[2] First, groups have private information (namely regarding their subsidiaries' investment opportunities) and 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.

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). 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 a subsidiary's creditors are also suppliers of the group parent company, for example, they may use their negotiating 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 recharacterized as equity by bankruptcy courts (Erens et al. 2008). As a result, in addition to losing the contributed equity capital, business groups may be 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; Vandekerckhove 2005; Erens et al. 2008; Mevorach 2009). Because the whole asset

[2] Group 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 related party transactions (RPTs).

base of business groups is larger than that of an individual subsidiary, these actions can generate high payoffs for subsidiaries' debtholders. While code law countries have traditionally taken an entity approach whereby liability may be imposed on the parent company, most common law countries have historically followed a limited liability approach. However, bankruptcy courts in some common law countries, such as the United States, have recently moved towards regarding a group as a single entity in circumstances where the relationship between group members justifies it (Mevorach 2009).[3] While the law literature has extensively debated whether business groups should be held liable for the debts of a bankrupt subsidiary, there is no empirical evidence on whether the likelihood of veil piercing affects the functioning of internal capital markets and the decision to support distressed group firms.

2.2 RPT reforms

In recent years, regulators around the world have introduced RPT reforms in response to a series of high-profile cases that have brought the potentially abusive use of RPTs to the forefront of the political agenda (e.g., Enron, Parmalat, Satyam). When weighing the benefits and costs of RPT regulation, policymakers face an important trade-off. On the one hand, RPTs can be beneficial to the extent that they substitute for underdeveloped financial markets and thus help business groups make the most of their internal capital markets. On the other hand, RPTs can be abused by executives and controlling shareholders at the expense of unprotected minority investors, who often risk being expropriated of their wealth via tunneling. Therefore, estimates of expected costs and benefits are key for policymakers if they are to strike the right balance while designing effective RPT regulation.

RPT reforms usually encompass several measures, which the World Bank Doing Business Reports group into three categories: (i) the extent of disclosure, (ii) the extent of director liability, and (iii) the ease of shareholder suits. The first category refers to the review and approval mechanisms required by law for RPTs. These mechanisms may include the requirement to disclose RPTs internally to the board of directors, to disclose RPTs within a maximum of 48 h after approval, or to periodically disclose RPTs in annual reports. The second category refers to the minority investors' ability to sue and hold interested directors and the rest of the board liable for prejudicial RPTs. The legal remedies available to minority investors may include damages, disgorgement of profits, fines, imprisonment, or rescission of transactions.

[3] Macey and Mitts (2014) identify 9,380 federal and state cases discussing veil piercing, and Matheson (2008) finds that US bankruptcy courts have pierced the corporate veil in 20.56% of their sample cases. An interesting 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 United States. 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.

The final category relates to the power that investors have to challenge a transaction and includes the ease of access to evidence—before and during trial—as well as the ability of investor plaintiffs to recover their expenditures from the company.[4]

RPT reforms that introduce stricter approval and disclosure requirements for RPTs may limit the extent to which group-affiliated firms can engage in transactions with each other that are not at the "arm's length." While "arm-in-arm" within-group transactions can certainly be regarded as conflicted, this need not imply that they make no economic sense. In fact, RPTs may well serve the purpose of reallocating resources across group firms to manage intra-group credit risk. Therefore, a potential unintended cost of RPT reforms is that an indiscriminate curb imposed on *all* RPTs, regardless of their merit, may impair business groups' ability to help their subsidiaries in need. Accordingly, we posit that regulatory changes that introduce stricter approval and disclosure requirements for RPTs may affect the ability and willingness of business groups to engage in intra-group credit-risk management. Consistent with our prediction, anecdotal evidence suggests that, after RPT reforms come into force, business groups refrain from engaging in RPTs aimed at financing certain subsidiaries, to avoid breaching anti-self-dealing regulation.[5]

3 Research design

We study the extent to which business groups use their internal capital markets to manage intra-group credit risk and whether the adoption of RPT reforms in several countries around the world impairs their ability to do so. To probe intra-group credit-risk management, we investigate whether mutual insurance within business groups dampens the negative effects of credit-risk shocks to subsidiaries (Khanna and Yafeh 2005). To this end, using non-group-affiliated entities (i.e., standalone firms) as a benchmark, we examine changes in subsidiary bankruptcy risk following plausibly exogenous credit-risk shocks. If business groups actively manage intra-group credit risk, then the same credit-risk shock should affect subsidiaries relatively less than comparable standalones. We match, without replacement, subsidiaries with standalones based on country,

[4] For example, during our sample period, Korea clarified directors' duties in its commercial code, making it easier for directors to be held accountable for damages resulting from negligent related party transactions. Chile amended its securities laws to require stricter approval and disclosure of transactions between related parties. Ukraine adopted a law requiring supervisory boards to approve transactions between interested parties and prohibiting those parties from participating in this process. This law also introduced the requirement to disclose conflicts of interest to supervisory boards and defined the duties of supervisory board members as well as their liability for harm caused by their actions or inactions.

[5] As an example, following the enactment of OECD regulation aimed at reducing the extent of self-dealing, US 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 nontrivial level of judgement. Uncertainty about the risk of potential noncompliance 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).

industry, listing status (i.e., a private or public firm indicator), and an estimated propensity score based on profitability, a loss indicator, leverage, debt coverage, and size (using a caliper of 0.01). With this propensity score matching (PSM) approach, we account for observable time-invariant heterogeneity across the two types of firms (Rosenbaum and Rubin 1983). We discuss the details of our PSM approach in Section 3.1 of the Online Appendix.

Our identification relies on episodes of industry distress as plausibly exogenous shocks to credit risk. Industry membership plays 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 can lead to an increase in the bankruptcy probability of other firms in that industry, irrespective of their financial health (Lang and Stulz 1992). The use of episodes of industry distress in our setting is key to addressing a potential endogeneity bias resulting from the non-random nature of group affiliation (e.g., Campa and Kedia 2002; Maksimovic and Phillips 2002; Matvos and Seru 2014). Since episodes of industry distress are largely unexpected, it is unlikely that business groups can change their organizational structures in anticipation of them. Hence, one can arguably assume that group affiliation is exogenous in the short run (Khanna and Yafeh 2005).[6]

To capture subsidiaries' differential sensitivity to credit-risk shocks, we compare changes in bankruptcy probability induced by episodes of industry distress across subsidiaries and matched standalones using the following model:

$$\begin{aligned} Bankrupt = {} & \beta_0 + \beta_1(Distress) + \beta_2(Subsidiary) + \beta_3(Distress \times Subsidiary) \\ & + \partial' Controls + \gamma' Fixed\ effects + \varepsilon. \end{aligned} \tag{1}$$

The dependent variable (*Bankrupt*) is an indicator set equal to one if a firm files for bankruptcy in the 12-month period following the end of the fiscal year, and zero otherwise.[7] *Distress* is an indicator variable set equal to one if the firm experiences

[6] While Matvos et al. (2018) document a rise in diversified mergers following increases in external capital market frictions, these organizational changes are unlikely to take place in the short run. Nonetheless, to further allay the potential concern that subsidiaries leave their business groups for reasons other than bankruptcy, in Section 5.2 of the Online Appendix, we assess the robustness of our main findings to the exclusion of non-bankrupt dropout firms. Our inferences remain qualitatively unchanged.

[7] We classify, as bankrupt, firms with the following Orbis statuses: "Active (default of payment)," "Active (rescue plan)," "Active (reorganization)," "Active (insolvency proceedings)," "Bankruptcy," "Dissolved," "Dissolved (bankruptcy)," "Dissolved (liquidation)," "In liquidation," and "Inactive (no precision)." Along with in-court proceedings, our bankruptcy indicator thus captures default events that may be resolved out-of-court. Our design choice to rely on a broader definition of bankruptcy is motivated by our international sample, which encompasses countries with very different insolvency laws and reflects our desire to be consistent with other bankruptcy studies that use the Bureau Van Dijk Orbis database (e.g., Altman et al. 2017; Beaver et al. 2019; Olbert 2022). In Section 5.4 of the Online Appendix, we discuss our bankruptcy indicator in more detail and assess the robustness of our main findings to alternative bankruptcy definitions. Our estimates remain qualitatively unchanged, irrespective of the bankruptcy definition that we use. Moreover, as credit-risk shocks can potentially affect bankruptcy probabilities beyond one year, in Section 5.5 of the Online Appendix, we assess the robustness of our findings to a longer bankruptcy horizon (i.e., one to three years). The results of these sensitivity tests are qualitatively similar to those of our main analysis.

an episode of industry distress, and zero otherwise.[8] *Subsidiary* is an indicator variable set equal to one if the firm is affiliated to a business group, and zero if it is a standalone entity. *Controls* is a vector of control variables that includes a set of time-varying firm-level characteristics (i.e., *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, *Size*, and *Listed*) associated with credit risk (Beaver et al. 2010).[9] Detailed variable definitions are provided in the Appendix. *Fixed effects* represents firm and year fixed effects. The inclusion of firm fixed effects allows us to control for time-invariant firm-level factors potentially affecting the likelihood of bankruptcy. Year fixed effects control for time-varying heterogeneity in bankruptcy risk due to changes in macro-economic conditions. Our fixed effects structure ensures that the effect we document is only driven by within-firm variation in bankruptcy probability. Our coefficient of interest, β_3, captures the differential effect of credit-risk shocks on subsidiaries relative to standalones. We expect β_3 to be negative, in line with subsidiaries being less sensitive to credit-risk shocks than comparable standalones.

To assess whether the adoption of RPT reforms renders business groups' internal capital markets a less effective tool for managing intra-group credit risk, we employ a generalized difference-in-differences (DiD) research design, which allows us to exploit the staggered introduction of RPT reforms in several countries. Our identification stems from the comparison of the differential sensitivity to credit-risk shocks of (i) a *treatment group* of subsidiaries domiciled in countries that adopt RPT reforms; and (ii) a *control group* of subsidiaries domiciled in countries that have not (yet) adopted RPT reforms, using standalones as a benchmark. In our DiD, the comparison with standalones effectively allows us to difference out time-varying country-level confounders. Accordingly, we estimate the following model:

$$\begin{aligned} Bankrupt = {} & \beta_0 + \beta_1(Distress) + \beta_2(Subsidiary) + \beta_3(RPT) \\ & + \beta_4(Distress \times Subsidiary) + \beta_5(Distress \times RPT) \\ & + \beta_6(Subsidiary \times RPT) + \beta_7(Distress \times Subsidiary \times RPT) \\ & + \partial' Controls + \gamma' Fixed\ effects + \varepsilon, \end{aligned} \tag{2}$$

where *RPT* is an indicator variable set equal to one starting in the year in which a country introduces RPT reforms, and zero otherwise. We report RPT reforms' adoption years for each sample country in Table OA-5 of the Online Appendix. All other variables are as previously defined. Because RPT reforms occur at the *country* level and the credit-risk shocks that we use are based on episodes of *industry* distress, we draw statistical inferences based on standard errors clustered at the country and

[8] For each firm, we compute the annual country-industry bankruptcy rate at the one-digit SIC code level excluding the respective firm from the calculation. *Distress* is set equal to one if the annual change in the bankruptcy rate falls into the top three deciles of the sample distribution, and zero otherwise.

[9] One potential drawback of matching subsidiaries and standalones in the first year they appear in the sample is that firm characteristics may diverge over time for reasons unrelated to credit-risk shocks or timing of RPT reform adoption. For this reason, in addition to matching on country, industry, listing status, and firm-level covariates, we also control linearly for these variables in our models. As such, our estimates are *doubly robust* in that they combine the bias-reducing properties of nonparametric matching and parametric regression methods (Cochran and Rubin 1973; Rubin 1973, 1979; Bang and Robins 2005).

industry level. Our coefficient of interest, β_7, captures the effect of the passage of RPT reforms on the differential sensitivity of subsidiaries and standalones to credit-risk shocks. If RPT reforms limit the ability of business groups to shield their subsidiaries from credit-risk shocks, then we would expect β_7 to be positive.

Unobservable country- and industry-level time-varying factors may present a challenge to our identification strategy. Market-wide factors that are concurrent with, but unrelated to, RPT reforms could bias our estimates if correlated with the treatment (i.e., with the timing of RPT reforms and with the occurrence of episodes of industry distress). For this concern to arise, however, our sample countries would have to experience a series of macroeconomic shocks or regulatory changes that are perfectly aligned with the timing of RPT reforms across 36 countries and that affect subsidiaries and standalones *differentially*. While this seems very unlikely, we nevertheless employ several strategies to alleviate this potential concern. First, we examine sources of cross-sectional variation in intra-group credit-risk management *within* the sample of subsidiaries that are plausibly uncorrelated with the timing of the treatment (i.e., adoption of RPT reforms). Specifically, we assess whether group and subsidiary characteristics that in theory should facilitate or incentivize intra-group credit-risk management indeed explain lower subsidiary sensitivity to credit-risk shocks and variation in the effect of RPT reforms. If the effects that we document were to be driven instead by other shocks or regulatory changes correlated with our treatment, there would be no reason to expect these effects to vary with group and subsidiary characteristics in a predictable direction. Second, we examine how credit-risk shocks propagate within the group structure by examining the spillover effects of credit-risk shocks to *other* group firms. To offer a plausible alternative explanation for our findings, macroeconomic factors that are unrelated to, but correlated with, RPT reforms would have to also explain changes in the sensitivity of subsidiaries to credit-risk shocks affecting other group firms in different industries and countries.

4 Data and summary statistics

We source our data from *Orbis Historical*, a database published by Bureau van Dijk Electronic Publishing (BvDEP) that provides ownership and financial data for close to 400 million public and private firms from around the world. We first identify subsidiaries by mapping the control chain of the business groups to which they belong. We then identify standalones as independent firms that (i) have no single shareholder holding more than 25% of their shares, and (ii) have no (investments in) subsidiaries. Section 1 of the Online Appendix discusses this process in detail.

In Table 1, Panel A, we report the sample selection criteria. We first eliminate firms whose Orbis legal form is labelled as "Other legal form" as well as firms with SIC codes of 8000 to 9999. We then delete firms that do not have assets and turnover of at least US $10,000, business groups with unavailable consolidated financial statements, and observations with missing data for our main analysis. Finally, we drop firm-years after

bankruptcy for bankrupt firms (Shumway 2001).[10] This leaves us with an *Initial Sample* of 272,955 (1,201,352) unique subsidiaries (subsidiary-years) and 6,326,790 (28,706,602) unique standalones (standalone-years) over the period 2004–2018.[11] We provide descriptive statistics for our *Initial Sample* in Table OA-1 of the Online Appendix.

Based on the PSM procedure discussed in Section 3.1 of the Online Appendix, we then match standalone firms to subsidiaries to form our *Final Sample* of subsidiary–standalone matched pairs.[12] Because we match subsidiaries and standalones in the first year they appear in the sample, we have an equal number of *unique* matched subsidiaries and standalones (137,305). However, as matched subsidiaries and standalones may leave the sample at different points in time after the first year, the number of subsidiary and standalone firm-years differs. Therefore, our *Final Sample* includes 625,563 subsidiary-year and 708,912 standalone-year observations.

Table 1, Panel B, presents the by-country distribution of the subsidiary firm-year observations included in the *Final Sample*.[13] There are 108 countries represented in the sample: France, Italy, Spain, and the United Kingdom account for more than 50% of the subsidiary and standalone firm-year observations.[14]

As subsidiaries and standalones are matched in the first year they appear in our sample, we discuss descriptive statistics for the variables used in the PSM procedure in the first year *before* and *after* matching as well as *over time*. Table OA-3, Panel B, of the Online Appendix shows that, before matching, subsidiaries and standalones exhibit statistically significant differences in *Profitability*, *Loss*, *Debt Coverage*, and *Size*. PSM successfully eliminates these significant differences for all covariates with the exception of *Loss*, for which the average is slightly smaller for standalones. Table 1, Panel C, presents descriptive statistics for the matching variables and other key variables used in our analysis, separately for subsidiaries and standalones, over time. Subsidiaries (standalones) exhibit an average bankruptcy rate (*Bankrupt*) of 1.4% (1.6%). Further, around 30% of both subsidiaries and standalones experience

[10] We use the field "status date" to identify the year in which a 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.

[11] As our sample period includes the global financial crisis of 2007–2008, in Section 5.1 of the Online Appendix, we discuss the sensitivity of our main findings to the exclusion of the years 2007 and 2008 from the sample. Our inferences remain qualitatively unchanged.

[12] In Section 3.2 of the Online Appendix, we discuss a sensitivity analysis in which we use entropy balancing (EB) (Hainmueller 2012) as an alternative approach to PSM to allay concerns that our findings could be driven by the idiosyncrasies of the specific matches resulting from the PSM procedure. We report the results of our EB tests in Table OA-4 of the Online Appendix. Our findings do not hinge on the specific covariate balance method that we use.

[13] Following Shroff et al. (2014), Beaver et al. (2019), and Beuselinck et al. (2019), we also keep, in our sample, countries with very few business group parent 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. (2019)).

[14] The distribution of observations by country may reflect not only differences in the number of firms in each country but also cross-country differences in reporting requirements. For example, in Canada and the United States, only public firms are required to file their annual financial statements. We conduct sensitivity tests in which we rerun our main analyses by excluding observations from Canada and the United States. The results of these tests, which are qualitatively similar to those of our main analyses, are discussed in Section 5.3 of the Online Appendix.

Table 1 Sample selection and composition

Panel A: Sample Selection Criteria

	Business Group Parents		Subsidiaries		Standalones	
	Unique Firms	**Firm-Years**	**Unique Firms**	**Firm-Years**	**Unique Firms**	**Firm-Years**
Firms with available ownership data, with total assets and sales greater than US $10,000, excluding *Other legal form* entities, *Museums and educational services*, *Private households*, *Membership organizations* (SIC codes 8000-8999), and *Public services* (SIC codes 9000-9999)	229,719	973,457	587,073	2,345,901	6,338,940	28,868,180
Exclude business groups without consolidated financial statements	(182,558)	(708,743)	(306,162)	(1,105,165)	-	-
Exclude years after bankruptcy for bankrupt firms	(722)	(5,708)	(7,850)	(38,533)	(12,020)	(160,792)
Exclude observations with missing data for main analysis	(13)	(209)	(106)	(851)	(130)	(786)
Exclude observations without subsidiary/standalone matches	(14,778)	(85,736)	(135,650)	(575,789)	(6,189,485)	(27,997,690)
Final Sample	31,648	173,061	137,305	625,563	137,305	708,912

Panel B: Final Sample Composition by Country

Country	**Business Group Parents**				**Subsidiaries**				**Standalones**			
	Unique Firms		**Firm-Years**		**Unique Firms**		**Firm-Years**		**Unique Firms**		**Firm-Years**	
	Obs.	**%**	**Obs.**	**%**	**Obs.**	**%**	**Obs.**	**%**	**Obs.**	**%**	**Obs.**	**%**
Albania	0	0.00%	0	0.00%	4	0.00%	12	0.00%	4	0.00%	8	0.00%
Algeria	0	0.00%	0	0.00%	10	0.01%	36	0.01%	10	0.01%	44	0.01%
Argentina	3	0.01%	11	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Australia	137	0.43%	613	0.35%	685	0.50%	1,835	0.29%	685	0.50%	2,359	0.33%
Austria	224	0.71%	1,331	0.77%	345	0.25%	1,444	0.23%	345	0.25%	1,401	0.20%
Azerbaijan	1	0.00%	1	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Barbados	1	0.00%	13	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Belgium	345	1.09%	2,438	1.41%	2,742	2.00%	12,696	2.03%	2,742	2.00%	12,446	1.76%
Bermuda	44	0.14%	219	0.13%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Bosnia and Herzegovina	7	0.02%	21	0.01%	98	0.07%	520	0.08%	98	0.07%	583	0.08%

Table 1 (continued)

Brazil	103	0.33%	316	0.18%	577	0.42%	1,780	0.28%	577	0.42%	2,057	0.29%
Bulgaria	21	0.07%	121	0.07%	705	0.51%	3,122	0.50%	705	0.51%	3,053	0.43%
Canada	123	0.39%	578	0.33%	8	0.01%	18	0.00%	8	0.01%	29	0.00%
Canary Islands	36	0.11%	227	0.13%	319	0.23%	1,669	0.27%	319	0.23%	1,899	0.27%
Cayman Islands	28	0.09%	89	0.05%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Ceuta	0	0.00%	0	0.00%	2	0.00%	13	0.00%	2	0.00%	16	0.00%
Chile	10	0.03%	68	0.04%	1	0.00%	6	0.00%	1	0.00%	6	0.00%
China	981	3.10%	3,386	1.96%	7,297	5.31%	23,212	3.71%	7,297	5.31%	22,629	3.19%
Colombia	16	0.05%	59	0.03%	576	0.42%	3,042	0.49%	576	0.42%	3,445	0.49%
Croatia	39	0.12%	251	0.15%	614	0.45%	3,120	0.50%	614	0.45%	3,350	0.47%
Curaçao	1	0.00%	15	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Cyprus	25	0.08%	69	0.04%	24	0.02%	40	0.01%	24	0.02%	51	0.01%
Czech Republic	18	0.06%	69	0.04%	2,143	1.56%	12,164	1.94%	2,143	1.56%	11,804	1.67%
Denmark	495	1.56%	2,690	1.55%	810	0.59%	3,171	0.51%	810	0.59%	2,053	0.29%
Egypt	3	0.01%	11	0.01%	2	0.00%	6	0.00%	2	0.00%	4	0.00%
Estonia	3	0.01%	11	0.01%	629	0.46%	3,524	0.56%	629	0.46%	3,689	0.52%
Faroe Islands	2	0.01%	8	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Finland	2,501	7.90%	11,970	6.92%	6,379	4.65%	28,393	4.54%	6,379	4.65%	38,660	5.45%
France	2,254	7.12%	13,981	8.08%	20,371	14.84%	111,302	17.79%	20,371	14.84%	125,745	17.74%
French Guiana	2	0.01%	6	0.00%	12	0.01%	53	0.01%	12	0.01%	54	0.01%
Germany	1,618	5.11%	10,016	5.79%	4,376	3.19%	15,859	2.54%	4,376	3.19%	14,615	2.06%
Gibraltar	2	0.01%	14	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Greece	252	0.80%	1,705	0.99%	997	0.73%	5,670	0.91%	997	0.73%	6,689	0.94%
Greenland	3	0.01%	31	0.02%	3	0.00%	13	0.00%	3	0.00%	22	0.00%
Guadeloupe	2	0.01%	5	0.00%	23	0.02%	147	0.02%	23	0.02%	133	0.02%
Guernsey	9	0.03%	35	0.02%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Guyana	1	0.00%	1	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Hong Kong	19	0.06%	118	0.07%	1	0.00%	1	0.00%	1	0.00%	1	0.00%

Table 1 (continued)

Hungary	70	0.22%	334	0.19%	1,136	0.83%	6,260	1.00%	1,136	0.83%	6,755	0.95%
Iceland	45	0.14%	141	0.08%	146	0.11%	322	0.05%	146	0.11%	413	0.06%
India	723	2.28%	2,355	1.36%	2,476	1.80%	6,761	1.08%	2,476	1.80%	7,694	1.09%
Indonesia	2	0.01%	4	0.00%	1	0.00%	1	0.00%	1	0.00%	1	0.00%
Iran	1	0.00%	1	0.00%	1	0.00%	1	0.00%	1	0.00%	2	0.00%
Ireland	155	0.49%	669	0.39%	400	0.29%	1,415	0.23%	400	0.29%	1,108	0.16%
Isle of Man	14	0.04%	46	0.03%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Israel	57	0.18%	323	0.19%	2	0.00%	9	0.00%	2	0.00%	4	0.00%
Italy	2,944	9.30%	19,453	11.24%	20,866	15.20%	93,729	14.98%	20,866	15.20%	117,861	16.63%
Jamaica	2	0.01%	15	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Japan	1,080	3.41%	8,244	4.76%	931	0.68%	9,278	1.48%	931	0.68%	10,731	1.51%
Jersey	28	0.09%	128	0.07%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Jordan	1	0.00%	1	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Kazakhstan	0	0.00%	0	0.00%	1	0.00%	8	0.00%	1	0.00%	10	0.00%
Kenya	0	0.00%	0	0.00%	1	0.00%	15	0.00%	1	0.00%	14	0.00%
Korea	746	2.36%	4,158	2.40%	2,633	1.92%	13,893	2.22%	2,633	1.92%	20,813	2.94%
Kosovo	1	0.00%	1	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Kuwait	10	0.03%	63	0.04%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Latvia	149	0.47%	654	0.38%	858	0.62%	3,767	0.60%	858	0.62%	3,851	0.54%
Liberia	1	0.00%	15	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Lithuania	85	0.27%	344	0.20%	356	0.26%	1,465	0.23%	356	0.26%	1,665	0.23%
Luxembourg	62	0.20%	225	0.13%	185	0.13%	709	0.11%	185	0.13%	688	0.10%
Malaysia	1,092	3.45%	8,023	4.64%	2,104	1.53%	15,171	2.43%	2,104	1.53%	17,326	2.44%
Malta	17	0.05%	53	0.03%	41	0.03%	112	0.02%	41	0.03%	102	0.01%
Marshall Islands	5	0.02%	30	0.02%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Martinique	3	0.01%	8	0.00%	18	0.01%	103	0.02%	18	0.01%	70	0.01%
Mauritius	5	0.02%	20	0.01%	4	0.00%	8	0.00%	4	0.00%	6	0.00%
Mexico	37	0.12%	169	0.10%	153	0.11%	407	0.07%	153	0.11%	390	0.06%

Table 1 (continued)

Montenegro	2	0.01%	10	0.01%	25	0.02%	72	0.01%	25	0.02%	78	0.01%
Morocco	4	0.01%	17	0.01%	194	0.14%	645	0.10%	194	0.14%	769	0.11%
Netherlands	706	2.23%	3,384	1.96%	189	0.14%	621	0.10%	189	0.14%	523	0.07%
New Zealand	19	0.06%	91	0.05%	9	0.01%	19	0.00%	9	0.01%	15	0.00%
Nigeria	0	0.00%	0	0.00%	1	0.00%	15	0.00%	1	0.00%	5	0.00%
North Macedonia	11	0.03%	53	0.03%	90	0.07%	312	0.05%	90	0.07%	389	0.05%
Norway	1,293	4.09%	6,221	3.59%	4,869	3.55%	19,489	3.12%	4,869	3.55%	24,720	3.49%
Pakistan	2	0.01%	10	0.01%	2	0.00%	11	0.00%	2	0.00%	29	0.00%
Panama	2	0.01%	15	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Peru	6	0.02%	13	0.01%	25	0.02%	39	0.01%	25	0.02%	29	0.00%
Philippines	3	0.01%	23	0.01%	166	0.12%	931	0.15%	166	0.12%	1,105	0.16%
Poland	569	1.80%	3,102	1.79%	5,578	4.06%	25,787	4.12%	5,578	4.06%	32,003	4.51%
Portugal	355	1.12%	1,596	0.92%	2,781	2.03%	12,608	2.02%	2,781	2.03%	14,341	2.02%
Qatar	1	0.00%	3	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Reunion	3	0.01%	16	0.01%	46	0.03%	191	0.03%	46	0.03%	216	0.03%
Romania	24	0.08%	111	0.06%	1,579	1.15%	8,017	1.28%	1,579	1.15%	7,921	1.12%
Russia	90	0.28%	521	0.30%	4,291	3.13%	16,482	2.63%	4,291	3.13%	19,286	2.72%
Saint Martin	0	0.00%	0	0.00%	1	0.00%	8	0.00%	1	0.00%	4	0.00%
Saudi Arabia	8	0.03%	60	0.03%	1	0.00%	7	0.00%	1	0.00%	7	0.00%
Serbia	7	0.02%	23	0.01%	432	0.31%	1,901	0.30%	432	0.31%	1,786	0.25%
Singapore	91	0.29%	646	0.37%	1	0.00%	9	0.00%	1	0.00%	15	0.00%
Slovakia	47	0.15%	109	0.06%	1,037	0.76%	4,936	0.79%	1,037	0.76%	5,043	0.71%
Slovenia	10	0.03%	82	0.05%	358	0.26%	1,970	0.31%	358	0.26%	2,154	0.30%
South Africa	27	0.09%	156	0.09%	1	0.00%	2	0.00%	1	0.00%	9	0.00%
Spain	1,437	4.54%	8,770	5.07%	11,865	8.64%	60,592	9.69%	11,865	8.64%	68,686	9.69%
Sri Lanka	4	0.01%	18	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Svalbard	1	0.00%	4	0.00%	2	0.00%	3	0.00%	2	0.00%	3	0.00%
Sweden	1,225	3.87%	6,984	4.04%	966	0.70%	4,877	0.78%	966	0.70%	7,461	1.05%

Table 1 (continued)

Switzerland	100	0.32%	1,049	0.61%	14	0.01%	192	0.03%	14	0.01%	180	0.03%
Taiwan	304	0.96%	1,669	0.96%	28	0.02%	128	0.02%	28	0.02%	127	0.02%
Thailand	2,030	6.41%	6,969	4.03%	5,395	3.93%	19,493	3.12%	5,395	3.93%	24,528	3.46%
Trinidad and Tobago	1	0.00%	9	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Tunisia	2	0.01%	6	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Turkey	54	0.17%	203	0.12%	349	0.25%	1,078	0.17%	349	0.25%	1,260	0.18%
Ukraine	32	0.10%	104	0.06%	555	0.40%	2,183	0.35%	555	0.40%	2,154	0.30%
United Arab Emirates	5	0.02%	23	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
United Kingdom	4,954	15.65%	24,931	14.41%	13,249	9.65%	53,903	8.62%	13,249	9.65%	44,599	6.29%
United States	1,098	3.47%	8,949	5.17%	34	0.02%	105	0.02%	34	0.02%	167	0.02%
Uruguay	1	0.00%	3	0.00%	3	0.00%	3	0.00%	3	0.00%	3	0.00%
Venezuela	1	0.00%	11	0.01%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Vietnam	446	1.41%	1,079	0.62%	1,103	0.80%	2,632	0.42%	1,103	0.80%	2,948	0.42%
Virgin Islands	9	0.03%	44	0.03%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Total	31,648	100.00%	173,061	100.00%	137,305	100.00%	625,563	100.00%	137,305	100.00%	708,912	100.00%

Table 1 (continued)

Panel C: Descriptive Statistics

	Unique Firms	Firm-Years	Mean	Std. Dev.	P25	Median	P75
Subsidiaries:							
Bankrupt	137,305	625,563	0.014	0.119	0.000	0.000	0.000
Distress	137,305	625,563	0.299	0.458	0.000	0.000	1.000
Profitability	137,305	625,563	0.056	0.245	-0.003	0.031	0.104
Loss	137,305	625,563	0.267	0.442	0.000	0.000	1.000
Leverage	137,305	625,563	0.699	0.537	0.392	0.656	0.874
Debt Coverage	137,305	625,563	0.166	0.395	0.000	0.079	0.293
Size	137,305	625,563	14.843	2.109	13.589	14.962	16.304
Listed	137,305	625,563	0.003	0.053	0.000	0.000	0.000
Foreign	137,305	625,563	0.399	0.490	0.000	0.000	1.000
Majority Owned	137,305	625,563	0.829	0.377	1.000	1.000	1.000
Wholly Owned	137,305	625,563	0.497	0.500	0.000	0.000	1.000
Standalones:							
Bankrupt	137,305	708,912	0.016	0.124	0.000	0.000	0.000
Distress	137,305	708,912	0.301	0.459	0.000	0.000	1.000
Profitability	137,305	708,912	0.041	0.192	-0.002	0.018	0.073
Loss	137,305	708,912	0.263	0.440	0.000	0.000	1.000
Leverage	137,305	708,912	0.701	0.463	0.426	0.696	0.900
Debt Coverage	137,305	708,912	0.127	0.345	0.002	0.057	0.194
Size	137,305	708,912	14.349	1.900	13.212	14.524	15.638
Listed	137,305	708,912	0.004	0.061	0.000	0.000	0.000

This table presents sample selection criteria, sample composition, and descriptive statistics for business group parent, subsidiary, and standalone observations. Panel A describes the sample selection criteria. We obtain subsidiary–standalone matches in the first year that subsidiaries appear in the sample. Standalones are matched (without replacement) to subsidiaries based on country, industry, listing status, and closest propensity score (using a caliper of 0.01) estimated based on a logistic regression of *Subsidiary* on *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, and *Size*. We present the results of the estimation of the first stage propensity score model and covariate balance tests in Table OA-3 of the Online Appendix. Panel B presents the distribution of sample firms and firm-years by country. Panel C presents descriptive statistics for our main dependent and independent variables separately for subsidiaries and standalones. All continuous variables are winsorized at the 1st and 99th percentiles of their distributions. All variables are defined in the Appendix

episodes of industry distress (*Distress*) during our sample period.[15] Approximately 40% of our sample subsidiaries are domiciled in a country that differs from that of their business group parents (*Foreign*). Business group parents hold (directly or indirectly) a majority stake in 82.9% of our sample subsidiaries (*Majority Owned*). Moreover, 49.7% of subsidiaries in our sample have their entire equity owned (directly or indirectly) by their business group parents (*Wholly Owned*).

5 Intra-group credit-risk management and RPT reforms

5.1 Do business groups insulate their subsidiaries from credit-risk shocks?

In this section, we assess the extent to which business groups use their internal capital markets to manage intra-group credit risk. Using standalone firms as a counterfactual, we examine changes in subsidiary bankruptcy probability following episodes of industry distress.

Table 2, Panel A, reports the results of this analysis. Columns (1) to (3) display coefficient estimates (and respective z-statistics) of logistic regressions. We first estimate model (1) without firm-level controls and fixed effects (Column (1)), then sequentially add firm-level controls (Column (2)) as well as country, industry, and year fixed effects, to control for unobservable factors at the country, industry, and year level (Column (3)). The remaining columns (Columns (4) to (7)) display the results of the estimation of linear probability models, which can accommodate a more demanding fixed effects structure (Wooldridge 2010).[16] Specifically, in Column (7), we replace country and industry fixed effects with firm fixed effects to control for time-invariant firm-specific heterogeneity.

Consistent with our expectations, we find, across all specifications, that both subsidiaries and standalones are, on average, more likely to file for bankruptcy following credit-risk shocks (positive and significant coefficient on *Distress*). Most importantly, we document that, relative to standalones, subsidiaries are less affected by credit-risk shocks (negative and significant coefficient on *Distress* × *Subsidiary*).[17] The

[15] In untabulated tests, we empirically validate our *Distress* indicator by examining its correlation with a series of country-level variables that capture macro-level shocks to credit risk (i.e., currency crises, banking crises, and sovereign debt crises). Average country-year *Distress* exhibits positive and significant correlations with the occurrence of banking and sovereign debt crises. The correlation between *Distress* and the occurrence of currency crises is also positive, albeit not statistically significant. The evidence emerging from this correlation analysis supports our choice to rely on *Distress* as a credit-risk shock indicator.

[16] We do not estimate our logistic regressions with firm fixed effects for two main reasons. First, the inclusion of such an extensive set of covariates would likely induce an incidental parameter problem (Neyman and Scott 1948; Lancaster 2000) that could bias our coefficient of interest. Second, using a logit estimation with firm fixed effects would effectively limit the sample to firms that have at least one bankruptcy during the sample period.

[17] In Section 2 of the Online Appendix, we discuss a further set of tests in which we investigate whether the differential sensitivity of subsidiaries and standalones to industry distress extends to the full sample of (unmatched) subsidiaries and standalones (i.e., our *Initial Sample*). The results of these tests are similar to those reported in Table 2.

Table 2 Intra-group credit-risk management

Panel A: Differential Sensitivity of Subsidiaries and Standalones to Credit-Risk Shocks

	Dependent variable: *Bankrupt*						
	Logit	**Logit**	**Logit**	**OLS**	**OLS**	**OLS**	**OLS**
Independent variables:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Distress	1.187***	1.156***	0.614***	0.021***	0.020***	0.012***	0.012***
	(12.32)	(12.78)	(7.95)	(11.13)	(11.47)	(7.86)	(6.74)
Subsidiary	0.128**	0.174***	0.174***	0.001**	0.002***	0.002***	
	(2.44)	(3.08)	(2.97)	(2.36)	(3.69)	(3.28)	
Distress × *Subsidiary*	-0.387***	-0.416***	-0.373***	-0.008***	-0.008***	-0.007***	-0.008***
	(-4.74)	(-4.55)	(-4.44)	(-4.59)	(-4.52)	(-4.11)	(-4.75)
Profitability		-0.131	-0.091		-0.008***	-0.008***	0.002
		(-1.09)	(-0.81)		(-2.79)	(-2.70)	(1.43)
Loss		0.760***	0.723***		0.013***	0.013***	0.009***
		(9.80)	(10.10)		(6.38)	(6.50)	(7.18)
Leverage		0.293***	0.353***		0.009***	0.009***	0.018***
		(8.27)	(10.24)		(5.36)	(5.96)	(6.90)
Debt Coverage		-0.248***	-0.268***		0.000	0.001	-0.002**
		(-4.50)	(-4.93)		(0.30)	(0.64)	(-2.51)
Size		-0.110***	-0.076***		-0.002***	-0.001***	-0.005***
		(-8.79)	(-6.97)		(-8.17)	(-6.69)	(-8.53)
Listed		-0.163	0.380		0.002	0.004**	-0.005*
		(-0.65)	(1.36)		(0.99)	(2.56)	(-1.94)
Country fixed effects	No	No	Yes	No	No	Yes	No
Industry fixed effects	No	No	Yes	No	No	Yes	No
Firm fixed effects	No	No	No	No	No	No	Yes
Year fixed effects	No	No	Yes	No	No	Yes	Yes
Obs.	1,334,475	1,334,475	1,329,437	1,334,475	1,334,475	1,334,475	1,334,475
Pseudo R^2	0.025	0.062	0.104				
Adj. R^2				0.004	0.011	0.017	0.337

Table 2 (continued)

Panel B: Multinational Groups and Foreign Subsidiaries

	Dependent variable: *Bankrupt*			
	Multinational Groups		**Foreign Subsidiaries**	
	No	**Yes**	**No**	**Yes**
Independent variables:	**(1)**	**(2)**	**(3)**	**(4)**
Distress	0.009***	0.015***	0.010***	0.015***
	(4.68)	(8.31)	(5.27)	(7.80)
Distress × *Subsidiary*	-0.004**	-0.012***	-0.006***	-0.012***
	(-2.05)	(-7.16)	(-3.17)	(-6.74)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Test for difference in *Distress* × *Subsidiary*				
χ^2-test *p*-value: No = Yes	0.000		0.002	
Obs.	635,764	698,711	822,699	511,776
Adj. R^2	0.345	0.329	0.337	0.338

Table 2 (continued)

Panel C: Majority and Wholly Owned Subsidiaries

	Dependent variable: *Bankrupt*			
	Majority Owned Subsidiaries		Wholly Owned Subsidiaries	
	No	Yes	No	Yes
Independent variables:	**(1)**	**(2)**	**(3)**	**(4)**
Distress	0.010***	0.012***	0.013***	0.010***
	(6.03)	(6.39)	(6.98)	(5.33)
Distress × *Subsidiary*	-0.003	-0.009***	-0.008***	-0.008***
	(-1.51)	(-4.84)	(-4.66)	(-3.60)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Test for difference in *Distress* × *Subsidiary*				
χ^2-test *p*-value: No = Yes	0.004		0.941	
Obs.	265,146	1,069,329	724,380	610,095
Adj. R^2	0.342	0.336	0.337	0.338

This table presents the results of the analysis that examines the differential sensitivity of subsidiaries and standalones to industry distress. The dependent variable is *Bankrupt*, an indicator variable set equal to one if a firm files for bankruptcy in the 12-month period following the end of the fiscal year, and zero otherwise. In Panel A, we report estimates based on the sample of subsidiaries and matched standalones. In Panel B, we report the results of the estimation of the model presented in Panel A, Column (7), separately for domestic and multinational business groups (Columns (1) and (2), respectively) as well as for domestic and foreign subsidiaries (Columns (3) and (4), respectively). We retain the respective standalone matches in each sample partition. A business group is classified as multinational if two or more of its subsidiaries are domiciled in different countries. A subsidiary is classified as foreign if its country of domicile and that of the business group parent are different. In Panel C, we report the results of the estimation of the model presented in Panel A, Column (7), separately for minority and majority owned subsidiaries (Columns (1) and (2), respectively) as well as for non-wholly owned and wholly owned subsidiaries (Columns (3) and (4), respectively). We retain the respective standalone matches in each sample partition. A subsidiary is classified as majority owned if more than 50% of its control rights are held (directly or indirectly) by the business group parent. A subsidiary is classified as wholly owned if 100% of its control rights are held (directly or indirectly) by the business group parent. In Panel A, the model specifications presented in Columns (1) to (3) are estimated using logistic regressions, whereas the model specifications presented in Columns (4) to (7) are estimated using ordinary least squares (OLS) regressions. In Panel A, the model specifications presented in Columns (3) and (6) include country, industry, and year fixed effects, whereas the model specification presented in Column (7) includes firm and year fixed effects. In Panels B and C, all model specifications are estimated using OLS regressions and include firm-level controls (i.e., *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, *Size*, and *Listed*) as well as firm and year fixed effects. In Panels B and C, we report *p*-values from χ^2-tests for the differences in *Distress* × *Subsidiary* across the *No* and *Yes* columns. The table reports (in parentheses) *z*-statistics (in Columns (1) to (3) of Panel A) and *t*-statistics (in the remaining columns of Panel A as well as in all columns of Panels B and C) based on heteroscedasticity-robust standard errors clustered at the country and industry level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in the Appendix

estimated effect is similar across alternative model specifications and fairly insensitive to the inclusion of firm-level control variables as well as different fixed effects structures. The economic magnitude of the differential sensitivity of subsidiaries and standalones to credit-risk shocks is meaningful. Based on the estimates reported in Column (7), the bankruptcy probability of subsidiaries (standalones) increases by 0.4 (1.2) percentage points following a credit-risk shock, which corresponds to an increase of 29% (75%) relative to their average bankruptcy rate of 1.4% (1.6%). In other words, following a credit-risk shock, subsidiaries experience an increase in bankruptcy probability that is 0.8 percentage points lower than that of standalones. This advantage that internal capital markets confer to subsidiaries is equivalent to approximately 57% of the subsidiaries' average bankruptcy rate.

Interestingly, the coefficient on *Subsidiary* is positive and significant, suggesting that subsidiaries are more likely to file for bankruptcy than standalones outside episodes of industry distress. 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 (because of group support). Khanna and Yafeh (2005) describe this as a "Darwinian selection of survivors." This higher likelihood of bankruptcy outside of episodes of industry distress could also be consistent with subsidiaries being used to provide help to other distressed subsidiaries when they are not themselves in financial distress, and thus being exposed to spillovers from other group firms.[18]

In Fig. 1, we map out the differential sensitivity of subsidiaries and standalones to episodes of industry distress in event-time. We estimate model (1) but replace the *Distress* indicator with separate event-time dummies, each marking a period relative to the occurrence of episodes of industry distress (except for the year before the occurrence of episodes of industry distress (i.e., $t = -1$), which serves as the benchmark). We then plot the coefficients on the interaction of *Subsidiary* and each event-time dummy. Our findings indicate that there is no apparent trend in the difference between the bankruptcy probabilities of subsidiaries and standalones in the period leading up to an episode of industry distress. However, when industry distress occurs, standalones experience an increase in bankruptcy probability that is significantly more pronounced than that of subsidiaries. This differential effect is observable in the year in which industry distress occurs and persists in the following year. From that point onward, standalones and subsidiaries again exhibit parallel trends in bankruptcy probabilities. This evidence is consistent with business groups providing "emergency" (short-term) support to their subsidiaries when in need.

We next examine the extent to which the effects that we document vary depending on whether business groups are domestic or multinational and subsidiaries are domestic or foreign. In Table 2, Panel B, we report the results of these tests. We estimate the model presented in Table 2, Panel A, Column (7), separately for subsidiaries in domestic (Column (1)) and multinational (Column (2)) groups as well as for domestic (Column (3)) and foreign (Column (4)) subsidiaries. We find that, across all partitions, subsidiaries experience lower increases in bankruptcy risk following an episode

[18] We examine intra-group spillover effects directly in Section 7.1.

of industry distress, compared to their matched standalones. Moreover, relative to their standalone benchmarks, subsidiaries of multinational groups and foreign subsidiaries experience significantly lower increases in bankruptcy probability (p-values of 0.000 and 0.002, respectively). This finding is consistent with the coinsurance hypothesis (Lewellen 1971; Khanna and Yafeh 2005), as business groups with a wider geographic footprint benefit from greater diversification opportunities and thus are better able to insulate their subsidiaries from adverse credit-risk shocks.[19]

We then explore whether the differential sensitivity of subsidiaries and standalones to credit-risk shocks varies depending on subsidiary ownership structure. To do so, we partition our sample based on the extent of business group parent control rights. In Table 2, Panel C, we present the results of this analysis. In Columns (1) and (2), we report estimates for minority and majority owned subsidiaries, whereas in Columns (3) and (4) we report estimates for non-wholly owned and wholly owned subsidiaries, respectively. We find that, following an episode of industry distress, majority owned subsidiaries experience a significantly lower increase in bankruptcy probability than minority owned subsidiaries (p-value of 0.004). Moreover, both wholly owned and non-wholly owned subsidiaries exhibit lower sensitivity to industry distress than their standalone matches. However, the coefficient on $Distress \times Subsidiary$ is not significantly different across the two subsamples (p-value of 0.941). Combined, these results indicate that subsidiary control is an important determinant of the decision to support a subsidiary. That said, conditional on a subsidiary being controlled, full ownership does not seem to be incrementally relevant in explaining this decision.

Collectively, the evidence of the tests presented in Table 2 suggests that business groups act as "shock absorbers" and is in line with the coinsurance hypothesis (Lewellen 1971; Khanna and Yafeh 2005).

5.2 Do RPT reforms hamper intra-group credit-risk management?

In this section, we employ the DiD research design described in Section 3 to gauge the effect of RPT reforms on intra-group credit-risk management. We posit that stricter approval and disclosure requirements for RPTs introduced by RPT reforms may affect the ability and willingness of business groups to support their distressed subsidiaries.

In Table 3, Panel A, we report the results of the estimation of model (2).[20] Across all model specifications (Columns (1) to (7)), the coefficient on $Distress \times Subsidiary$ is negative and significant, suggesting that, prior to RPT reforms, subsidiaries are less sensitive to credit-risk shocks than their standalone counterparts. Most importantly, the coefficient on $Distress \times Subsidiary \times RPT$ is positive and significant, which indicates that, following the introduction of RPT reforms, the differential

[19] Several countries require foreign business groups to set up local subsidiaries (as opposed to local branches) to hire employees and conduct business. Therefore, this finding could also be consistent with business groups protecting foreign subsidiaries in countries with these legal requirements.

[20] As data on RPT reforms is only available from 2008 onwards, the sample used in these tests is smaller than our *Final Sample*.

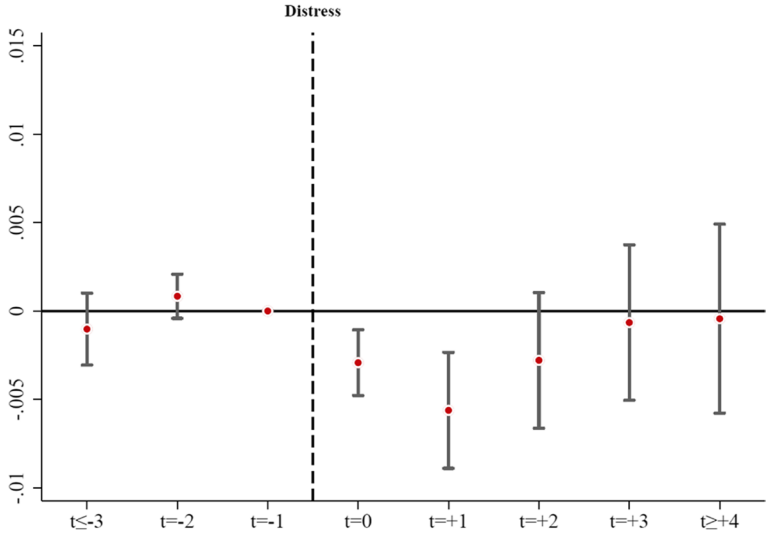


Fig. 1 Subsidiaries and standalones' differential sensitivity to industry distress. This figure depicts the estimated coefficients of an ordinary least squares (OLS) regression, which we use to investigate the differential sensitivity of subsidiaries and standalones to episodes of industry distress. We estimate model (1) but replace the *Distress* indicator with separate event-time dummies, each marking a period relative to the occurrence of episodes of industry distress (except for the year before the occurrence of episodes of industry distress (i.e., $t = -1$), which serves as the benchmark). We report event-time industry distress effects (red dots) for the whole sample of subsidiaries and matched standalones. Vertical bands represent 95% confidence intervals for the point estimate in each event-time period and are calculated based on standard errors clustered at the country and industry level. The vertical dashed line marks the occurrence of episodes of industry distress

sensitivity of subsidiaries and standalones to credit-risk shocks becomes significantly less pronounced. This evidence is consistent with business groups finding it more costly to shelter subsidiaries from negative credit-risk shocks after the enactment of RPT reforms.[21]

In terms of economic magnitude, we find that the advantage that internal capital markets confer to subsidiaries significantly declines when RPT reforms come into force. The sensitivity of subsidiaries to credit-risk shocks increases by 0.7 percentage points relative to standalones (Column (7)), which corresponds to approximately 50% of their pretreatment average bankruptcy probability.

The negative and significant coefficient on *RPT* and the insignificant coefficient on $Subsidiary \times RPT$ are also noteworthy. They suggest that, after RPT reforms, both subsidiaries and standalones that are *not* exposed to credit-risk shocks

[21] To alleviate the concern that the effect that we document could be due to random chance, in Section 5.6 of the Online Appendix, we discuss the results of two placebo tests where we randomly assign RPT reform implementation dates. Moreover, in Section 5.7 of the Online Appendix, we follow the approach described by Oster (2019) to assess the stability of our treatment effect and evaluate robustness to omitted variable bias. Combined, the evidence from these sensitivity tests suggests that it is unlikely that our findings are driven by random chance or omitted variables.

Table 3 The effect of RPT reforms

Panel A: RPT Reforms and Intra-Group Credit-Risk Management

	Dependent variable: *Bankrupt*						
	Logit	**Logit**	**Logit**	**OLS**	**OLS**	**OLS**	**OLS**
Independent variables:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Distress	0.936***	0.950***	0.574***	0.017***	0.016***	0.010***	0.011***
	(9.05)	(9.48)	(6.95)	(8.35)	(8.44)	(6.11)	(5.43)
Subsidiary	0.045	0.133*	0.156**	0.001	0.002**	0.002***	
	(0.67)	(1.85)	(2.15)	(0.66)	(2.44)	(2.60)	
RPT	-1.140***	-1.084***	-0.244**	-0.008***	-0.007***	0.001	-0.007***
	(-5.99)	(-5.51)	(-2.15)	(-6.17)	(-5.65)	(0.36)	(-5.10)
Distress × *Subsidiary*	-0.443***	-0.524***	-0.468***	-0.009***	-0.011***	-0.010***	-0.007***
	(-4.50)	(-4.63)	(-4.33)	(-4.98)	(-5.13)	(-4.74)	(-4.08)
Distress × *RPT*	1.210***	0.979***	0.035	0.009***	0.006**	-0.003	0.001
	(5.79)	(4.64)	(0.31)	(2.82)	(1.99)	(-1.53)	(0.33)
Subsidiary × *RPT*	-0.039	-0.121	-0.077	-0.000	-0.001	-0.001	0.001
	(-0.30)	(-0.94)	(-0.58)	(-0.55)	(-1.27)	(-1.26)	(0.64)
Distress × *Subsidiary* × *RPT*	0.453***	0.630***	0.483***	0.010***	0.012***	0.011***	0.007***
	(2.91)	(3.96)	(3.07)	(3.61)	(4.41)	(4.26)	(2.84)
Controls	No	Yes	Yes	No	Yes	Yes	Yes
Country fixed effects	No	No	Yes	No	No	Yes	No
Industry fixed effects	No	No	Yes	No	No	Yes	No
Firm fixed effects	No	No	No	No	No	No	Yes
Year fixed effects	No	No	Yes	No	No	Yes	Yes
Obs.	1,152,422	1,152,422	1,147,734	1,152,422	1,152,422	1,152,422	1,152,422
Pseudo R^2	0.028	0.072	0.108				
Adj. R^2				0.004	0.013	0.018	0.394

Table 3 (continued)

Panel B: RPT Reforms and Financial Market Development

	Dependent variable: *Bankrupt*			
	Financial Market Development			
	Weak	***Strong***	***Weak***	***Strong***
Independent variables:	**(1)**	**(2)**	**(3)**	**(4)**
Distress	0.028***	0.011***	0.038***	0.009***
	(6.82)	(5.17)	(5.73)	(4.16)
RPT			0.024***	-0.007***
			(3.01)	(-4.49)
Distress × *Subsidiary*	-0.021***	-0.008***	-0.029***	-0.008***
	(-5.94)	(-4.48)	(-4.60)	(-4.68)
Distress × *RPT*			-0.021***	-0.007**
			(-3.03)	(-2.26)
Subsidiary × *RPT*			-0.012*	0.001
			(-1.83)	(0.59)
Distress × *Subsidiary* × *RPT*			0.022***	0.010***
			(3.51)	(2.69)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Test for difference *in Distress* × *Subsidiary* χ^2-test *p*-value: Weak = Strong	0.001		0.004	
Test for difference in *Distress* × *Subsidiary* × *RPT* χ^2-test *p*-value: Weak = Strong			0.815	
Obs.	319,856	684,737	268,163	561,966
Adj. R^2	0.314	0.303	0.371	0.387

Table 3 (continued)

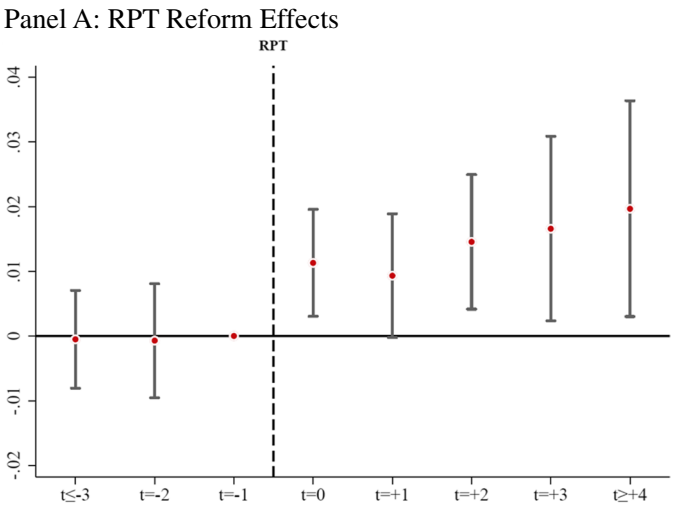
This table presents the results of the analysis that examines the effect of related party transaction (RPT) reforms on the differential sensitivity of subsidiaries and standalones to industry distress. The dependent variable is *Bankrupt*, an indicator variable set equal to one if a firm files for bankruptcy in the 12-month period following the end of the fiscal year, and zero otherwise. In Panel A, we report estimates based on the sample of subsidiaries and matched standalones. In Panel B, we report the results of the estimation of the models presented in Table 2, Panel A, Column (7) and Table 3, Panel A, Column (7), separately for firms domiciled in countries with weak financial market development (Columns (1) and (3), respectively) and firms domiciled in countries with strong financial market development (Columns (2) and (4), respectively). We retain the respective standalone matches in each sample partition. A country is classified as having weak financial market development if the ratio of the total market capitalization of all publicly listed firms in the country to the country's gross domestic product is below the sample median. In Panel A, the model specifications presented in Columns (1) to (3) are estimated using logistic regressions, whereas the model specifications presented in Columns (4) to (7) are estimated using ordinary least squares (OLS) regressions. The model specifications presented in Columns (2), (3), (5), (6), and (7) include firm-level controls (i.e., *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, *Size*, and *Listed*). The model specifications presented in Columns (3) and (6) include country, industry, and year fixed effects, whereas the model specification presented in Column (7) includes firm and year fixed effects. In Panel B, all model specifications are estimated using OLS regressions and include firm-level controls as well as firm and year fixed effects. In Panel B, we report *p*-values from χ^2-tests for the differences in *Distress* × *Subsidiary* and *Distress* × *Subsidiary* × *RPT* across the *Weak* and *Strong* columns. The table reports (in parentheses) *z*-statistics (in Panel A, Columns (1) to (3)) and *t*-statistics (in the remaining columns of Panel A as well as in all columns of Panel B) based on heteroscedasticity-robust standard errors clustered at the country and industry level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in the Appendix

experience a decline in bankruptcy probability. This is not surprising, considering that RPT reforms also target the transactions of non-group-affiliated firms (i.e., standalones) with their insiders (e.g., with management). As such, RPT reforms can affect the credit risk of both types of firms. Note that the identifying assumption underlying our DiD research design maintains that, absent the adoption of RPT reforms, the sensitivities to credit-risk shocks of subsidiaries and standalones across treated and control countries would not be *differentially* affected. Thus, the fact that the baseline bankruptcy probabilities of both subsidiaries and standalones are *individually* affected by the passage of RPT reforms is *not* a threat to our identification.

Next, we examine whether the effect of RPT reforms varies, in the cross-section, with the degree of subsidiary country financial market development. We expect internal capital markets to play a more prominent role in countries with weak financial market development, where access to external capital is constrained (Khanna and Palepu 2000). We therefore contend that RPT reforms should exhibit a stronger effect in subsidiaries domiciled in countries with less developed capital markets. We report the results of this analysis in Table 3, Panel B. We split subsidiaries and their matched standalones based on the degree of their countries' financial market development. In line with our expectations, we find that subsidiaries are significantly less sensitive to credit-risk shocks than standalones both in countries with weak and strong financial market development (negative and significant coefficient on *Distress* × *Subsidiary* in Columns (1) and (2)). Most importantly, the sensitivity of subsidiaries to credit-risk shocks is significantly lower in countries with weak financial market development (p-value of 0.001). The differential sensitivity of subsidiaries and standalones to credit-risk shocks declines following the adoption of RPT reforms both in countries with weak and strong financial market development (negative and significant coefficients on *Distress* × *Subsidiary* × *RPT* in Columns (3) and (4)), but more so in countries with weak financial market development, although the difference is not statistically significant (p-value of 0.815).

In Fig. 2, we map out the differential sensitivity of subsidiaries and standalones to credit-risk shocks across treated and control countries in the years surrounding the introduction of RPT reforms and test for differences in pretreatment trends. We estimate model (2) but replace the *RPT* indicator with separate event-time dummies, each marking a period relative to the introduction of RPT reforms (except for the year before the introduction of RPT reforms (i.e., $t = -1$), which serves as the benchmark). We plot the coefficients on the interaction of *Distress* × *Subsidiary* and each event-time dummy in Fig. 2, Panel A. Our findings indicate that, prior to the adoption of RPT reforms, the treatment effect magnitudes are economically small and statistically indistinguishable from zero, and there is no evidence of a trend in the differential sensitivity of subsidiaries and standalones to credit-risk shocks across treated and control countries, which provides support for the parallel-trends assumption. In contrast, treatment effects experience a sharp increase in the years following RPT reforms, which persists over time.

In Fig. 2, Panel B, we map out event-time RPT reform effects separately for countries with weak and strong financial market development. As in Fig. 2, Panel A, our findings indicate that, both in countries with weak and strong financial market development, the treatment effect of RPT reforms does not build up in the pretreatment



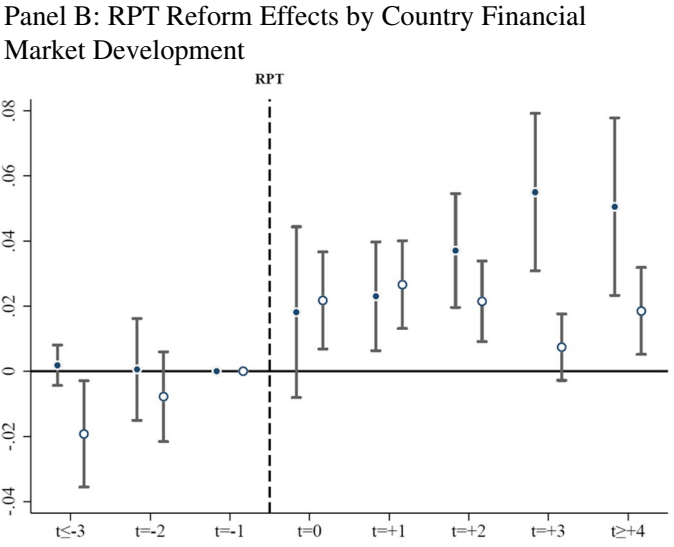


Fig. 2 Dynamic analysis of RPT reform effects. This figure depicts the estimated coefficients of ordinary least squares (OLS) regressions, which we use to investigate the differential sensitivity of subsidiaries and standalones to industry distress in the years surrounding the introduction of RPT reforms. We estimate model (2) but replace the *RPT* indicator with separate event-time dummies, each marking a period relative to the introduction of RPT reforms (except for the year before the introduction of RPT reforms (i.e., $t = -1$), which serves as the benchmark). In Panel A, we report event-time RPT reform effects (red dots) for the whole sample of subsidiaries and matched standalones. In Panel B, we report event-time RPT reform effects for the sample of subsidiaries and matched standalones separately for weak (blue dots) and strong (white dots) financial market development countries. Vertical bands represent 95% confidence intervals for the point estimate in each event-time period and are calculated based on standard errors clustered at the country and industry level. The vertical dashed line marks the adoption of RPT reforms

period. More interestingly, the evidence in Fig. 2, Panel B, suggests that the effect of RPT reforms is stronger, although not significantly so, for subsidiaries domiciled in countries with weak financial market development.

6 Treatment effect heterogeneity

6.1 Cross-sectional variation in group characteristics

The previous tests rely on standalones as a counterfactual to investigate the extent to which groups insulate their subsidiaries from credit-risk shocks before and after RPT reforms. In this section, we explore treatment effect heterogeneity by focusing on sources of cross-sectional variation in intra-group credit-risk management *within* the sample of subsidiaries.

Building on prior literature, we identify a series of group characteristics likely associated with business groups' incentives and ability to use their internal capital markets to support subsidiaries exposed to credit-risk shocks. We then investigate whether these group characteristics indeed explain lower subsidiary sensitivity to credit-risk shocks and variation in the effect of RPT reforms. These tests are important for two main reasons. First, they improve our understanding of the functioning of groups' internal capital markets and of the costs of RPT regulation. Second, because the group characteristics that we investigate are plausibly uncorrelated with the timing of the adoption of RPT reforms, the results of these tests provide reassurance that the effects that we document are indeed attributable to a decline in intra-group credit-risk management that RPT reforms engender.

The extent to which business groups are able to insure their subsidiaries against 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 (Lewellen 1971; Khanna and Yafeh 2005) and hence country and industry diversification should be important determinants of a group's ability to manage credit risk (Kuppuswamy and Villalonga 2015). 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; Ashcraft 2008), 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). We contend that, if RPT reforms that introduce stricter approval and disclosure requirements for RPTs impair the ability or willingness of business groups to engage in intra-group credit-risk management, then subsidiaries of business groups that are larger, more diversified, less financially constrained, pyramidal, and have a bank in their corporate structure should be disproportionally more affected by RPT reforms. To assess whether this is indeed the case, we partition our business groups based on the characteristics discussed above—specifically, on their degree of geographic and industry

Table 4 Group characteristics

	Dependent variable: *Bankrupt*											
	Geographic Diversification		Industry Diversification		Bank in the Group		Number of Subsidiaries		Number of Levels		Financial Constraints	
	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)
Distress	0.006***	0.003***	0.005***	0.004**	0.005***	-0.001	0.006***	0.004**	0.006***	0.004***	0.003**	0.004***
	(3.02)	(2.78)	(3.18)	(2.49)	(3.47)	(-0.35)	(3.35)	(2.28)	(2.91)	(2.73)	(2.22)	(2.84)
RPT	-0.009***	-0.003*	-0.007***	-0.005***	-0.005***	-0.005	-0.007***	-0.005***	-0.008***	-0.004**	-0.004**	-0.009***
	(-4.33)	(-1.90)	(-3.57)	(-3.19)	(-3.47)	(-0.97)	(-3.86)	(-2.88)	(-4.46)	(-2.18)	(-2.23)	(-4.57)
Distress × *RPT*	0.003	0.013***	0.002	0.014***	0.007**	0.030**	0.001	0.015***	0.001	0.015***	0.013***	0.003
	(0.97)	(2.96)	(0.68)	(3.48)	(2.24)	(2.20)	(0.47)	(3.50)	(0.36)	(3.76)	(3.29)	(1.17)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test for difference in *Distress*												
χ^2-test *p*-value: *Low (No)* = *High (Yes)*	0.027		0.199		0.024		0.144		0.211		0.017	
Test for difference in *Distress* × *RPT*												
χ^2-test *p*-value: *Low (No)* = *High (Yes)*	0.006		0.001		0.125		0.001		0.000		0.001	
Obs.	295,802	238,648	274,614	259,836	513,269	21,181	269,752	264,698	273,304	261,146	257,529	235,644
Adj. R^2	0.449	0.450	0.446	0.454	0.446	0.518	0.442	0.459	0.428	0.473	0.442	0.460

Table 4 (continued)

This table presents the results of the analysis that examines how the effect of related party transaction (RPT) reforms on the sensitivity of subsidiaries to industry distress varies, in the cross-section, with business group characteristics. The dependent variable is *Bankrupt*, an indicator variable set equal to one if a subsidiary files for bankruptcy in the 12-month period following the end of the fiscal year, and zero otherwise. We report estimates based on the sample of subsidiaries. Subsidiaries are partitioned into subsamples (*Low* and *High* or *No* and *Yes*) based on different business group characteristics. The *Low* (*High*) columns present estimates based on subsidiaries that belong to business groups where each characteristic is below (above) the respective sample median. Similarly, the *Yes* (*No*) columns present estimates based on subsidiaries that belong to business groups with (without) a specific characteristic. All model specifications are estimated using ordinary least squares (OLS) regressions and include firm-level controls (i.e., *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, *Size*, and *Listed*) as well as firm and year fixed effects. We report *p*-values from χ^2-tests for the differences in *Distress* and *Distress* × *RPT* across the *Low* (*No*) and *High* (*Yes*) columns. The table reports (in parentheses) *t*-statistics based on heteroscedasticity-robust standard errors clustered at the country and industry level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in the Appendix

diversification, the presence of a bank in the corporate structure, the number of subsidiaries, the number of levels in the control chain (which measures the extent to which group structures are pyramidal), and the extent of financial constraints. We then compare the magnitude of the coefficients on *Distress* and *Distress* × *RPT* across the different subsamples. We predict a lower coefficient on *Distress* and a higher coefficient on *Distress* × *RPT* for subsidiaries of groups where internal capital markets are expected to be more active.

We report the results of this analysis in Table 4. Consistent with our expectations, we find that subsidiaries of groups with higher geographical diversification, a bank in the corporate structure, and less financial constraints are significantly less sensitive to episodes of industry distress (*p*-values ranging from 0.017 to 0.027). Furthermore, subsidiaries of groups with high geographic and industry diversification, a large number of subsidiaries, longer control chains, and less financial constraints are disproportionately more affected by the adoption of RPT reforms (*p*-values ranging from 0.000 to 0.006).

6.2 Veil piercing and intra-group credit-risk management

In some jurisdictions, courts are more inclined to make an exception to limited liability and pierce the corporate veil, holding a parent company liable for its subsidiaries' debts (e.g., Erens et al. 2008; Mevorach 2009). As such, we posit that groups are more likely to support a distressed subsidiary when the risk of veil piercing is high. In this section, we examine how the effect of RPT reforms varies, in the cross-section, with the likelihood of veil piercing. We measure the likelihood of veil piercing (*Veil Piercing*) using the measure developed by Belenzon et al. (2018).[22] This measure captures bankruptcy courts' proclivity to take an "enterprise" view of the business group—that is, to disregard the separate legal identity of group firms, suspend the limited liability protection, and hold the business group parent liable for the debts of its insolvent subsidiaries.

We report the results of this analysis in Table 5. We partition our sample subsidiaries based on *Veil Piercing*.[23] A subsidiary is classified as having a high likelihood of veil piercing if *Veil Piercing* is above the median *Veil Piercing* of all other subsidiaries that belong to the same business group. We find that the sensitivity of subsidiaries to episodes of industry distress (*Distress*) is significantly lower when the likelihood of veil piercing is higher (*p*-value of 0.049). This evidence suggests that business groups are more prone to shelter subsidiaries whose debts they are more likely to be held accountable for. Also,

[22] Belenzon et al. (2018) score a number of countries on a scale from zero to five based on the propensity of courts to pierce the veil in cases involving corporate groups. This propensity is assessed based on five distinct criteria, weighted according to their importance: (1) the extent to which courts apply an enterprise approach; (2) the number of factors considered in veil piercing cases; (3) the extent to which veil piercing is allowed outside of bankruptcy proceedings; (4) the extent to which veil piercing is allowed outside of fraudulent behaviors; and (5) observed corporate veil piercing rates. Based on these different criteria, Belenzon et al. (2018) conclude that the likelihood of veil piercing is highest in France, Germany, and Italy, and lowest in Denmark, Sweden, and the United Kingdom.

[23] The sample size in these tests is reduced because *Veil Piercing* is not available for all our sample countries.

Table 5 Veil piercing

	Dependent variable: *Bankrupt*	
	Veil Piercing	
	Low	**High**
Independent variables:	**(1)**	**(2)**
Distress	0.006***	0.004***
	(3.06)	(4.58)
RPT	-0.012***	-0.004
	(-5.23)	(-1.04)
Distress × *RPT*	-0.000	0.033***
	(-0.07)	(2.75)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Test for difference in *Distress*		
χ^2-test *p*-value: *Low* = *High*	0.049	
Test for difference in *Distress* × *RPT*		
χ^2-test *p*-value: *Low* = *High*	0.008	
Obs.	191,199	95,767
Adj. R^2	0.446	0.457

This table presents the results of the analysis that examines how the effect of related party transaction (RPT) reforms on the sensitivity of subsidiaries to industry distress varies, in the cross-section, with the likelihood of veil piercing. Our measure for the likelihood of veil piercing (*Veil Piercing*) is based on Belenzon et al. (2018). The dependent variable is *Bankrupt*, an indicator variable set equal to one if a subsidiary files for bankruptcy in the 12-month period following the end of the fiscal year, and zero otherwise. We report estimates based on the subsample of subsidiaries for which *Veil Piercing* is available. A subsidiary is classified as having a high likelihood of veil piercing if *Veil Piercing* is above the median *Veil Piercing* of all other subsidiaries that belong to the same business group. All model specifications are estimated using ordinary least squares (OLS) regressions and include firm-level controls (i.e., *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, *Size*, and *Listed*) as well as firm and year fixed effects. We report *p*-values from χ^2-tests for the differences in *Distress* and *Distress* × *RPT* across the *Low* and *High* columns. The table reports (in parentheses) *t*-statistics based on heteroscedasticity-robust standard errors clustered at the country and industry level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in the Appendix

we document that, after the introduction of RPT reforms, business groups reduce their support of high veil piercing subsidiaries that experience credit-risk shocks (positive and significant coefficient on *Distress* × *RPT* in Column (2)). Lastly, we find that, compared to low veil piercing subsidiaries (Column (1)), high veil piercing subsidiaries are disproportionally more affected by RPT reforms (*p*-value of 0.008).[24]

[24] Because veil piercing may pose jurisdictional problems in the case of multinational business groups, in Section 6.1 of the Online Appendix, we investigate (i) the role of veil piercing in business groups' decisions to support domestic vs. foreign subsidiaries, and (ii) how the passage of RPT reforms differentially affects the ability of business groups to support domestic vs. foreign subsidiaries depending on the likelihood of veil piercing. We find that, prior to the passage of RPT reforms, business groups are more prone to shield domestic subsidiaries whose bankruptcies are more likely to impose costs on the group. Also, we find that domestic subsidiaries with high veil piercing likelihood become more sensitive to credit-risk shocks following RPT reforms.

In sum, our findings are consistent with RPT reforms decreasing the extent of intra-group credit-risk management and rendering internal capital markets a less effective tool for mitigating the risk of veil piercing.

7 Credit-risk spillovers, tunneling, and the efficiency of intra-group transfers

7.1 Within-group credit-risk shock propagation

Our previous tests examine the extent of intra-group credit-risk management from the perspective of a *receiver* subsidiary. If business groups actively reallocate resources across the corporate structure, then the financial support a distressed subsidiary receives should stem from other *provider* subsidiaries within the same group. If this is the case, then the decline in bankruptcy probability that a receiver subsidiary experiences should be accompanied by a corresponding increase in the bankruptcy probability of *other* subsidiaries within the same group.

In this section, we conduct a set of tests to examine how credit-risk shocks to other group firms affect the bankruptcy probability of a subsidiary before and after the passage of RPT reforms. These tests are important for three main reasons. First, they allow us to pin down the channel of group support. Second, they also allow us to gauge the effect of RPT reforms on within-group credit-risk spillovers. Third, by focusing on credit-risk shocks to group firms from *other* countries and industries, they mitigate the potential concern that *local* market-wide factors that are concurrent with, but unrelated to, RPT reforms could bias our inferences.

Based on the discussion above, we expect subsidiaries to be sensitive to credit-risk shocks that affect other subsidiaries that belong to the same group. Moreover, we posit that these within-group credit-risk spillovers decline following the adoption of RPT reforms. To test these conjectures, we use an approach similar to Bertrand et al. (2002). Table 6 presents the results of this analysis.[25] We create an indicator variable, *Other Distress*, which is set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of subsidiaries that experience industry distress (i.e., when the number of subsidiaries affected by industry distress falls into the top three deciles of the sample distribution).[26] In Column (1), we report the results of a regression of subsidiary bankruptcy probability on credit-risk shocks suffered by other group subsidiaries and document a positive and significant coefficient (*Other Distress*), suggesting that shocks to credit risk spill over

[25] In this analysis, we exclude from the sample subsidiaries that are themselves directly affected by a credit-risk shock.

[26] In untabulated tests, we assess the robustness of our results to two alternative measures of *Other Distress* based on (i) the percentage of other distressed subsidiaries in the group, and (ii) the percentage of the assets of distressed subsidiaries relative to the total assets of the other group subsidiaries. Our inferences remain qualitatively unchanged.

Table 6 Within-group credit-risk shock spillovers

	Dependent variable: *Bankrupt*	
Independent variables:	**(1)**	**(2)**
Other Distress	0.002**	0.002***
	(2.43)	(2.76)
RPT		-0.003***
		(-2.61)
Other Distress × *RPT*		-0.004***
		(-3.26)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Obs.	383,016	316,977
Adj. R^2	0.429	0.505

This table presents the results of the analysis that examines the effect of RPT reforms on the sensitivity of subsidiaries to the industry distress of other subsidiaries that belong to the same business group. The dependent variable is *Bankrupt*, an indicator variable set equal to one if a subsidiary files for bankruptcy in the 12-month period following the end of the fiscal year, and zero otherwise. We report estimates based on the sample of subsidiaries that do not experience industry distress themselves. *Other Distress* is an indicator variable set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of subsidiaries that experience industry distress (i.e., when the number of subsidiaries affected by industry distress falls into the top three deciles of the sample distribution), and zero otherwise. All model specifications are estimated using ordinary least squares (OLS) regressions and include firm-level controls (i.e., *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, *Size*, and *Listed*) as well as firm and year fixed effects. The table reports (in parentheses) *t*-statistics based on heteroscedasticity-robust standard errors clustered at the country and industry level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in the Appendix

to other group firms. In Column (2), we augment the model specification with *RPT* and its interaction with *Other Distress*. Our findings closely mirror those reported in Table 3, Panel B, Column (7), in that the sensitivity of a subsidiary to *Other Distress* significantly declines following RPT reforms (negative and significant coefficient on *Other Distress* × *RPT*), consistent with a reduction in the extent of intra-group credit-risk management.

7.2 Is group support tunneling in disguise?

Our findings thus far endorse the *bright side* of business groups, in that subsidiaries benefit from the support offered by the rest of the group when affected by credit-risk shocks. However, it is possible that the intra-group transfers that we document instead reflect a potential expropriation of resources by controlling shareholders at the expense of minority investors. *Tunneling* takes place when intra-group transactions transfer resources from subsidiaries where controlling shareholders have low cash flow rights (i.e., high wedge subsidiaries) to subsidiaries where they have high

Table 7 Tunneling

Panel A: Subsidiary Own Wedge

	Dependent variable: *Bankrupt*			
	Subsidiary Wedge			
	Low	**High**	**Low**	**High**
Independent variables:	**(1)**	**(2)**	**(3)**	**(4)**
Other Distress	0.002**	0.001	0.003**	-0.000
	(2.08)	(0.44)	(2.54)	(-0.04)
RPT			-0.003**	-0.002
			(-2.39)	(-1.43)
Other Distress × *RPT*			-0.004***	-0.001
			(-2.82)	(-0.48)
Controls	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Test for difference in *Other Distress*				
χ^2-test *p*-value: Low = High	0.052		0.015	
Test for difference in *Other Distress* × *RPT*				
χ^2-test *p*-value: Low = High			0.043	
Obs.	321,110	61,906	268,537	48,440
Adj. R^2	0.444	0.511	0.513	0.636

Panel B: Wedge of Other Subsidiaries within the Same Business Group

	Dependent variable: *Bankrupt*	
Independent variables:	**(1)**	**(2)**
$Other\ Distress^{High\ Wedge}$	-0.000	-0.000
	(-0.22)	(-0.09)
$Other\ Distress^{Low\ Wedge}$	0.002***	0.002**
	(2.95)	(2.36)
RPT		-0.003**
		(-2.58)
$Other\ Distress^{High\ Wedge} \times RPT$		-0.001
		(-0.79)
$Other\ Distress^{Low\ Wedge} \times RPT$		-0.003**
		(-2.53)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Obs.	383,016	316,977
Adj. R^2	0.429	0.505

This table presents the results of the analysis that examines the interplay between intra-group credit-risk management and the extent of tunneling. The dependent variable is *Bankrupt*, an indicator variable set equal to one if a subsidiary files for bankruptcy in the 12-month period following the end of the fiscal year, and zero otherwise. We report estimates based on the sample of subsidiaries that do not experience industry distress themselves. In Panel A, *Other Distress* is an indicator variable set equal to one

Table 7 (continued)

if a subsidiary belongs to a business group that, in a given year, has a large number of subsidiaries that experience industry distress (i.e., when the number of subsidiaries affected by industry distress falls into the top three deciles of the sample distribution), and zero otherwise. A subsidiary is classified as high wedge (low wedge) if the wedge between its cash flow rights and voting rights is above (below) the median wedge of all other subsidiaries that belong to the same business group. The wedge between cash flow rights and voting rights (*Wedge*) is defined as one minus the ratio of cash flow rights to voting rights. In Panel B, $Other\ Distress^{High\ Wedge}$ ($Other\ Distress^{Low\ Wedge}$) is an indicator variable set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of "high wedge" ("low wedge") subsidiaries that experience industry distress, and zero otherwise. All model specifications are estimated using ordinary least squares (OLS) regressions and include firm-level controls (i.e., *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, *Size*, and *Listed*) as well as firm and year fixed effects. In Panel A, we report *p*-values from χ^2-tests for the differences in *Other Distress* and *Other Distress* × *RPT* across the *Low* and *High* columns. The table reports (in parentheses) *t*-statistics based on heteroscedasticity-robust standard errors clustered at the country and industry level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in the Appendix

cash flow rights (i.e., low wedge subsidiaries), which ultimately harms the interests of minority investors (Bertrand et al. 2002). Therefore, if intra-group credit-risk management were to simply be tunneling in disguise, then one should observe group support uniquely stemming from high wedge subsidiaries.

In Table 7, we report the results of the analysis that examines whether intra-group credit-risk management can be entirely explained by tunneling. For that to happen, only high wedge subsidiaries should be sensitive to credit-risk shocks affecting other group firms. In contrast, as shown in Table 7, Panel A, we find that, when other firms within the group experience credit-risk shocks, it is the low wedge subsidiaries that are most affected (*p*-value of 0.052). This finding cannot be reconciled with a pure tunneling explanation. The fact that low wedge subsidiaries are the ones that help the most is consistent with these firms being more integrated and higher up in the control chain and therefore better placed to offer help to other subsidiaries. When examining the effect of RPT reforms, we show that the sensitivity of low wedge subsidiaries to other subsidiaries' credit-risk shocks decreases, which is again consistent with a decline in the extent of intra-group credit-risk management.

In Table 7, Panel B, Column (1), we present the results of a test that examines whether low wedge subsidiaries are also the ones that receive help when in need. We document that subsidiaries show greater sensitivity to credit-risk shocks affecting low wedge subsidiaries in their group ($Other\ Distress^{Low\ Wedge}$). Furthermore, we find that this sensitivity decreases after the passage of RPT reforms (negative and significant coefficient on $Other\ Distress^{Low\ Wedge} \times RPT$ in Column (2)).[27]

Combined, the evidence of these tests suggests that low wedge subsidiaries are the most active players within business groups' internal capital markets. Not only are they more likely to receive help when exposed to credit-risk shocks, but they are

[27] In Table OA-14 of the Online Appendix, we conduct a sensitivity test in which we restrict our sample to majority owned subsidiaries to allay the concern that partitioning the sample on wedge essentially splits subsidiaries according to the extent of their business group parent's control rights. We continue to find that low wedge subsidiaries are both more likely to receive transfers and to provide support.

also more likely to provide support to other group firms in need. If the intra-group credit-risk management that we document were to be explained by tunneling only, then one should observe that group support flows uniquely and unidirectionally from high wedge to low wedge subsidiaries. Our findings instead suggest that, although tunneling can be a concern at the margin, the intra-group transfers that we document are more consistent with groups using internal capital markets to manage credit risk.

7.3 The efficiency of intra-group credit-risk management before and after RPT reforms

Our analysis thus far cannot speak to whether intra-group credit-risk management is beneficial *on net*. While we clearly highlight a potential benefit of internal capital markets—the shielding of group firms from adverse credit-risk shocks by the rest of the group—it may well be that the ensuing resource transfers are *inefficient*. An insolvent subsidiary may in fact not deserve to be supported by other group firms if its future prospects are poor relative to the rest of the group. As such, when resources are limited, group support to subsidiaries "not worth helping" would destroy value for the business group and be inefficient. Similarly, when analyzing the effect of RPT reforms, we document a cost, in the form of a reduced ability of business groups to shield their subsidiaries from adverse credit-risk shocks after RPT reforms are enacted. However, to the extent that RPT reforms limit inefficient within-group transactions, the overall effect of these reforms could be net beneficial.

In this section, we examine (i) whether business groups' credit-risk management results in transfers of resources that primarily target subsidiaries that are "worth helping," that is, highly profitable subsidiaries that are temporarily affected by credit-risk shocks; and (ii) whether the documented reduced ability of business groups to use their internal capital markets to manage credit risk that RPT reforms engender reflects an indiscriminate curtailment of *all* intra-group transactions or, instead, a targeted reduction of inefficient transfers *only*.

Table 8, Panel A, reports the results of the tests that assess the extent of within-group credit-risk management and the effect of RPT reforms separately for subsidiaries that are worth and not worth helping. We classify as worth helping subsidiaries with return on assets above the average return on assets of all other subsidiaries that belong to the same business group.[28] If intra-group credit-risk management is net beneficial, we should observe that the subsidiaries worth helping are less sensitive to episodes of industry distress, consistent with their receiving help from the rest of the group when in need. We find that, in line with this expectation, the coefficient on *Distress* is significantly lower for subsidiaries that are worth helping (p-value of 0.002). Moreover, we document that, following RPT reforms, business groups

[28] Our approach loosely follows the internal capital markets literature that attempts to gauge the relative efficiency of resource transfers within US conglomerates using segment data (e.g., Billett and Mauer 2003). In untabulated tests, we assess the robustness of our results to the use of an alternative sample split criterion based on the comparison between the return on assets of a subsidiary and the asset-weighted average of all other subsidiaries' return on assets. Our inferences remain qualitatively unchanged.

Table 8 The efficiency of intra-group credit-risk management

Panel A: Subsidiary Own Industry Distress

	Dependent variable: *Bankrupt*	
	Worth Helping Subsidiaries	
	No	**Yes**
Independent variables:	**(1)**	**(2)**
Distress	0.006***	0.003**
	(3.47)	(2.44)
RPT	-0.005**	-0.005***
	(-2.53)	(-3.72)
Distress × *RPT*	0.008*	0.011***
	(1.87)	(3.60)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Test for difference in *Distress*		
χ^2-test *p*-value: No = Yes	0.002	
Test for difference in *Distress* × *RPT*		
χ^2-test *p*-value: No = Yes	0.219	
Obs.	242,157	223,069
Adj. R^2	0.546	0.616

Panel B: Industry Distress of Other Subsidiaries within the Same Business Group

	Dependent variable: *Bankrupt*	
Independent variables:	**(1)**	**(2)**
$Other\ Distress^{Worth\ Helping}$	0.004***	0.004***
	(4.04)	(3.79)
$Other\ Distress^{Not\ Worth\ Helping}$	-0.000	0.000
	(-0.29)	(0.24)
RPT		-0.003**
		(-2.48)
$Other\ Distress^{Worth\ Helping} \times RPT$		-0.004***
		(-3.33)
$Other\ Distress^{Not\ Worth\ Helping} \times RPT$		-0.001
		(-1.19)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Obs.	383,016	316,977
Adj. R^2	0.429	0.505

This table presents the results of the analysis that examines the effect of RPT reforms on the efficiency of intra-group credit-risk management. In Panel A, we examine whether the effect of related party transaction (RPT) reforms on the sensitivity of subsidiaries to industry distress depends on the extent to which subsidiaries are "worth helping" and report estimates based on the sample of subsidiaries. A subsidiary is classified as worth helping if its return on assets is above the average return on assets of all

Table 8 (continued)

other subsidiaries that belong to the same business group. In Panel B, we examine whether the effect of RPT reforms on the sensitivity of subsidiaries to the industry distress of other subsidiaries that belong to the same business group depends on the extent to which subsidiaries are worth helping. In Panel B, we report estimates based on the sample of subsidiaries that do not experience industry distress themselves. *Other Distress*$^{Worth\ Helping}$(*Other Distress*$^{Not\ Worth\ Helping}$) is an indicator variable set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of worth helping (not worth helping) subsidiaries that experience industry distress, and zero otherwise. All model specifications are estimated using ordinary least squares (OLS) regressions and include firm-level controls (i.e., *Profitability*, *Loss*, *Leverage*, *Debt Coverage*, *Size*, and *Listed*) as well as firm and year fixed effects. In Panel A, we report *p*-values from χ^2-tests for the differences in *Distress* and *Distress* × *RPT* across the *No* and *Yes* columns. The table reports (in parentheses) *t*-statistics based on heteroscedasticity-robust standard errors clustered at the country and industry level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. All variables are defined in the Appendix

reduce their support to both types of subsidiaries (positive and significant coefficients on *Distress* × *RPT*). This decline in group support is not significantly different across the two types of subsidiaries (*p*-value of 0.219).

In Table 8, Panel B, we show that subsidiaries exhibit greater sensitivity to industry distress affecting *other* group subsidiaries that are worth helping (*Other Distress*$^{Worth\ Helping}$). Furthermore, we find that this sensitivity decreases after the passage of RPT reforms (negative and significant coefficient on *Other Distress*$^{Worth\ Helping}$ × *RPT* in Column (2)).

Combined, the evidence of these tests suggests that, prior to the passage of RPT reforms, subsidiaries that are worth helping are more likely to receive support from other group firms when in need, consistent with intra-group credit-risk management being net beneficial. However, RPT reforms reduce the extent to which resources flow to these firms, thus imposing a nontrivial cost on business groups.

8 Conclusion

We investigate whether business groups take advantage of their internal capital markets to prevent the insolvency of their subsidiaries and the extent to which RPT reforms aimed at curbing self-dealing impair their ability to manage credit risk. Using a large cross-country sample of group-affiliated firms from more than 100 countries, we document two main findings. First, we show that, compared to similar standalone firms, subsidiaries are less sensitive to credit-risk shocks, which supports the idea that business groups actively manage intra-group credit risk by reallocating resources within the corporate structure. This pattern of capital reallocation appears to be in line with business groups supporting subsidiaries whose bankruptcies are expected to be more costly because of the risk of veil piercing. Second, we show that recent regulatory changes to the approval and disclosure of RPTs hinder business groups' ability to manage credit risk, which highlights an important cost of anti-self-dealing regulation.

An important 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. 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. Also, we focus on a specific advantage of group affiliation—that is, intra-group credit-risk management—and thus abstract away from other potential benefits of group affiliation (e.g., reduction of transaction costs, provision of reputational capital, etc.). Moreover, our findings do not imply that stricter approval and disclosure requirements for RPTs are welfare decreasing, since their overall effect on economic welfare depends on other general equilibrium considerations. Any potential benefits of intra-group credit-risk management might in fact be partly offset by the social costs of self-dealing, which the stricter approval and disclosure requirements for RPTs are meant to discourage.

With these caveats in mind, our findings may be helpful to policymakers when they weigh the benefits and costs of RPT regulation. The findings thus cater to the current regulatory debate on the desirability of further reforms strengthening anti-self-dealing regulation. Importantly, our evidence suggests that, if unaccompanied by concurrent capital market reforms that improve access to external finance, RPT reforms can impose nontrivial costs on business groups. Thus, policymakers should carefully consider interdependencies among the different elements of a country's institutional infrastructure when designing regulatory interventions (Shleifer 2005; Leuz 2010).

Appendix: Variable Definitions

Variable	Definition
Bankrupt	Indicator variable set equal to one if a firm files for bankruptcy in the 12-month period following the end of the fiscal year, and zero otherwise. We use the status date to identify the year in which a firm files for bankruptcy (source: Orbis).
Distress	Industry distress indicator variable set equal to one if a firm's country-industry experiences a large increase in the bankruptcy rate in a given year, and zero otherwise. For each firm, we compute the annual country-industry bankruptcy rate at the one-digit SIC code level, excluding the respective firm from the calculation. *Distress* is set equal to one if the annual change in the bankruptcy rate falls into the top three deciles of the sample distribution, and zero otherwise (source: Orbis).
Subsidiary	Indicator variable set equal to one if a firm is a subsidiary of a business group, and zero if a firm is a standalone entity (source: Orbis).
Profitability	Return on assets, defined as net income divided by lagged total assets (source: Orbis).
Loss	Indicator variable set equal to one if a firm's return on assets is negative, and zero otherwise (source: Orbis).
Leverage	Book leverage ratio, defined as total liabilities divided by total assets (source: Orbis).
Debt Coverage	Ratio of earnings before interest and taxes to lagged total liabilities (source: Orbis).

Variable	Definition
Size	Natural logarithm of total assets (source: Orbis).
Listed	Indicator variable set equal to one if a firm has equity securities listed in a public equity market, and zero otherwise (source: Orbis).
Multinational	Indicator variable set equal to one if a business group has two or more subsidiaries domiciled in different countries, and zero otherwise (source: Orbis).
Foreign	Indicator variable set equal to one if a subsidiary and its business group parent are domiciled in different countries, and zero otherwise (source: Orbis).
Majority Owned	Indicator variable set equal to one if more than 50% of a subsidiary's control rights are held (directly or indirectly) by the business group parent, and zero otherwise. We compute control rights using the weakest link approach (La Porta et al. 1999; Claessens et al. 2000; Nenova 2003) (source: Orbis).
Wholly Owned	Indicator variable set equal to one if 100% of a subsidiary's control rights are held (directly or indirectly) by the business group parent, and zero otherwise. We compute control rights using the weakest link approach (La Porta et al. 1999; Claessens et al. 2000; Nenova 2003) (source: Orbis).
RPT	Indicator variable set equal to one starting in the first year in which a country introduces related party transaction (RPT) reforms, and zero otherwise. The adoption years of RPT reforms for each *Initial Sample* country are reported in Table OA-5 of the Online Appendix (source: World Bank Doing Business Reports 2008-2018).
Financial Market Development	Ratio of total market capitalization of all publicly listed firms in a country to the country's gross domestic product (source: World Bank).
Geographic Diversification	Number of unique countries in which the subsidiaries that belong to the same business group operate (source: Orbis).
Bank in the Group	Indicator variable set equal to one if a business group has a bank in its corporate structure, and zero otherwise (source: Orbis).
Number of Subsidiaries	Number of subsidiaries that belong to a business group (source: Orbis).
Number of Levels	Maximum number of subsidiary levels (one to five) of a business group's control chain (source: Orbis).
Financial Constraints	Measure of business group financial constraints, calculated following the approach of Whited and Wu (2006) (source: Orbis).
Veil Piercing	Measure of veil piercing likelihood, based on Belenzon et al. (2018).
Other Distress	Indicator variable set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of subsidiaries that experience industry distress (i.e., when the number of subsidiaries affected by industry distress falls into the top three deciles of the sample distribution), and zero otherwise (source: Orbis).
Wedge	Wedge between cash flow rights and voting rights, defined as one minus the ratio of cash flow rights to voting rights (source: Orbis).
Other Distress$^{High\ Wedge}$	Indicator variable set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of "high wedge" subsidiaries that experience industry distress (i.e., when the number of high wedge subsidiaries affected by industry distress falls into the top three deciles of the sample distribution), and zero otherwise. A subsidiary is classified as high wedge if *Wedge* is above the median *Wedge* of all other subsidiaries that belong to the same business group (source: Orbis).

Variable	Definition
Other Distress$^{Low\ Wedge}$	Indicator variable set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of "low wedge" subsidiaries that experience industry distress (i.e., when the number of low wedge subsidiaries that are affected by industry distress falls into the top three deciles of the sample distribution), and zero otherwise. A subsidiary is classified as low wedge if *Wedge* is below the median *Wedge* of all other subsidiaries that belong to the same business group (source: Orbis).
Worth Helping	Indicator variable set equal to one if a subsidiary is "worth helping," and zero otherwise. A subsidiary is classified as worth helping if its return on assets is above the average return on assets of all other subsidiaries that belong to the same business group (source: Orbis).
Other Distress$^{Worth\ Helping}$	Indicator variable set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of subsidiaries "worth helping" that experience industry distress (i.e., when the number of subsidiaries "worth helping" that are affected by industry distress falls into the top three deciles of the sample distribution), and zero otherwise. A subsidiary is classified as worth helping if its return on assets is above the average return on assets of all other subsidiaries that belong to the same business group (source: Orbis).
Other Distress$^{Not\ Worth\ Helping}$	Indicator variable set equal to one if a subsidiary belongs to a business group that, in a given year, has a large number of subsidiaries "not worth helping" that experience industry distress (i.e., when the number of subsidiaries "not worth helping" that are affected by industry distress falls into the top three deciles of the sample distribution), and zero otherwise. A subsidiary is classified as not worth helping if its return on assets is below the average return on assets of all other subsidiaries that belong to the same business group (source: Orbis).

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