Does Bankruptcy Risk Increase Value?
Diversification Puzzles in Efficient Markets

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Abstract

This paper investigates the relationship between the survival ability of firms and their value. We show that, in an efficient market, the average stock price of surviving firms exceeds the average value of surviving plus defaulted firms. This price-value wedge is narrower for diversified conglomerates than for non-diversified firms, if the former default less than the latter. This, in turn, implies that the price of surviving diversified conglomerates will be lower than the price of the surviving focused firms, when their profits are equal. In other words, a survivorship bias generates an observed diversification discount. Consistent with this argument, diversified US companies survive more than focused ones. The explanatory variables used in the diversification discount literature also explain the survival differential. Finally, the diversification discount shrinks (from 13% to 5%) when measured on companies with decreasing default probability.

JEL Classification: G32, D23, K19.

Keywords: diversification discount, survivorship bias, market efficiency, parent company discount, bankruptcy, coinsurance, contagion.

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1 Introduction

It is well known that the price of diversified firms, or "'conglomerates"', is lower than the price of portfolios of focused firms. Given the real-world relevance of diversified firms, the relationship between their economic role and their market price remains unclear. Some argue that diversification reduces firm efficiency, thereby lowering both the value and the price of diversified firms below that of focused, standalone ones. Others question the causal link between the observed diversification discount and inefficiency, showing that the discount disappears once efficient acquisitions of discounted firms by conglomerates or accounting definitions enter the analysis.[1]

This paper provides a new interpretation of the diversification puzzle, relating it to a survivorship bias. First, we show that the average stock price of surviving firms exceeds the average value of surviving plus defaulted firms. This occurs because bankruptcy has canceled the worst performing firms from the stock market. This price-value wedge is narrower for diversified conglomerates than for non-diversified firms, if the former default less than the latter. This reasoning, in turn, implies that the price of surviving diversified conglomerates will be lower than the price of the surviving focused firms, when the profitability of all diversified firms is equal to that of all focused firms. In other words, a survivorship bias is able to generate a diversification discount. Unfortunately, it is impossible to test this implication directly, by comparing average market prices with the average values of all firms, because datasets cannot contain contemporaneous information on the prices of defaulted companies. However, our insight finds support in both the excess survival of US diversified firms relative to focused firms and its covariation with their discount.

A model makes the previous argument tighter, building on three key assumptions. First, units belonging to diversified conglomerates co-insure each other while units run as standalone companies do not. Such co-insurance has positive value because it reduces the incidence of default (as in Boots and Schmeits, 2000) relative to focused units. Second, we allow for (asymmetric) contagion across units in diversified conglomerates, that is, unprofitable units may drag profitable ones into bankruptcy due to their joint debt liability, as in Banal, Ottaviani and Win-

[1] A summary of the early, but ongoing, debate on the diversification discount appears in Maksimovic and Phillips (2007).

ton (2013). Third, the probability of coinsurance exceeds the probability of contagion for the average conglomerate firm, in line with survey evidence of lower conglomerate risk relative to focused companies (Hann et al, 2014). These conditions ensure that the heterogeneous mortality of firms distorts the comparison of firm value, when it is based on the market price of surviving firms. Because focused firms default more often in industry downturns, the average stock price will be lower for diversified survivors than for focused, better-performing survivors. The first implication of the model is that the average market price of conglomerate firms is lower than the average market price of standalone units, after controlling for characteristics linked to profitability. Controlling for their age will help reduce the conglomerate discount, but will not cancel it because of sample selection. In other words, controlling for the age of firms that are currently alive cannot account for the fact that there are more dead standalone units than conglomerates in the corporate graveyard.[2]

The model also leads to an even more paradoxical finding, when we additionally consider that bankruptcy is costly. It will be recalled that diversified conglomerates have higher value than standalone firms, even when they have equal profits and the same proportional bankruptcy costs, because the former survive more thanks to coinsurance (as in Lewellen, 1971). However, the previous paragraph argues that there is a conglomerate discount due to a survivorship bias. It follows that diversified firms that save on bankruptcy costs relative to focused ones have lower market price. In other words, the market price of surviving firms does not reflect the superior ability of diversified firms in hedging bankruptcy risk, due to the survivorship bias. This insight may explain the reason why diversified conglomerates thrive in the real world, despite the observation of a lower market price.

We turn to the data to analyze the relationship between firm survival skills and the diversification discount. First, our estimations of the default probabilities of US firms[3] confirm that diversified firms have better survival skills compared to their focused components, confirming results in Borghesi, Houston, and Naranjo (2007). We also investigate the relationship between the survivorship bias and the diversification discount in the cross-section of firms with different survival skills. We find that, for firms that are closest to distress, the diversification discount is

[2]Both delistings and decade returns of -100% are frequent over 1926-2016. The median time that a common stock stays listed in the CRSP database is seven and a half years (Bessembinder, 2018).

[3]We follow the survival models of Campbell, Hilscher, and Szilagyi (2008)

much lower (5.6%) than in the standard finding in the literature (12%). When firms belong to the top quartile of survival probability, the discount reaches 13.3%, above the sample average. This evidence supports our hypothesis showing that a survivorship bias is responsible for, at least, a non-negligible share of the conglomerate discount.

In our model, leverage is exogenous so as to allow for straightforward value comparisons. The implications of our analysis carry over to models that allow for an endogenous choice of debt (as in Leland (2007) and Nicodano and Regis (2019)), conditional on the level of debt. In those models with endogenous debt, cash flow correlation captures firm diversification. We therefore analyze the cross-section of firm leverage, finding that the diversification discount is equal to 9% (16%) when firms belong to the top 75% (bottom 25%) of leverage. Furthermore, our results are robust to the substitution of the conglomerate dummy with cash flow correlation across conglomerate units. The estimates show that the diversification discount is lower when cash flow correlation is equal to one with respect to the case of uncorrelated units, confirming that the discount and differential survival probability display a positive association.

Our theory offers an explanation for other value puzzles relating to diversification. We argue that the survivorship bias contributes to explain both the parent company discount and the group discount. Business groups survive more often than conglomerates thanks to their ability to avoid contagion as the members are separate legal entities that can selectively default. Our model predicts that, while groups' average discount will exceed the average conglomerate discount, the value of all groups is above the value of all conglomerates, when there are positive bankruptcy costs. This is consistent with a strand of literature that provides empirical evidence on the relative market value and profitability of group affiliates (see Almeida, Park, Subrahmanhyam and Wolfenzon (2011), Cornell and Liu (2001) and references in Khanna and Yafeh (2007).

The rest of the paper proceeds as follow. Section 1.1 reviews closely related literature. Section 2 presents our model of expected firm value. Section 3 determines market values and examines the robustness of our results. It also interprets known puzzles through the model. Section 4 investigates the empirical relation between value and default probability. Conclusions follow. All proofs are in Appendix A.1., together with several model extensions. Appendix A.2 provides details on variables included in the empirical analysis.

1.1 Related Literature

This paper provides new insights into the diversification-value controversy, bringing into this arena the known problem of survivorship bias in empirical finance. Banz and Breen (1986) observe that databases exclude companies that have filed for bankruptcy or have otherwise ceased to exist. They argue that this induces an ex-post-selection bias disturbing the comparison of returns between firms displaying different price/earnings ratios. Kothari, Shanken and Sloan (1995) argue that ex-post selection overstates the excess return on high book-to-market portfolios. Brown, Goetzmann and Ross (1995) highlight that survival distorts return predictability and the equity premium. Taking the reasoning one step forward, we show that the survivorship bias is the source of a price-value wedge in an efficient market. We never abandon the assumption that the stock price is equal to the best estimate of value, that is the discounted future cash flow. However, we observe that a market trades survivors. Since these are the most profitable among the companies that existed, the stock price exceeds value. More precisely, stock price - being equal to value conditional on survival - exceeds unconditional value. Thus, we make progress in our understanding of efficient markets (Grossman, 1981) showing that market prices are not sufficient statistics for the value of companies when there is bankruptcy. [4] Furthermore, we show that market prices of diversified and focused companies do not reflect the differential ability of hedging bankruptcy costs, due to the survivorship bias. This is likely to imply that allocating resources based on market prices will not allow to reach a constrained optimal allocation, contrary to the case of an economy without bankruptcy analyzed in Grossman (1981). While we focus on bankruptcy, the acquisition of distressed focused companies by conglomerates reinforces the survivorship bias. Graham, Lemmon and Wolf (2002) consider a different kind of sample selection in relation to mergers. At least half of the reduction in excess market value occurs because conglomerates acquire already-discounted business units, and not because combining firms destroys value. In a similar vein, Gomes and Livdan (2004) argue that the conglomerate discount reflects the endogenous, efficient selection of less productive firms into diversified conglomerates. Our model does not consider both mergers and operational inefficiencies in order to isolate the pure effects of bankruptcy. In other words, our agument does not require assumptions about operational (in)efficiency in conglomerates stemming from

[4] Damodaran (2009) reaches the related insight that conventional discounted cash flow valuations, premised on firms being going concerns, will tend to overstate the value of distressed companies.

the internal capital market (Almeida et al. (2011), Rajan, Servaes and Zingales (2000), Stein (2002)), employees' incentives (Fulghieri and Sevilir (2011)), or production decisions (Alonso, Dessein and Matouschek (2015)). Our general point is that any discount (or premium) due to such motives is upward (downward) biased by enhanced survival. We make this point clear in a robustness section, where coinsurance distorts effort incentives of conglomerate managers (as in Boot and Schmeits (2000)). Otherwise, we sidestep agency costs, which figure prominently in the early literature focusing on the diversification discount.

Some prior papers highlight the role of bankruptcy risk in generating the diversification discount. Mansi and Reeb (2002) argue that diversification brings about a wealth transfer for bondholders at the expense of stockholders by reducing default risk. What produces the discount, in their view, is the excess value measure in the discount literature. This measure uses the market value of equity, thereby capturing the wealth transfer from stockholders, and the book value of debt, thus ignoring the transfer to bondholders. Our insight indicates the presence of an additional distortion induced by the data, when the analyst does not account for the differential mortality of firms. Hund, Monk and Tice (2010) build on the idea that diversified firms face less uncertainty about future mean profitability compared with focused firms. They show that diversified firms will trade at a discount relative to single-segment firms due to convexity of the discounting function. In our one-period model, the diversification discount is exclusively an artifact of the data.

Finally, several papers (Cornell and Liu (2001), Lamont and Thaler (2003), Mitchell, Pulvino and Stafford (2002) attribute the parent company discount to inefficiencies, such as limited arbitrage. Our model provides a unifying theory of both the conglomerate and the parent company discounts sticking to market efficiency. What generates the efficient price-value wedge is the excess survival of diversified firms through downturns.

2 The Model

This section sets up the essential elements of the model and derives the cost of debt and the value of different organizations.

2.1 Organizational Structures and Cash Flows

Below, we define three organizational types for two production units. Since there are no operational differences across organizations, units produce equal cash flows irrespective of the organization to which they belong. Such cash flows are independently distributed across units. Each production unit funds its investment through a fixed amount of debt. Organizations differ only in the extent of support that each unit can provide to the other, as well as in each unit's extent of liability for the other unit's debt. This affects both credit conditions and profits, net of funding costs, to each organization.

Each unit, indexed by $i = (A, B)$, raises an amount of debt D_i to invest in a project at the initial time ($t = 0$). The operating profit of each unit is realized in $t = 1$. It will be High $\{H\}$, and equal to $X_i > 0$, with probability $p_i \in (0, 1)$, and it will be Low $\{L\}$, and equal to zero, with probability $(1 - p_i)$. We define four states of the world, $\{HH, LL, HL, LH\}$, where the first (second) letter in each pair refers to the profit of unit A (B). For the sake of simplicity, operating profits are independently distributed across firms. Our choice of values implies that each unit has insufficient operating profits in state L to honor its own debt obligations. Without support, it defaults, and the future profit of unit i conditional on survival, $K_i \geq 0$, is lost. Our key assumption is that the profit of unit A, in state $\{HL\}$, exceeds combined debt repayment of the two units, whereas the profit of unit B is lower than the combined service of debt. We will later assess that payoffs satisfy these restrictions. This is our way of capturing dissipative bankruptcy without going through the non-linearities of endogenous default.

The entrepreneur chooses among three organizations: standalone firms, business groups and conglomerates. Standalone firms operate independently. Each is independently liable to competitive lenders, who require an interest factor R_i. Given the assumptions concerning cash flows, firm A defaults in states $\{LH\}$ and $\{LL\}$ while firm B defaults in states $\{HL\}$ and $\{LL\}$. Thus, the survival probability of standalone units A and B are $p_A^{Sur} = p_A$ and $p_B^{Sur} = p_B$, respectively.

In a conglomerate, segments A and B belong to the same firm. They are therefore jointly liable *vis-à-vis* lenders. The conglomerate defaults in state $\{LL\}$, when both units have zero profits, and in state $\{LH\}$, when segment A drags the profitable segment B into bankruptcy. There are coinsurance benefits in state $\{HL\}$, because profits from segment A save B from insolvency. Thus, the conglomerate organization allows for coinsurance, while standalone companies do not, but it suffers from contagion. We define the survival probability of conglomerates as $p_C^{Sur} = p_A$, as the conglomerate survives only if unit A survives. So far, we are following the setup of Boot and Schmeits (2000) without incentive problems, adding instead the assumption of asymmetric profits. This assumption makes contagion possible, a feature that is prominent in other studies of conglomerate mergers such as Banal, Ottaviani and Winton (2013) and Leland (2007).

We now extend the analysis to a group, where the incorporation of affiliates is separate and lenders fund them individually. The parent company, B, owns its subsidiary, A. The parent receives dividends that allow for the service of its debt in state $\{HL\}$. Despite this ownership link, the parent company enjoys corporate limited liability *vis-à-vis* the debt obligations of its subsidiary. This limit on liability implies that A selectively defaults in state $\{LH\}$. Thus, the group organization allows for diversification, as in conglomerates, without incurring contagion. Therefore, the subsidiary A and the parent company B survive with probability $p_{A \in G}^{Sur} = p_A$ and $p_{B \in G}^{Sur} = p_B + p_A(1 - p_B)$, respectively. In the first part of our analysis, we assume that the parent company owns 100% of the shares of its subsidiary.

It is worthwhile to discuss a few features of our model. First, corporate limited liability is central to the argument that groups save on bankruptcy costs with respect to conglomerates. Courts may occasionally repeal corporate limited liability asking the parent company to meet its subsidiary debt obligations.[5] Second, the model is simple so as to allow for value comparisons. On the one hand, the amount of debt is exogenous, as in the case of credit rationing. In general, optimal debt responds to both coinsurance and contagion (as in Leland (2007) and Nicodano and Regis (2019)). Insights on relative survival rates, relative efficiency and relative stock prices carry over to these settings conditional on debt levels. On the other hand, our one-shot model rules out mergers and divestment, which have been the focus of prior research (Gomes and Livdan (2004)). Another simplifying assumption is that coinsurance takes the form of a transfer from A to B, both in conglomerates and in groups. We enlarge this minimalist state space to define an additional state in which B rescues A from bankruptcy in a robustness section. These algebraic complications do not affect the key insight concerning the values of each organization,

[5] An Appendix, available upon request, reports on court practice in several jurisdictions, that usually 'pierce the corporate veil' only in cases of fraud.

to which we turn in the next sections.

2.2 Coinsurance, Contagion, and the Cost of Debt

We now determine the interest factors earned by the lenders, assuming their risk-neutrality and a zero risk-free rate. Lenders of focused firms, $i = A, B$, receive debt repayment in state $\{H\}$ and collect nothing in state $\{L\}$. It follows that the interest factor for unit i, R_i, satisfying the lenders' zero expected profit condition, $(1 - p_i) \times 0 + p_i R_i = D_i$, is equal to

$$R_i = D_i p_i^{-1} . \tag{1}$$

Conglomerate lenders receive the debt repayment in states $\{HH\}$ and $\{HL\}$. They also recover the cash flow X_B in state $\{LH\}$, when unit A drags the profitable unit B into bankruptcy. Thus, the interest factor for the conglomerate is equal to

$$R_C = [D_A + D_B - p_B(1 - p_A)X_B)]p_A^{-1} . \tag{2}$$

This factor solves the zero profit condition, which requires lenders' expected repayments to equal the loan provided at t=0, that is, $[p_A p_B + p_A(1 - p_B)]R_C + p_B(1 - p_A)X_B = D_A + D_B$. Lenders collect the interest payment when either both units are successful, an event that has probability $p_A p_B$, or unit A is profitable but B is not, with probability $p_A(1 - p_B)$. Moreover, they recover profit, X_B, upon the conglomerate default when there is contagion, with probability $p_B(1 - p_A)$.

Turning to the group, the subsidiary defaults in the same states of the world as the standalone firm does. Therefore lenders charge to the subsidiary, A, the same interest rate of the corresponding standalone firm defined by Equation (1), that is $R_{A \in G} = R_A$. Conversely, the cost of borrowing for the parent B is lower than the corresponding cost of unit B when it operates as a standalone, thanks to the possibility of support in state $\{HL\}$:

$$R_{B \in G} = D_B[p_B + p_A(1 - p_B)]^{-1} . \tag{3}$$

Indeed, the parent, B, defaults in state $\{LL\}$ only. The dividend it receives from A in state $\{HL\}$ is sufficient to avoid insolvency, and corporate limited liability insulates it from contagion in state $\{LH\}$. Therefore, lenders' zero expected profit condition for the parent is: $[p_B + p_A(1 - p_B)]R_{B\in G} = D_B$.

We can now rank the interest factor across organizational structures, while making explicit the cash flow restrictions that support our state space and the derivations of Equations (1)-(3). The Lemma in the Appendix shows that:

$$R_C < R_G < R_A + R_B \,, \tag{4}$$

where $R_G = R_{A\in G} + R_{B\in G}$ is the overall interest factor for a group. Groups bear a lower interest factor compared to standalone firms, thanks to the positive probability of the coinsurance state, in which subsidiary dividends allow the parent to survive. Conglomerates also enjoy better credit conditions due to coinsurance. However, they pay an even lower interest rate compared to groups, since lenders anticipate recovering positive cash flow (X_B) when the profitable segment B defaults due to contagion. In other words, a reduction in the interest factor stems from either lower bankruptcy costs, thanks to coinsurance, or higher recovery upon default due to contagion.

2.3 The Value of Diversification

The following proposition highlights the economic role of diversified firms, whose enhanced survival saves on bankruptcy costs.

Proposition 1: *Assume costly bankruptcy ($K_i > 0$) and let $\pi_i = p_i X_i - D_i$, i = A,B be the expected current profit after the service of debt. Then:*

a. Firm expected value, V_i, increases together with survival probability, and it is equal to:

$$V_S = \pi_A + \pi_B + p_A^{Sur} K_A + p_B^{Sur} K_B \tag{5}$$

$$V_C = \pi_A + \pi_B + p_C^{Sur}(K_A + K_B) \tag{6}$$

$$V_G = \pi_A + \pi_B + p_{A\in G}^{Sur} K_A + p_{B\in G}^{Sur} K_B \tag{7}$$

for two standalone firms, a conglomerate and a group, respectively;

b. The group expected premium relative to conglomerates and standalone firms represents the *value of saved contagion costs and of coinsurance, respectively;*

c. The conglomerate expected excess value relative to standalone firms is positive if, and only if, coinsurance probability exceeds the contagion one.

Expected value increases together with survival probability, because the accrual of future profits conditional on survival, K_i, depends on firm's ability to keep operating. However, firms are heterogeneous in such ability.

Part (b) indicates that groups best protect firm activity from bankruptcy, under the maintained assumption of no agency problems. It further traces back their excess expected value creation to either saved contagion costs, due to corporate limited liability, or coinsurance gains. It thus extends the reasoning of Nicodano et al. (2019) to a world without tax distortions. There is some direct evidence of such a bankruptcy-cost-saving role played by business groups. Santioni, Schiantarelli and Strahan (2017) show that group affiliates survived more often than non-affiliates during the recent crisis, thanks to within-group transfers from high-cash-flow to low-cash-flow affiliates. Cestone et al. (2017) show how diversification helps with worker reallocation, slashing firing costs that would otherwise be associated with closures. They highlight that adverse shocks hitting some group affiliates trigger workers' reallocation. Such an ability to save on bankruptcy costs may explain why diversified business groups are common corporate organizations, generating a total value added of 28 US trillion dollars in over 200 countries (Altomonte and Rungi (2013), Herring and Carmassi (2009)).

Part (c) indicates that there is a conglomerates expected premium only if contagion problems are limited, even without agency costs. This is not a new result, as it is reminiscent of previous insight from to Banal-Estanol et al. (2013) without tax distortions and Leland (2007) with tax distortions. Part (c) of this proposition and the preceding Lemma also complete the reasoning in Hann et al. (2013), clarifying that conglomerates do not generate the highest expected value among competing organizations, even when they pay the lowest interest rate. Conglomerates may actually destroy value even with respect to (focused) standalone firms. The reason is that lenders charge a lower rate in anticipation of a larger recovery-upon-default due to the contagion of healthy segments. We thus highlight that contagion in diversified conglomerates may counter-intuitively reduce both the interest rate and conglomerate value below those of focused firms.

In the following section we explain how surviving firms, however organized, trade at prices in excess of their unconditional expected value. Moreover, we show that the organizations with the highest expected value thanks to diversification become those with the highest diversification discount. These are our main insights, which will find support in the empirical study.

3 The Diversification Discount and Other Puzzles

This section shows how market price deviates from the expected value found in the previous section because of the survivorship bias, due to the absence of defaulted firms in both markets and databases. The market price thus reflects the value of survived firms only. In other words, the market price provides an estimate of firm value conditional on survival, instead of an unconditional estimate of firm value.

After illustrating this point, we will argue that acknowledging such survivorship bias contributes to the explanation of pricing puzzles. The best-known such puzzle is the diversification discount - that is, the observation that the average stock price of diversified firms is lower than the average stock price of matched focused firms (Berger and Ofek, 1995). The second puzzle is the parent company discount, in which a parent company displays lower value than an equivalent portfolio of standalone firms (Cornell and Liu, 2001). We will first develop the theoretical predictions and then discuss some stylized facts about pricing puzzles.

3.1 Survivorship Bias

In order to determine the market price, that is the value conditional on survival, MV_i, we must ask whether the state is high or low when a firm is listed (or, equivalently, the analyst finds a given firm in her dataset). This determines the chances of observing a high or a low cash flow. Let us start with standalone units. The probability of state $\{H\}$, when a standalone firm is listed, is 1, because that unit goes bankrupt and delists in state $\{L\}$. It follows that the stock price of a standalone is equal to the high cash flow realizations net of the debt repayment; that is:

$$MV_i = X_i + K_i - R_i = \pi_i (p_i^{Sur})^{-1} + K_i \,. \tag{8}$$

In turn, the combined market value of two standalone firms is equal to

$$MV_S = \pi_A(p_A^{Sur})^{-1} + K_A + \pi_B(p_B^{Sur})^{-1} + K_B\,. \tag{9}$$

Let us now determine the market value of a conglomerate. The probability of state $\{HH\}$, conditional on observing both standalone companies alive, is one. In contrast, the probability of state $\{HH\}$ conditional on observing a conglomerate is lower than one, because of the conglomerate's ability to survive when A rescues B. Such probability is $Pr(HH)/[Pr(HH)+Pr(HL)] = p_A p_B[p_A p_B + (1-p_B)p_A]^{-1}$, which simplifies to p_B. The probability of state $\{HL\}$ conditional on observing a listed conglomerate (i.e., $Pr(HL)/[Pr(HH) + Pr(HL)]$), is equal to $(1 - p_B)$. Thus, the market value of the conglomerate is equal to:

$$\begin{aligned} MV_C &= p_B(X_A + K_A + X_B + K_B - R_C) + (1-p_B)(X_A + K_A + K_B - R_C) = \\ &= (\pi_A + \pi_B)(p_C^{Sur})^{-1} + K_A + K_B\,. \end{aligned} \tag{10}$$

Let us conclude with the group organization. The probability of state $\{H\}$, when the subsidiary A is alive, equals one because affiliation does not influence the default of the subsidiary. Hence, the stock price of the subsidiary is equivalent to that of the corresponding standalone firm ($MV_{A\in G} = MV_A$). In contrast, the state is $\{H\}$ with probability equal to $p_B[p_B+p_A(1-p_B)]^{-1}$, and $\{L\}$ with probability equal to $p_A(1-p_B)[p_B + p_A(1-p_B)]^{-1}$, when the parent company, B, is listed (or, equivalently, appears in datasets). This occurs because B survives in low states, in which it generates zero cash flows, thanks to the subsidiary support. The analyst, therefore, estimates the market value of the parent company B as being equal to:

$$\begin{aligned} MV_{B\in G} &= [p_B(X_B + K_B - R_{B\in G}) + p_A(1-p_B)(K_B - R_{B\in G})][p_B + p_A(1-p_B)]^{-1} = \\ &= \pi_B(p_{B\in G}^{Sur})^{-1} + K_B\,. \end{aligned} \tag{11}$$

Overall, the market price of a group, conditional on survival, is equal to:

$$MV_G = \pi_A(p_{A\in G}^{Sur})^{-1} + K_A + \pi_B(p_{B\in G}^{Sur})^{-1} + K_B\,. \tag{12}$$

Equations (9), (10) and (12) show that higher levels of survival probability result in lower market prices (or, equivalently, in lower firm values observed in databases). We summarize our results as follows:

Proposition 2: *Due to a survivorship bias, the market value of a firm i, MV_i, exceeds its expected value, V_i, for all i:*

$$V_S = MV_A \times p_A^{Sur} + MV_B \times p_B^{Sur}\,, \tag{13}$$

$$V_C = MV_C \times p_C^{Sur}\,, \tag{14}$$

$$V_G = MV_{A\in G} \times p_{A\in G}^{Sur} + MV_{B\in G} \times p_{B\in G}^{Sur}\,. \tag{15}$$

This proposition highlights that markets correctly reflect the value of surviving firms only. Market price therefore exceeds unconditional expected value, and such price-value wedge increases together with firm exposure to bankruptcy. Importantly, this wedge does not depend on the existence of bankruptcy costs. The overvaluation embedded in stock prices is due to defaulting firms having lower profits than surviving ones, while analysts rely on (market) data regarding surviving firms only. Correctly inferring (unconditional expected) value from market prices requires controlling for survival probability.

We are now ready to address both the conglomerate and the group (or parent company) puzzles. These puzzles appear in papers matching single-unit to multi-unit firms, when all of them are alive. Such puzzles arise when comparing the market values instead of firm expected values, due to the survivorship bias. Let us start by comparing the market value of conglomerates in Equation (10) to that of both standalone firms in Equation (9). The former is lower if:

$$(\pi_A + \pi_B)(p_C^{Sur})^{-1} < \pi_A(p_A^{Sur})^{-1} + \pi_B(p_B^{Sur})^{-1}\,, \tag{16}$$

that is, if $p_B^{Sur} < p_C^{Sur}$ or, equivalently, $p_A > p_B$. Thus, a conglomerate discount appears when the probability of coinsurance exceeds the probability of contagion, or, equivalently, when the survival probability of conglomerates exceeds that of comparable standalone firms. Inference regarding firm efficiency based on market values is misleading, if bankruptcy costs are positive. A conglomerate discount (premium) will indeed characterize conglomerates that save (contribute to higher) bankruptcy costs.

Similarly, the difference between the market value of a group in (12) and that of comparable standalone units in (9) is negative if:

$$\pi_A(p_{A\in G}^{Sur})^{-1} + \pi_B(p_{B\in G}^{Sur})^{-1} < \pi_A(p_A^{Sur})^{-1} + \pi_B(p_B^{Sur})^{-1}\,, \tag{17}$$

or $p_B^{Sur} < p_{B\in G}^{Sur}$, or $p_B < 1$, which holds by assumption. It follows that surviving parent companies and their groups appear to trade at a discount, while in reality they are saving on bankruptcy costs.

Finally, the market value of groups is lower than that of conglomerates, if:

$$\pi_A(p_{A\in G}^{Sur})^{-1} + \pi_B(p_{B\in G}^{Sur})^{-1} < (\pi_A + \pi_B)(p_C^{Sur})^{-1}\,, \tag{18}$$

that is, if $p_C^{Sur} < p_{B\in G}^{Sur}$, or $p_A < 1$, which always holds.

We summarize our results as follows:

Proposition 3: *Due to a survivorship bias:*

a. there is a conglomerate discount if coinsurance probability exceeds contagion probability:

$$MV_C - MV_S = \pi_A[(p_C^{Sur})^{-1} - (p_A^{Sur})^{-1}] + \pi_B[(p_C^{Sur})^{-1} - (p_B^{Sur})^{-1}] < 0\,. \tag{19}$$

b. there is a parent company discount and a group discount with respect to both standalone firms and conglomerates:

$$MV_G - MV_S = \pi_A[(p_{A\in G}^{Sur})^{-1} - (p_A^{Sur})^{-1}] + \pi_B[(p_{B\in G}^{Sur})^{-1} - (p_B^{Sur})^{-1}] < 0\,. \tag{20}$$

$$MV_G - MV_C = \pi_A[((p_{A\in G}^{Sur})^{-1} - p_C^{Sur})^{-1}] + \pi_B[(p_{B\in G}^{Sur})^{-1} - (p_C^{Sur})^{-1}] < 0\,. \tag{21}$$

c. with positive bankruptcy costs, the larger the expected unconditional diversification premium is, the larger the diversification discount will be.

Proposition 3.a and 3.b imply that the discount is larger the better the relative survival ability of a firm. Furthermore, Proposition 3.c implies that comparing average market values of different organizations conditional on survival leads to the wrong inferences concerning their relative efficiency, when there are positive bankruptcy costs.

3.2 Robustness

This section qualifies previous results by relaxing some simplifying assumptions. We first allow for different levels of bankruptcy costs across organizations. We then turn to partial ownership of the subsidiary by its parent, and subsequently study the impact of non-contractible managerial effort. We conclude with a setting in which both units of a diversified company are able to support the other.

3.2.1 Different Bankruptcy Costs across Organizations

Bankruptcy costs might differ across organizations. Hennessy and Whited (2007) indicate that the bankruptcy costs for smaller firms are almost double those of larger firms (15% to 8% of capital). Since diversified firms are on average larger, then their bankruptcy costs might be lower than those of standalone units. Against this background, Appendix A.1.1. shows that lower bankruptcy costs in diversified organizations increase their discount, when coinsurance exceeds contagion probability. However, they also imply a reduced role for diversification and therefore a lower expected unconditional premium than in the case of equal bankruptcy costs across organizations.

3.2.2 Diversification Benefits in Pyramidal Groups

Previous sections deal with groups with fully owned subsidiaries, whereas this section investigates the consequences of partial subsidiary ownership for group diversification. A simple argument implies that the listing of affiliates does not generally improve, and in fact may worsen, group survival thereby reducing both its market discount and its unconditional expected value premium with respect to standalone organizations.

Let the parent firm own a percentage, γ, of subsidiary equity. Then the dividends it receives from the subsidiary reduce to γX_A, which may not be sufficient for honoring debt obligations in state LH. Lower dividends increase the cost of parent debt, if lenders anticipate a positive default probability in state LH. Let λ account for the bailout probability. Then, it will assume two possible values, conditional on the realization of cash flow of units A and B:

$$\begin{aligned} \lambda = 1 \qquad & if \qquad \gamma X_A \geq (R_A + R_{B\in G}) \,, \\ \lambda = 0 \qquad & if \qquad \gamma X_A < (R_A + R_{B\in G}) \,. \end{aligned} \tag{22}$$

We can determine the threshold level of γ, which we indicate with γ^*, such that $\lambda = 1$:

$$\gamma > \gamma^* = (R_A + R_{B\in G})X_A^{-1} = \{D_A p_A^{-1} + D_B[p_B + p_A(1 - p_B)]^{-1}\}X_A^{-1} \,. \tag{23}$$

since X_A is at least as large than $(R_A + R_{B\in G})$ according to the Lemma. This result indicates that coinsurance is no longer possible, if the parent ownership share falls short of γ^* in a pyramidal group. In such a case, both the cost of debt and firm value are equal across group affiliates and standalone firms. Consequently, the group will no longer suffer from the survivorship bias. This result is able to rationalize the evidence that the market value of parent companies increases after a subsidiary carve-out or spin-off, which reduce parent's ownership of the subsidiary's equity.

3.2.3 Effort Provision, Contagion, and Outside Funding

The previous sections show that diversified firms suffer from a discount when they reduce bankruptcy costs with respect to standalone firms. It also establishes that the discount is larger for groups than for conglomerates. These results obtain provided coinsurance and contagion do not distort managerial incentives. When diversification distorts incentives, conglomerates and groups survive less and their discount falls. An Appendix, available upon request, makes this intuition precise letting the probability of success for unit A be endogenous and non-contractible. As in Boot and Schmeits (2000), we assume that managerial effort increases the success probability of unit A but imposes on it a monitoring cost. Lenders will exert "market discipline", trying to detect the probability of success of the unit. Boot and Schmeits (2000) point out that there are negative incentive effects in conglomerates, due to coinsurance. Effort provision in conglomerates is lower than in standalone firms for all levels of market discipline because the manager of unit A does not fully internalize the positive consequences of his effort provision on unit B.

Our model reinforces this insight, because unit A may also contaminate unit B with manager

A enjoying a lower funding cost rather than incurring a penalty. Such contagion is not present in a group thanks to the limited liability of each unit. These agency costs tend to diminish the survival skills of diversified firms, especially in conglomerates, thereby reducing both their unconditional expected diversification premium and their market discount.

3.2.4 The Discount with Mutual Support

While only the unit B provides support to the other unit in our model, in reality parent companies often support their subsidiaries (see Santioni, Schiantarelli and Strahan, 2017). It is easy to add a state of nature where A, having profits in excess of the debts of both units, supports B, as in Boot and Schmeits (2000) and Luciano and Nicodano (2014). Appendix A.1.2. provides such an extension, displaying the necessary variation in the definitions of survival probabilities and cash flow restrictions.

3.3 Diversification, Survival and Pricing Puzzles

This section collects results from previous literature that broadly align with our main insight. It begins with the evidence of a positive value of diversification in experiments that limit the survivorship bias. It then examines through the lens of our model both the parent company discount, the so-called boring company puzzle and the distress puzzle.

First, our arguments rest on diversification creating value through survival, as in Propositions 1 and 3a. An empirical analysis that succeeds in accounting for defaulted units at a given time – thus containing the survivorship bias – should reveal that diversified firms outperform standalone, focused firms during industry distress. Gopalan and Xie (2011) measure the average discount on multi-units firms just before and during unexpected industry distress, taking into account the disappearance (e.g., delisting due to bankruptcies, mergers, etc.) of firms. They find that the average conglomerate discount is reduced from 20% the year before industry distress to 6.9% in the three years after industry distress. Similarly, Kuppuswamy and Villalonga (2015) find that conglomerates became significantly more valuable than similar single-segment firms during the 2008 financial crisis.

In Proposition 3, groups and especially their parent companies have lower stock prices than their standalone counterparts, because they survive industry downturns more often. Several works document the lower valuation of groups with respect to non-group affiliates, attributing it to tunneling and expropriation of resources by controlling shareholders (Joh (2003), Bae, Kang and Kim (2002), Johnson, Boone, Breach and Friedman (2000)). However, Masulis, Pham and Zein (2008) find that Tobin's Q is higher in subsidiaries of pyramidal groups, where the separation of ownership from control is higher, than in firms at the top, after controlling for endogeneity of group membership. Proposition 3 may contribute to explain the higher parent company discount with respect to subsidiaries.

Proposition 3 also relates the survivorship bias to the probability of default, which may be higher for firms operating in industries with higher profit dispersion. The survivorship bias might, therefore, contribute to explain why companies in such industries display higher value than firms in so-called "boring" industries. Chen, Hou and Stulz (2015) cannot find a rational explanation for this apparent mispricing and thus resort to a behavioral one. They also show that firms in less boring industries have lower realized returns. Their evidence appears consistent with our survivorship bias story.

Finally, several papers find a puzzling negative cross-sectional relationship between ex-post realized stock returns and default risk. However, the relationship turns positive when realized returns are substituted with ex ante estimates of expected returns based on the cost of capital implied by analysts' forecasts (Chava and Purnanandam, 2010). The use of survey data also leads Hann et al. (2013) to conclude that diversification reduces the expected cost of capital through coinsurance.

In summary, our model may provide a unifying rationale for puzzling patterns uncovered by different strands of empirical work. In the next section, we will investigate the survivorship bias in the market prices of US firms, with a focus on the conglomerate discount.

4 The Value of Survival and the Conglomerate Discount

In this section, we collect some stylized facts about market value and bankruptcy. In doing so we will use methods borrowed from two strands of empirical literature, those on the conglomerate discount and default probability, which have so far progressed separately. We first use default probabilities of US firms in order to establish whether multi-segment firms have better survival skills than single-segment firms. We then investigate the relationship between the survivorship bias and the conglomerate discount. We juxtapose all types of multi-segment to single-segment firms, as our data sources do not distinguish between groups and conglomerates. Consistent with previous papers addressing the diversification discount, we call all multi-segment firms "conglomerates". Below, we outline our method, before proceeding to its implementation.

We estimate the probability of default for each firm-year using the following hazard rate model:

$$P_{t-1}(Y_{i,t} = 1) = [1 + exp(-a - bx_{i,t-1})]^{-1} \tag{24}$$

where Y_{it} is an indicator variable equal to 1 when the firm goes bankrupt at time t. The vector x includes the predictive variables from Campbell, Hilscher, and Szilagyi (2008).[6] We experiment with two different dependent variables, a narrower one (default) and a broader one (failure), as alternative indicators of financial distress. Default events includes cases filed under both Chapter 7 and Chapter 11, while failure also includes a default on a bond.

A necessary condition for conglomerates to trade at a discount due to the survivorship bias is that their survival probability exceeds that of standalone firms. We therefore begin with a test of this hypothesis in the raw data. We then measure the conglomerate discount in the raw market data. Including in the sample firms that have defaulted after the bankruptcy event, in order to correct for the survivorship bias, is not possible, because we cannot observe both their value and balance sheet items once they are delisted. We thus run the opposite experiment of eliminating from the beginning of the sample all the companies that defaulted during the sample period. If our conjecture is correct, we should observe an increase in the conglomerate discount.

Of course, differential survival may derive from differential firm characteristics other than diversification. For this reason, we proceed to a multivariate analysis of the diversification discount, following Villalonga (2004b), using the regression model:

$$y_{i,t} = \alpha + \beta Conglomerate_{it} + \Gamma X_{i,t-1} + \varepsilon_t\,, \tag{25}$$

where the dependent variable is firm excess value, based on market prices as in Berger and Ofek (1995), and $X_{i,t-1}$ a vector of controls including firm characteristics and year fixed effects. The variable 'Conglomerate' is an indicator variable that is equal to one if the firm engages in

[6]The specifications of Shumway (2001), or Chava and Jarrow (2004) lead to similar results.

industry diversification. Its coefficient measures the benchmark discount of conglomerate firms. Again, we expect the component of such benchmark discount to increase once we aggravate the survivorship bias by eliminating all defaulted firms from the beginning of the sample.

Equation (19) shows that conglomerate excess market value is jointly determined and increases together with its excess default probability with respect to comparable focused firms. We thus investigate whether they share the same determinants in a multivariate regression. Finally, we run a quantile regression relating the excess market value of conglomerates, within each survival probability quartile, to a conglomerate dummy along with other controls. We expect the conglomerate discount to be higher in quartiles including firms with higher survival probability. For robustness, we repeat our analysis using one-year ahead historical default probabilities that follow the methodology in Duan, Sun, and Wang (2012).[7]

We conclude with a calibrated numerical example indicating a range of values for the unobservable expected conglomerate premium.

4.1 Data and Sample

Our sample combines several data sources over the years 1990-2014. Firstly, we retrieve information on multi-segment firms from COMPUSTAT-Historical Segments. Previous studies associate each segment with a similar independent firm in the same industry to compute the discount of conglomerate firms with respect to the standalone ones. We follow a similar approach, applying the sample selection as in Lamont and Polk (2001) and Berger and Ofek (1995). We exclude financial and utility firms, and we discard all segments that do not have at least five similar single-unit firms in the same industry (4, 3, and 2-digits SIC), and negligible segments with total firm sales lower than $20 million. We then require that, for each segment in a conglomerate, we can match with at least five single-segment firms in the industry.[8]

Information on firm bankruptcy comes from three sources. The first is the COMPUSTAT-NA database, which provides the indication of deletion of a company, as well as the motivation for such deletion. We keep only the deletions for bankruptcy filings. The second source is CRSP,

[7]Since we are not using risk-adjusted probabilities, our analysis provides a lower bound to the impact of the survivorship bias on firm value and the conglomerate discount. See Almeida and Philippon (2007) for a risk-adjusted estimate.

[8]We follow this procedure to obtain results that are comparable with prior ones. Such filtering, however, does impact the survivorship bias, as we are conditioning the measurement of the discount on surviving standalone firms.

which also gives information about all public firms delisted for a bankruptcy filing. The third source is the UCLA- LoPucki Bankruptcy Research Database (BRD)[9]. It reports the bankruptcy filings in the United States Bankruptcy Courts of the major public companies since October 1st, 1979.[10] Coverage includes cases filed under both Chapter 7 and Chapter 11. We also retrieve the one-year-ahead probability of default by the Credit Research Initiative (CRI) from the National University of Singapore.[11]

After merging all these datasets except CRI, we have a total of 40,545 firm-year observations (6,309 firms), of which 13,014 are multi-segment firms (2,589 conglomerates, see Table 1, columns 1 and 2, for details). Thus, conglomerates represent 32.1% of active US firms in our sample. Table 1 also reports the number of defaults and failures per year in our sample. As defined in Campbell et al. (2008), a default event is a bankruptcy filing under either Chapter 7 or Chapter 11 of the bankruptcy code. The default events from 1990 to 2014 represent around 1.32% of active firms, on average. Consistent with Campbell at al. (2008), they are rare except during economic slowdowns. Failures are defined more broadly to include bankruptcies, financially driven delistings (reported in CRSP), or D (default) ratings issued by a leading credit rating agency. The total number of failures (565) therefore exceeds the total number of defaults (546, respectively).

The variation in the number of firms stems from three sources, namely the entry of new companies, the exit of bankrupt firms and mergers. For this reason, the last column of Table 1 reports the number of merger deals, retrieved from Thompson Reuters. The acquisition of a distressed company may indeed contribute to both reducing the expected unconditional value of conglomerates (as in Gomes and Livdan (2004)) and increasing the survivorship bias, since low-valuation single-segment firms disappear from databases. However, we do not consider these additional self-selection issues, already uncovered in Graham, Lemmon and Wolf (2002).

[9] We are grateful to UCLA-LoPucki for offering us free access to their database.

[10] A company is public according to this source if it filed an Annual Report (Form 10-K or Form 10) with the Securities and Exchange Commission in a year ending not less than three years before the filing of the bankruptcy case. A company is major if assets are worth $100 million or more, measured in 1980 dollars (about $280 million in current dollars).

[11] Data are available at www.rmicri.org. This dataset provides the individual firms' probability of default for a sample of 32,258 US companies.

4.2 Univariate Analysis

Our main dependent variables are excess value and excess default probability. Following past works (Berger and Ofek (1995) and Villalonga (2004b)), we define the excess value as the natural logarithm of the ratio between firm market value and its imputed value at the end of the year, computed as the sum of its segments' imputed values. The imputed value is obtained by multiplying each segment's most recent asset (sales) value by the median market-to-assets multiplier of single-segment firms in the same industry. We implement the industry matching using the narrower SIC including at least five single-segment firms. The measure of the excess PD is similar. It is set as the natural logarithm of the ratio between a firm's PD and its imputed PD at the end of the year. The imputed value is the sum of its segments' imputed values, as above.

Regarding the control variables, Appendix A.2 provides their definition along with descriptive statistics (Table A.2.1). Given the relevance of diversification, we construct the cash flow correlation across segment units (CFCORR) following Kolasinski (2009). We first compute the average of the EBITDA/Assets ratio for all standalone firms for each quarter-year. In a second step, we compute, for each year, the correlation of this ratio across each segment-industry pair, using rolling five-year windows. Next, we compute the average correlation across segments units in the conglomerate. Appendix A.2 also provides details of PD estimation (Table A.2.2) following Campbell et al. (2008).

Figure 1 portrays the excess PD for different intervals of the excess value of conglomerates and standalone firms. It shows that excess conglomerate values are negative – and large in absolute values – along with excess default probabilities. Figure 2 reports excess values and excess PDs according to the industry SIC one digit classification. These figures show that the excess value of conglomerates and their excess default probabilities are negative except in Retail Trade, an industry where the excess conglomerate PD is also (slightly) positive. Conglomerates represent 40% of manufacturing, a typically mature industry, while in services (hi-tech, etc.) their share falls to 30%.

Table 2 reports tests of the differences in firm characteristics between conglomerates and standalone firms. Panel A uses the full sample, including firms that enter or exit the database after the beginning of the sample. In Panel B, the sample contains only firms surviving until

2014, thereby excluding the defaulted ones. Table 2 also reports the variation in mean excess PDs across firm types. Consistent with past findings (Villalonga (2004a)), conglomerates' mean value is 13% lower (column (2)) than their segments'. According to our model, conglomerates that add to the (unconditional expected) value of their segments have lower PD than their segments, because coinsurance exceeds contagion. Consistent with this view, conglomerates' mean and median PDs are 9.8% lower than their segments' (column (3)).[12] The average default rate of conglomerates (1.2%; see column (2) Panel A) is 15% lower than the default rate of standalones (1.4%; see column (4)). This evidence suggests that conglomerates are in general able to move resources across their segments in order to offset industry-specific shocks.

We are ready to turn to our experiment of eliminating all firms that disappear from the sample from the beginning of the sample. This deletion should enhance the survivorship bias and increase the diversification discount. Accordingly, the difference in the excess PD of standalone firms and conglomerate increases from 12% in Panel A to 15% in Panel B. The mean conglomerate discount in panel B reaches 17.2%, and the conglomerate's excess survival relative to its segments reaches 23.4%, up from 13.4% and 9.8% respectively. Consistent with the insight of the model, as the relative survival ability of conglomerate firms improves, the survivorship bias becomes more severe and the conglomerate discount widens.

4.3 Multivariate Analysis

We now turn to the estimation of the benchmark diversification discount, as in Equation (25). Table 3 reports the results when the dependent variable is the excess value and the vector of firm characteristics includes industry (3-digit SIC code) and year fixed effects. Column (1) shows that the diversification discount is equal to 13% after controlling for firm and industry characteristics, confirming traditional findings. Column (2) includes firm age among the controls. Consistent with our theory, its negative coefficient indicates that the stock price of all firms falls when their age increases, because older firms have gone through and survived to downturns. At the same time, the benchmark conglomerate discount decreases to 11%, since age helps to control for the lower mortality of diversified firms thereby reducing the survivorship bias. [13]

[12] Interestingly, there are also unreported cases where contagion exceeds coinsurance, as revealed by the maximum value (4.68) of the excess PD distribution.

[13] Borghesi, Houston, and Naranjo (2007) find a similar relationship between age and discount, which they attribute to a life-cycle for firm growth opportunities (as in Matsusaka (2001)).

The other source of the discount is the exit from databases of the most unprofitable firms, which are less likely to be diversified firms. Since we cannot correct this problem, we exacerbate it once again. Restricting the sample to firms that survive through the whole sample increases the benchmark conglomerate discount to 15% and 13% in Columns (3) and (4) respectively.[14]

Table 4 shows that similar control variables explain a considerable share of the variation of the excess PDs. This is consistent with our model that jointly determines market value and default probability of each organization. Estimates show that there is a negative benchmark excess default probability (the coefficient of the conglomerate dummy), indicating that conglomerate PD is, on average, 3.5% lower than its segments' PD. Moreover, it increases to 8% when we progressively restrict the sample.

Table 5 reports results of a quantile regression of the firm discount, when the dependent variable is the excess value and samples are divided according to 25%, 50% and 75% percentiles of firms' survival probability. Firms in the lowest percentile are those with the highest default probability. Table 5 shows that the diversification discount decreases to 5% when firms are closer to distress (column (1))[15] and increases with survival skills. When firms have very high survival probability (column (4)), the conglomerate discount increases to 13%. When we exclude from the sample firms involved in M&A, the range of variation becomes 5%-12%.

Firm leverage is not usually included in the excess value regression. One may argue, however, that firm value is jointly endogenous with the leverage level and default probability (as in Leland (2007)). The equations identifying both expected excess value and market discounts should then hold at the same level of debt for diversified and focused firms. For this reason, we estimate a quantile regression of the firm discount, when the dependent variable is the excess value and samples are divided according to 25%, 50%, 75% percentiles of firm leverage. Table 6 shows that the diversification discount falls to 9% when leverage takes the firm closer to distress (column (4)). When firms are more likely to survive due to lower leverage (column (1)), the conglomerate discount increases to 16%.

In summary, the (average and median) survival ability of conglomerates exceeds that of standalone firms. Such multivariate evidence confirms that conglomerates with better survival

[14]When we control for firm fixed effects in unreported estimates, the conglomerate discount drops to 3.9%, whereas it increases to 6.5% when the sample excludes defaulted firms from the beginning.

[15]Recall that we do not examine both self-selection issues unrelated to survival and accounting distortions, which have been already covered in previous work.

skills than their component segments suffer from higher market discounts, as implied by our model.

4.3.1 Further tests

We provide further tests of our baseline results.

First, we estimate the excess default probability by using the PD from the CRI database. Multivariate estimates in Table 7 show that the benchmark conglomerate PD is on average 9% lower than for standalone firms. Moreover, it increases to 14.4% when we restrict the sample to firms surviving through 2014. These results confirm our previous findings shown in Table 4.

So far, we have benchmarked results in the conglomerate discount literature using the conglomerate dummy to capture industry diversification. However, the dummy indicates whether the firm operates in more than one segment, whereas diversification is better captured by the correlation of cash flows from the conglomerate segments. For this reason, we estimate the multivariate models for excess value and excess default probabilities (in Table 8 and Table 9, respectively) including such measure, 'CFCORR', in the control variables. Following Kolasinsky (2009), we first compute the average of the EBITDA/Assets ratio for all standalone firms for each quarter-year. In a second step, we compute for each year the correlation of this ratio across each segment-industry pair, by using rolling five-year windows. Next, we compute the average correlation across segments in the conglomerate. Since the variable 'CFCORR' is equal to one for all standalone firms, we replace the conglomerate dummy with it. Table A.2.1. indicates considerable variation in cash flow correlation for conglomerate firms, ranging from a minimum of -44% to a maximum of 96%, with a mean of 58%.

While our model assumes, for simplicity, that unit cash flows are independently distributed, its logic implies that the excess default probability increases in cross-segment cash flow correlation, as coinsurance opportunities fade. Correspondingly, the survivorship bias should diminish, because of reduced survival ability, leading to higher excess value. Results in Table 7 confirm the positive association between cash flow correlation and both excess default probability in Table 9 and the excess value in Table 8.[16] The estimates show that the benchmark standalone default

[16]In earlier studies, firms engaging in unrelated diversification are subject to a higher discount compared to conglomerates operating in related business, irrespective of the accounting data used (as in Berger and Ofek (1995), Villalonga (2004a)).

probability, measured by the coefficient of CFCORR when segment cash flow correlation is equal to one, is now 7.4% higher than that of uncorrelated conglomerate segments (CFCORR=0). In turn, the benchmark standalone premium is equal to 8.6% in Table 8, confirming the covariation of excess values and excess default and a considerable impact of the survivorship bias.

Finally, we estimate our models on a restricted sample when we only keep firms that remain in our sample from the beginning until the end of the sample. We therefore exclude not only exiting firms but also entrants. Results (shown in Table 10) support our model predictions, that is, that the diversification discount for surviving conglomerate firms becomes even more severe.

4.4 The Conglomerate Unconditional Expected Premium

Bankruptcy costs are on average positive for US firms, equaling 10.4% of total asset value in Hennessy and Whited (2007). Proposition 3.c then suggests that the unconditional expected value is higher for conglomerates than for their standalone counterparts, since we observe a conglomerate discount conditional on survival in market data. However, each individual conglomerate may display an unconditional expected premium or discount with respect to its standalone counterpart. This section provides a back-of-the envelope range for the individual conglomerate (unconditional expected) premium in a calibrated numerical example.

We estimate it through equation (13). We let firm bankruptcy costs, K_i, vary between 0% and 20% of total asset value following Bris et al. (2006). Given a median total asset value of 196.745 ($mio) in our sample, we define $K_0 = 0$, $K_{max} = 39.349$ and $K_{med} = 20.461$ as the lower bound, upper bound and median values, respectively, for the bankruptcy costs of A and B. Regarding their survival probabilities, p_A and p_B, we let them vary in the interval [0.896; 0.999]. This range results from the 1^{st} and 99^{th} percentile values of the estimated probability of default for standalone firms in our sample, equal to 0.001 and 0.104 respectively. Since the median PD is equal to 0.006 (0.6%), we set the median probability of survival to 0.994 (99.4%).

Our output variable is the standardized premium – that is, the conglomerate premium divided by the standalone value in (5). Computing the latter requires calibrating both cash flows and debt. Considering the median value of the cash flow of all standalone firms in Compustat (16.594 ($ mio)), we set $X_B = 13$ and $X_A = 20.189$ in order to satisfy the restrictions on asymmetric cash flows in the Lemma. The stock of debt in Compustat exceeds the debt, D_i, in our one-period model, being closer to a yearly debt amortization. Since Compustat reports the amount of debt due in 18 months, in five years and in more than ten years, we divide the amount of short- and long-term debt by the respective residual maturity, which is on average equal to 5.7 years. The unit debts, D_A and D_B, are both set equal to the resulting debt amortization, 6.552.

The upper panel of Figure 3 reports the behavior of the conglomerate premium with equal bankruptcy costs in the two units, as p_i varies in the interval [0.896; 0.999]. As in Proposition 1c., the percentage difference in unconditional value is equal to zero when those costs are null (K_0). It reaches the extremes at the upper bound of bankruptcy costs (K_{max}). The maximum conglomerate premium (4.38%) is obtained when $p_A = 0.999$ and $p_B = 0.896$, while the maximum conglomerate discount (-4.42%) is reached when $p_A = 0.896$ and $p_B = 0.999$.[17] When p_A equals p_B, diversified and focused firms have equal value, since there is no benefit from a multi-segment structure. We know, however, that the latter two cases are not pervasive. In our empirical analysis, the average survival probability of the conglomerate (p_A) exceeds that of the standalone (p_B), or, equivalently, the probability of contagion is lower than the probability of coinsurance.

The lower panel of Figure 3, in turn, studies the evolution of the conglomerate premium when we let p_B and K_B vary, while p_A and K_A are fixed at their median value. Not surprisingly the diversification premium is increasing in K_B and decreasing in p_B, with maximum value (5.22%) when $K_B = 39.34$ and $p_B = 0.896$.[18] It turns moderately negative when the conglomerate suffers from contagion (i.e., p_B exceeds 0.994). This sensitivity analysis reveals that even small differences in the unit survival probabilities (e.g., from 0.89 to 0.99) may lead to large changes in the efficiency of a conglomerate relative to its standalone units.

5 Conclusion

There is conflicting evidence regarding the performance of diversified organizations. Whereas owners tend to choose diversified organizations for their firms, diversified firms have lower market value than focused ones. This paper proposes a resolution of this conondrum by going back to

[17]This range shrinks to (3.7; -3.75) in the unreported case when both units have median bankruptcy costs.

[18]The value premium in Proposition 1 only depends on K_B and p_i. The standardized premium in the figure is inversely related to K_A, since the latter increases the standalone value.

an old economic rationale for diversification: enhanced firm survival. Markets do not price firms that disappeared in a downturn due to defaults, whereas they do price the firms that survived. Thus, the (average) market value does not reflect firm unconditional expected value.

Our analysis implies that market value is distorted further upwards with respect to unconditional expected value when the incidence of defaults is larger. This insight is relevant in practice when we compare market values across focused and diversified firms, without controlling for differential mortality. Our empirical analysis shows that diversified companies display higher average survival probability compared to their focused units. Their excess survival probability correlates with their observed discount. Moreover, both increase when we exacerbate the survivorship bias. Thus, it seems that the economic function of diversification, consisting of limiting dissipative bankruptcy costs, is hard to detect in market prices because of the survivorship bias. Our pricing model also shows that the diversification discount is even larger for groups than for conglomerates, because of their better survival skills, absent moral hazard. An extensive body of literature considers such discount as reflecting inefficiencies. Our paper warns that the survivorship bias may generate a discount precisely when groups save on bankruptcy costs thanks to corporate limited liability.

These insights should lead to adjustments of measured relative values both in the cross section and in the time series, as defaults vary by industry, country and across business cycles. Our model is silent as to the possible consequences of the survivorship bias for the economy, as we leave this important topic for further research.

A Appendices

A.1 Lemma and Proofs of All Propositions

Lemma: State Space and Borrowing Costs: Assume $D_B p_B^{-1} \leq X_B < (D_A + D_B)[p_A + p_B(1 - p_A)]^{-1}$; and $X_A \geq D_A p_A^{-1} + D_B[p_B + p_A(1 - p_B)]^{-1}$. Then:

a. the state space is $\{HH, LL, HL, LH\}$, as defined above;

b. the following ranking of borrowing costs holds across firm types:

$$R_C < R_G < R_A + R_B \,, \tag{A.1}$$

where $R_G = R_{A \in G} + R_{B \in G}$ is the overall interest factor for a group.

Proof of the Lemma:

a. In state $\{H\}$, it must be the case that cash flow, X_i, exceeds the total debt repayment in each unit. For unit B, this requires that

$$X_B \geq max(R_{B \in G}, R_B) = D_B p_B^{-1} \tag{A.2}$$

since the interest factor of a standalone firm exceeds that of the parent company (by the ranking in Part(b)). In state $\{LH\}$, unit B is unable to rescue unit A since its cash flow falls short the combined interest factor, that is $X_B < min(R_C, R_A + R_{B \in G})$. Since conglomerate lenders require a lower interest rate than group lenders (by the ranking in Part(b)), the condition simplifies to $X_B < R_C$, that is:

$$X_B < [D_A + D_B - p_B(1 - p_A)X_B]p_A^{-1}$$

$$p_A X_B < D_A + D_B - p_B(1 - p_A)X_B$$

$$[p_A + p_B(1 - p_A)]X_B < D_A + D_B$$

which implies

$$X_B < (D_A + D_B)[p_A + p_B(1 - p_A)]^{-1} \,. \tag{A.3}$$

As for unit A, its profit in state $\{H\}$ must also exceed the combined service of debt for the two units, i.e. $X_A \geq max(R_C, R_A + R_{B\in G})$, that is:

$$X_A \geq D_A p_A^{-1} + D_B [p_B + p_A(1 - p_B)]^{-1} \,. \tag{A.4}$$

b. We first show that $R_G < R_A + R_B$. Since $R_{A\in G} = R_A$, the following must hold:

$$\begin{gathered} R_{B\in G} < R_B \\ D_B[p_B + p_A(1 - p_B)]^{-1} < D_B p_B^{-1} \\ p_B + p_A(1 - p_B) > p_B \\ p_A(1 - p_B) > 0 \,, \end{gathered}$$

that is $p_B < 1$, which is always satisfied. We then show that $R_C < R_A + R_{B\in G}$, that also implies $R_C < R_A + R_B$. The first inequality can be written as:

$$\begin{gathered} [D_A + D_B - p_B(1 - p_A)X_B]p_A^{-1} < D_A p_A^{-1} + D_B[p_B + p_A(1 - p_B)]^{-1} \\ [D_B - p_B(1 - p_A)X_B]p_A^{-1} < D_B[p_B + p_A(1 - p_B)]^{-1} \\ D_B - p_B(1 - p_A)X_B < D_B p_A[p_B + p_A(1 - p_B)]^{-1} \\ p_B(1 - p_A)X_B > D_B\{1 - p_A[p_B + p_A(1 - p_B)]^{-1}\} \\ p_B(1 - p_A)X_B > D_B[p_B + p_A(1 - p_B) - p_A][p_B + p_A(1 - p_B)]^{-1} \\ p_B(1 - p_A)X_B > D_B[p_B(1 - p_A)][p_B + p_A(1 - p_B)]^{-1} \\ X_B > D_B[p_B + p_A(1 - p_B)]^{-1} \end{gathered}$$

i.e. $X_B > R_{B\in G}$. This last inequality is always satisfied by construction of the state space.

Proposition 1: Firm value

To prove Part (a), consider that value coincides with expected profit, thanks to the zero risk-free rate assumption. In the case of two focused, standalone firms expected profit is equal to:

$$\begin{aligned} V_S &= p_A(X_A + K_A - R_A) + p_B(X_B + K_B - R_B) = \\ &= p_A X_A + p_A K_A - D_A + p_B X_B + p_B K_B - D_B = \\ &= \pi_A + \pi_B + p_A K_A + p_B K_B \,, \end{aligned} \tag{A.5}$$

which proves Equation (5) since $p_A^{Sur} = p_A$ and $p_B^{Sur} = p_B$. In turn, conglomerate expected profit is equal to

$$\begin{aligned} V_C &= p_A p_B(X_A + K_A + X_B + K_B - R_C) + p_A(1 - p_B)(X_A + K_A + K_B - R_C) = \\ &= p_A(X_A + K_A + K_B - R_C) + p_A p_B X_B = \\ &= p_A X_A + p_A(K_A + K_B) + p_B X_B - D_A - D_B = \\ &= \pi_A + \pi_B + p_A(K_A + K_B) \,, \end{aligned} \tag{A.6}$$

Finally, group expected profit is equal to

$$\begin{aligned} V_G &= p_A p_B(X_A + K_A + X_B + K_B - R_A - R_{B\in G}) + \\ &+ p_A(1 - p_B)(X_A + K_A + K_B - R_A - R_{B\in G}) + \\ &+ p_B(1 - p_A)(X_B + K_B - R_{B\in G}) = \\ &= p_A(X_A + K_A - R_A) + p_B X_B + [p_B + p_A(1 - p_B)](K_B - R_{B\in G}) = \\ &= p_A X_A + p_A K_A - D_A + p_B X_B + [p_B + p_A(1 - p_B)]K_B - D_B = \\ &= \pi_A + \pi_B + p_A K_A + [p_B + p_A(1 - p_B)]K_B \,, \end{aligned} \tag{A.7}$$

As for part (b) and (c), results derive directly from combinations of Equations (5)-(7). Alternatively, we can write group value in Equation (A.7) using Equation (A.5) as:

$$V_G = V_S + p_A(1 - p_B)K_B \,, \tag{A.8}$$

and using Equation (A.6) as:

$$V_G = V_C + p_B(1 - p_A)K_B \,. \tag{A.9}$$

Given that $p_{A\in G}^{Sur} = p_A$, $p_{B\in G}^{Sur} = p_B + p_A(1 - p_B)$, and $p_C^{Sur} = p_A$:

$$V_G - V_C = (p^{Sur}_{A\in G} - p^{Sur}_{C})K_A + (p^{Sur}_{B\in G} - p^{Sur}_{C})K_B \tag{A.10}$$

$$V_G - V_S = (p^{Sur}_{A\in G} - p^{Sur}_{A})K_A + (p^{Sur}_{B\in G} - p^{Sur}_{B})K_B\,, \tag{A.11}$$

A group premium follows directly from the assumption of positive bankruptcy costs, $K_B > 0$. Moreover, the group premium relative to standalone companies in (A.8) measures the added future profits, K_B, due to the rescue of the otherwise-insolvent unit B. This occurs with probability $p_A(1-p_B)$, which is the probability that B is insolvent but unit A generates enough profits to support it. A group premium relative to conglomerates in (A.9) highlights the savings of future profits (K_B) from contagion. This happens with probability $p_B(1-p_A)$, which is the probability that unit B in a conglomerate, while solvent by itself, is unable to provide support to the insolvent one. Finally, comparing (A.8) and (A.9) and re-arranging terms we find that conglomerate profits are higher than those of standalone firms if the diversification effect prevails on the contagion effect:

$$p_B K_B < p_A K_B\,, \tag{A.12}$$

or $p_A > p_B$, with the conglomerate excess value relative to standalone firms equal to

$$V_C - V_S = p_A(1-p_B)K_B - p_B(1-p_A)K_B. \tag{A.13}$$

Proposition 2: Value vs. Market Value conditional on Survival

Tedious but straightforward algebra delivers the result.

Proposition 3: Survivorship Bias and Diversification Discount

a. Subtracting (9) from (10) delivers the conglomerate discount relative to standalone firms:

$$\begin{aligned} MV_C - MV_S &= (\pi_A + \pi_B)(p^{Sur}_C)^{-1} + K_A + K_B + \\ &\quad - \pi_A(p^{Sur}_A)^{-1} - K_A - \pi_B(p^{Sur}_B)^{-1} - K_B = \\ &= \pi_A[(p^{Sur}_C)^{-1} - (p^{Sur}_A)^{-1}] + \pi_B[(p^{Sur}_C)^{-1} - (p^{Sur}_B)^{-1}] = \\ &= (p_B X_B - D_B)[p_A^{-1} - p_B^{-1}]\,, \end{aligned} \tag{A.14}$$

since $p_C^{Sur} = p_A^{Sur}$.

b. Subtracting (9) from (12) delivers the group discount with respect to standalone firms:

$$\begin{aligned} MV_G - MV_S &= \pi_A(p_{A\in G}^{Sur})^{-1} + K_A + \pi_B(p_{B\in G}^{Sur})^{-1} + K_B + \\ &- \pi_A(p_A^{Sur})^{-1} - K_A - \pi_B(p_B^{Sur})^{-1} - K_B = \\ &= \pi_A[(p_{A\in G}^{Sur})^{-1} - (p_A^{Sur})^{-1}] + \pi_B[(p_{B\in G}^{Sur})^{-1} - (p_B^{Sur})^{-1}] \\ &= (p_B X_B - D_B)\{[p_B + p_A(1-p_B)]^{-1} - p_B^{-1}\}, \end{aligned} \tag{A.15}$$

since $p_{A\in G}^{Sur} = p_A^{Sur}$. Subtracting (10) from (12) delivers the group discount relative to a conglomerate:

$$\begin{aligned} MV_G - MV_C &= \pi_A(p_{A\in G}^{Sur})^{-1} + K_A + \pi_B(p_{B\in G}^{Sur})^{-1} + K_B + \\ &- (\pi_A + \pi_B)(p_C^{Sur})^{-1} - K_A - K_B = \\ &= \pi_A[(p_{A\in G}^{Sur})^{-1} - p_C^{Sur})^{-1}] + \pi_B[(p_{B\in G}^{Sur})^{-1} - (p_C^{Sur})^{-1}] \\ &= (p_B X_B - D_B)\{[p_B + p_A(1-p_B)]^{-1} - p_A^{-1}\}, \end{aligned} \tag{A.16}$$

since $p_{A\in G}^{Sur} = p_C^{Sur}$.

c. We can define the differential values across organizations, by appropriately combining Equations (5), (6), and (7), as follows:

$$V_C - V_S = (p_C^{Sur} - p_B^{Sur})K_B, \tag{A.17}$$

$$V_G - V_S = (p_{B\in G}^{Sur} - p_B^{Sur})K_B, \tag{A.18}$$

$$V_G - V_C = (p_{B\in G}^{Sur} - p_C^{Sur})K_B, \tag{A.19}$$

since $p_A^{Sur} = p_C^{Sur} = p_{A\in G}^{Sur}$. Therefore, the diversification premium of an organization (Equations (A.17)-(A.19)) is a positive function of its relative survival ability, if bankruptcy costs, K_B, are positive. Likewise, the diversification discount of an organization (Equations (A.14)-(A.16)) increases in its relative survival ability. Therefore, the larger the true diversification premium of a firm, the larger its "market" diversification discount.

A.1.1 Different Bankruptcy Costs across Organizations

Let us define the difference in bankruptcy costs as $\delta = K_C - K_A - K_B$, where $K_C = K_A^C + K_B^C$. Then the stock price of standalone firms exceeds the one of conglomerates if:

$$\begin{aligned} MV_S - MV_C &= \pi_A(p_A^{Sur})^{-1} + \pi_B(p_B^{Sur})^{-1} - (\pi_A + \pi_B)(p_C^{Sur})^{-1} - \delta = \\ &= \pi_A[(p_A^{Sur})^{-1} - (p_C^{Sur})^{-1}] + \pi_B[(p_B^{Sur})^{-1} - (p_C^{Sur})^{-1}] - \delta = \\ &= (p_B X_B - D_B)[p_B^{-1} - p_A^{-1}] - \delta > 0, \end{aligned} \tag{A.20}$$

since $p_A^{Sur} = p_C^{Sur}$.

A conglomerate discount may now emerge either because conglomerates survive more often to industry downturns (positive first term), or because they have lower bankruptcy costs (positive second term), or both. So, lower bankruptcy costs in diversified organization increase their discount (or reduce their premium).

Bankruptcy costs in diversified organizations need not be lower, *a priori*, as segments with larger bankruptcy costs as stand-alone may self-select into diversified organizations if diversification helps survival. The differential bankruptcy cost δ must be bounded above by saved bankruptcy costs for Proposition 3.a to hold:

$$(p_B X_B - D_B)[p_B^{-1} - p_A^{-1}] > \delta \tag{A.21}$$

in which case the stock price of standalones firms exceeds the conglomerates' if the coinsurance probability exceeds the contagion probability, that is $[p_B^{-1} > p_A^{-1}] > 0$. It is easy to derive an equivalent condition for the group discount, such that Proposition 3.b holds.

As for Proposition 3.c, lower bankruptcy costs for conglomerate organizations imply a reduced role for diversification and therefore a lower premium:

$$V_S - V_C = [(p_C^{Sur}) - (p_B^{Sur})]K_B + p_C^{Sur}\delta \tag{A.22}$$

A.1.2 The Discount with Partial Ownership

We now determine how the partial ownership affects the stock price of the parent firm. For each level of the ownership γ, the probability of bailout λ is function of the cash flow of unit A, the probability of success of both units, and their amounts of debt, that is:

$$\lambda(X_A, p_A, p_B, D_A, D_B) = 1 \qquad \text{if} \qquad X_A \geq (R_A + R_{B\in G})/\gamma\,.$$

The stock price of the parent firm, corrected by the probability of bailout of unit B equals

$$MV_{B\in G,\lambda} = [(X_B + K_B - R_{B\in G,\lambda})p_B + (K_B - R_{B\in G,\lambda})\lambda p_A(1-p_B)][p_B + \lambda p_A(1-p_B)]^{-1}\,, \quad \text{(A.23)}$$

where $R_{B\in G,\lambda} = D_B[p_B + \lambda p_A(1 - p_B)]^{-1}$, which equals R_B if $\lambda = 0$ and $R_{B\in G}$ if $\lambda = 1$. Equation (A.23), then, reduces to MV_B if $\lambda = 0$, and to $MV_{B\in G}$ if $\lambda = 1$. Intuitively, if parent ownership share γ is lower than its threshold level, γ^*, the coinsurance between the parent and its subsidiary is not possible, and $\lambda = 0$. This also implies that the conditional probability of state $\{H\}$ when observing a parent in operation is the same as a standalone firm, equal to one, and the interest factors of parents and standalone firms align. It follows that the group will not suffer from the survivorship bias, and the stock price of parent firms equal the stock price of standalone firms, ceteris paribus.

A.1.3 Model with Mutual Support

This section adds to the model in Section 2 the possibility that unit A rescues unit B. Each unit operating profit in $t = 1$ can therefore be medium, high or low. It will be medium $\{M\}$, and equal to $X_i^M > 0$, with probability $p_i^M \in (0, 1)$, it will be high $\{H\}$, and equal to $X_i^H > X_i^M$, with probability $p_i^H \in (0, 1)$, and it will be low and equal to zero with probability $p_i^L = (1 - p_i^M - p_i^H)$. Accordingly, we define nine states of the world, $\{LL, LM, ML, LH, HL, MM, MH, HM, HH\}$.

The key assumption of the general model is that the profit of each unit, in state $\{H\}$, exceeds the combined debt repayment of the two units, while, in state $\{M\}$, it is sufficient to honor its own debt obligations but not the combined service of debt. Consequently, not only unit A can rescue unit B in state $\{HL\}$ but also unit B can save unit A from bankruptcy in state $\{LH\}$, provided that they do not operate as independent entities. Setting $p_A^M = 0$, $p_A^H = p_A$, $p_B^M = p_B$, $p_B^H = 0$, $X_A^H = X_A$, $X_B^M = X_B$ leads to the original model where only unit A can rescue unit B in state $\{HL\}$.

Let us now consider, for each organization, survival probability, cost of debt and conditions on cash flows within this general setup. Standalone firms survive in states $\{M\}$ and $\{H\}$ with probability $p_i^{Sur} = (p_i^M + p_i^H)$ and default in state $\{L\}$. A conglomerate defaults in states $\{LL\}$, $\{LM\}$ and $\{ML\}$ when both units do not realize any profit, when unit A drags profitable unit B into bankruptcy and when unit B drags solvent unit A into bankruptcy, respectively. However, conglomerates survive when either their segments are both profitable, states $\{MM\}$, $\{MH\}$, $\{HM\}$ and $\{HH\}$, or one of their units can save the other from insolvency, states $\{LH\}$ and $\{HL\}$. Conglomerate survival probability is, therefore, equal to $p_C^{Sur} = (p_A^H + p_B^H - p_A^H p_B^H + p_A^M p_B^M)$. Finally, group affiliates benefit from both limited liability and coinsurance gains. Thus, the subsidiary A selectively defaults in state $\{LM\}$[19] while it is rescued by the parent B in state $\{LH\}$, then surviving with probability $p_{A\in G}^{Sur} = (p_A^M + p_A^H + p_A^L p_B^H)$. The parent company, in turn, goes bankrupt in state $\{ML\}$ without affecting its subsidiary, and receives funds from it to meet its debt obligations in state $\{HL\}$, staying alive with probability $p_{B\in G}^{Sur} = (p_B^M + p_B^H + p_A^H p_B^L)$.

Within this framework, the interest factor charged by the lenders, satisfying their zero expected profit condition, is equal to

$$R_i = D_i(p_i^M + p_i^H)^{-1} = D_i(p_i^{Sur})^{-1} \tag{A.24}$$

for a standalone,

$$\begin{aligned} R_C &= (D_A + D_B - p_A^M p_B^L X_A^M - p_A^L p_B^M X_B^M)(p_A^H + p_B^H - p_A^H p_B^H + p_A^M p_B^M)^{-1} \\ &= (D_A + D_B - p_A^M p_B^L X_A^M - p_A^L p_B^M X_B^M)(p_C^{Sur})^{-1} \end{aligned} \tag{A.25}$$

for a conglomerate,

$$R_{A\in G} = D_A(p_A^M + p_A^H + p_A^L p_B^H)^{-1} = D_A(p_{A\in G}^{Sur})^{-1}\,, \tag{A.26}$$

$$R_{B\in G} = D_B(p_B^M + p_B^H + p_A^H p_B^L)^{-1} = D_B(p_{B\in G}^{Sur})^{-1} \tag{A.27}$$

for a subsidiary and a parent company of a group, respectively. As before, we can show that

[19] This is the situation when Indian groups fail to provide support to ailing subsidiaries (Gopalan, Nanda and Seru (2007)).

the following inequality holds:

$$R_C < R_{A\in G} + R_{B\in G} < R_A + R_B \,. \tag{A.28}$$

Therefore, the assumption that profit in state $\{M\}$ exceeds the individual debt repayment implies that $X_i^M \geq max(R_i, R_{i\in G})$. Since standalones have a higher cost of debt relative to groups, the following condition must hold:

$$X_i^M \geq D_i(p_i^M + p_i^H)^{-1} \,. \tag{A.29}$$

At the same time, cash flow in state {M} must fall short the combined interest factor, such that $X_i^M < min(R_C, R_{A\in G} + R_{B\in G})$, which requires

$$X_i^M < (D_i + D_j - p_i^L p_j^M X_j^M)(p_i^H + p_i^M + p_i^L p_j^H)^{-1} \tag{A.30}$$

since conglomerate interest factor is lower than that of groups. The additional assumption that each unit cash flow in state $\{H\}$ exceeds the cost of debt for the two units implies $X_i^H \geq max(R_C, R_{A\in G} + R_{B\in G})$ which requires, since R_C is lower than $R_{A\in G} + R_{B\in G}$, that

$$X_i^H \geq D_A(p_A^M + p_A^H + p_A^L p_B^H)^{-1} + D_B(p_B^M + p_B^H + p_A^H p_B^L)^{-1} \,. \tag{A.31}$$

Let us define $\pi_A = X_A^M p_A^M + X_A^H p_A^H - D_A$ and $\pi_B = X_B^M p_B^M + X_B^H p_B^H - D_B$ as the expected current profit after the service of debt for unit A and B, respectively. Therefore, it can be shown that the value definitions (Equations (5)-(7)), stock price definitions (Equations (8)-(12)), and Propositions 1, 2, and 3 hold for the general model as well, once the reader takes into account the new definitions of both π_i and the survival probability of each organization.

This extension confirms the main results of the restricted model. Provided that contagion is less likely than coinsurance, the stock price differential between diversified and standalones firms may grow even larger, since all units have the ability to rescue the other from bankruptcy.

A.2 Construction of Variables

A.2.1 Dependent Variables

EXCESS VALUE is computed as the natural logarithm of the ratio between a firm's market value and its imputed value. The imputed value is computed as the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median market-to-assets multiplier of single-segment firms in the same industry. The industry matching is done by using the narrower SIC including at least five single-segment firms.

EXCESS DEFAULT PROBABILITY is computed as the natural logarithm of the ratio between a firm's probability of default (PD) and its imputed PD at the end of the year. The PD is computed following Campbell et al. (2008. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median PD-to-assets (sales) multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. For robustness tests, default probabilities are retrieved from the Credit Research Initiative (CRI) of the University of Singapore (RMI-NUS). The estimation of CRI's probabilities is built on the forward intensity model developed by Duan et al. (2012, Journal of Econometrics).

A.2.2 Independent Variables - Multivariate Regressions

CALC is the ratio of firm Current assets (ca) to firm Current liabilities (cl).

CAPEX is the ratio of firm Capital Expenditure to firm Total Assets.

CFCORR is the cross-segment cash flow correlation. We first compute the average of the EBITDA for all standalone firms for each quarter-year. In a second step, we compute for each year the correlation of this ratio across each segment-industry pair, by using rolling five-year windows. Next, we compute the average correlation across segments units in the conglomerate.

DIVIDENDS is the ratio of Dividends to Total Assets.

EBITDA is the ratio of firm Earnings before Extraordinary Items to firm Total Assets.

LEVERAGE is the ratio between total debt (dltt+dlc) and firm total assets.

MB (market-to-book) is the ratio between the market value of firm equity (computed by multiplying yearly closing price by the number of outstanding shares) and the book value of the equity (seq).

NITA is the ratio between firm Net Income and firm Total Assets.

SALES GROWTH is the yearly growth of the ratio of Sales and firm Total Assets.

SIZE is the natural logarithm of firm total assets.

A.2.3 Independent Variables - Survival Analysis

ADJSIZE is the logarithm of the total firm assets adjusted by 10% of the difference between the market equity and the book equity of the firm $[TA + 0.1(ME - BE)]$.

CASHMTA is the ration between firm Cash and Short Term Investments and the sum of firm Market Equity and the firm Total Liabilities.

EBTA is the ratio between firm Market Equity and the firm Total Liabilities.

EXRET is the difference between the log gross firm return in CRSP (ret), and the log gross return on the S& P Index.

MELT is the ratio between the Market Equity of the firm and firm Total Liabilities.

REAT is the ratio between firm retained earnings and the total assets.

SIGMA is volatility of a firm stock returns, computed as the annualized standard deviation of daily stock returns, averaged over 3 months:

$$SIGMA_{i,t-1,t-3} = \left(\frac{252 \times \sum_{t-1,t-2,t-3} r^2}{n-1} \right) .$$

NIMTA is the ratio between firm Net Income (ni in compustat) and the sum of firm Market Equity to Total Liabilities (net income/ME+assets).

TLMTA is the ratio of Total Liabilities, and the sum of firm Market Equity to Total Liabilities.

TLTA is the ratio between firm Total Liabilities and firm Total Assets(adjusted).

RSIZE is the logarithm of the ratio of firm Market Equity to the S& P500 Market Value.

WC is the firm Working Capital over total assets.

A.2.1. Descriptive Statistics The table reports the summary statistics for all the variables used in the analysis. The sample consists of the intersection of the COMPUSTAT, CRSP, and the bankruptcy datasets over the period January 1990 - December 2014. For each variable, column (1) reports the number of observations, columns (2)-(3) the mean and standard deviation, columns (4)-(10) the percentile distribution. Panel A refers to the main variables, Panel B to the control variables for the entire sample.

	Obs.	Mean	Std. Dev.	Min	1%	25%	Median	75%	90%	Max
Panel A: Main Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Excess Value (sales mult.)	40,545	-0.079	0.599	-11.201	-1.792	-0.388	-0.039	0.244	1.422	4.204
Excess PD (sales mult.)	40,545	-0.017	0.913	-3.364	-3.364	-0.444	0.000	0.430	2.402	2.402
Excess PD (CRI) (sales mult.)	28,286	-0.128	0.923	-5.963	-2.680	-0.622	0.000	0.371	2.179	4.489
PD (Estimated - Campbell et al. (2008))	40,545	0.013	0.022	0.000	0.000	0.004	0.007	0.014	0.102	0.576
Default (Y/N)	40,545	0.013	0.115	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Failure (Y/N)	40,545	0.014	0.117	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Mergers (Y/N - as bidders)	40,545	0.185	0.388	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Mergers (Y/N - as targets)	40,545	0.010	0.099	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Industry Distress	40,545	0.011	0.107	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Segment Industry Distress	40,545	0.016	0.126	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Numb. Segments	40,545	1.598	1.086	1.000	1.000	1.000	1.000	2.000	5.000	21.000
Unrelated Diversified (Y/N)	40,545	0.138	0.344	0.000	0.000	0.000	0.000	0.000	1.000	1.000
Seg. CFCORR (Congl.)	13,014	0.582	0.490	-0.443	-0.297	0.138	0.881	0.928	0.957	0.961

A.2.1. Descriptive Statistics - continued.

	Obs.	Mean	Std. Dev.	Min	1%	25%	Median	75%	90%	Max
Panel B: Control Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Size	40,545	5.685	1.721	2.343	2.695	4.379	5.492	6.788	10.179	12.507
EBITDA	40,545	0.119	0.113	-0.576	-0.272	0.072	0.125	0.180	0.392	0.471
CAPEX	40,545	0.077	0.090	0.000	0.002	0.024	0.048	0.092	0.469	0.687
Sales growth (SG)	40,545	0.149	0.311	-0.626	-0.415	-0.007	0.092	0.234	1.397	2.844
Dividends (Y/N)	40,545	0.009	0.021	0.000	0.000	0.000	0.000	0.011	0.103	0.293
LTAT	40,545	0.478	0.209	0.065	0.086	0.312	0.482	0.631	0.934	0.981
CACL	40,545	2.544	1.868	0.000	0.000	1.372	2.034	3.089	10.069	12.442
Leverage	40,545	0.216	0.188	0.000	0.000	0.034	0.191	0.343	0.721	0.815
NITA	40,545	0.013	0.126	-1.711	-0.461	-0.006	0.039	0.074	0.196	0.306
TLTA	40,545	0.453	0.209	0.040	0.071	0.285	0.452	0.608	0.908	0.972
EXRET	40,545	-0.006	0.124	-0.610	-0.368	-0.072	-0.002	0.066	0.302	0.602
NIMTA	40,545	0.000	0.109	-1.586	-0.417	-0.005	0.027	0.045	0.131	0.278
TLMTA	40,545	0.363	0.232	0.007	0.024	0.168	0.327	0.527	0.916	0.988
EXRETAVG	40,545	-0.015	0.070	-0.484	-0.222	-0.051	-0.010	0.027	0.142	0.264
SIGMA	40,545	0.050	0.058	0.001	0.001	0.011	0.030	0.066	0.252	0.409
CASHMTA	40,545	0.092	0.115	0.000	0.000	0.015	0.050	0.123	0.530	0.924
MB	40,545	2.354	1.715	0.461	0.461	1.103	1.816	3.040	6.834	6.834
PRICE	40,545	0.665	1.841	-12.562	-4.893	-0.064	0.576	1.400	6.479	17.462

A.2.2. Default Probability Estimation

The table reports the estimates of the default probabilities according to Campbell et al. (2008), where the dependent variable is an indicator variable equal to one when the firm goes bankrupt in t, or fail in t,and X a vector of variables listed in the table. The estimates are computed with robust standard errors. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Survival Analysis [(Campbell et al. (2008)]				
	Default	Failure	Default	Failure
	(1)	(2)	(4)	(5)
NITA	-1.897***	-1.851***		
	(-11.403)	(-11.040)		
NIMTAAVG			-1.435***	-1.408***
			(-5.598)	(-5.496)
TLTA	3.280***	3.377***		
	(13.40)	(13.99)		
TLMTA			3.460***	3.582***
			(14.17)	(14.79)
EXRET	-1.700***	-1.680***		
	(-5.156)	(-5.181)		
EXRETAVG			-3.440***	-3.406***
			(-6.996)	(-6.905)
SIGMA	3.128***	3.078***	1.567***	1.508***
	(5.41)	(5.41)	(2.72)	(2.66)
RSIZE	-0.153***	-0.164***	-0.093**	-0.098**
	(-2.742)	(-2.796)	(-2.297)	(-2.336)
CASHMTA			-0.094	0.003
			(-0.205)	(0.01)
MB			0.142***	0.139***
			(4.95)	(4.93)
PRICE			-0.043**	(0.035)
			(-1.997)	(-1.556)
Constant	-6.217***	-6.227***	-6.413***	-6.438***
	(-38.180)	(-38.529)	(-33.629)	(-34.107)
N	40,545	40,545	40,545	40,545

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Table 1: Number of firms per year
This table lists the total number of active firms, the number of active conglomerates (including groups), of defaults, failures, mergers, and new entries for every year. The sample consists of the intersection of the COMPUSTAT, CRSP and the UCLA- LoPucki Bankruptcy Research Database (BRD), over the period January 1990 - December 2014.

Year	Active firms	Conglomerates	Default	Default (%)	Failures	Mergers	New Entries
1990	1,493	416	17	1.14%	17	220	0
1991	1,512	433	10	0.66%	10	166	0
1992	1,595	453	6	0.38%	6	232	32
1993	1,706	454	15	0.88%	16	271	30
1994	1,844	458	7	0.38%	7	318	124
1995	2,051	482	20	0.98%	21	367	347
1996	2,245	485	21	0.94%	21	440	533
1997	2,261	419	38	1.68%	38	474	699
1998	2,028	645	29	1.43%	29	429	721
1999	1,912	761	46	2.41%	49	395	816
2000	1,734	672	53	3.06%	53	321	803
2001	1,668	601	57	3.42%	59	279	835
2002	1,716	600	27	1.57%	28	297	884
2003	1,616	575	25	1.55%	26	291	817
2004	1,589	588	26	1.64%	27	319	797
2005	1,471	540	21	1.43%	23	291	770
2006	1,464	542	14	0.96%	15	298	773
2007	1,468	540	21	1.43%	22	298	786
2008	1,404	499	14	1.00%	15	223	829
2009	1,409	495	17	1.21%	18	178	872
2010	1,357	488	17	1.25%	18	228	828
2011	1,275	468	12	0.94%	13	235	746
2012	1,257	462	10	0.80%	11	298	708
2013	1,240	474	10	0.81%	10	290	700
2014	1,230	464	13	1.06%	13	329	683
Total	40,545	13,014	546	1.32%	565	7,487	15,133

Table 2: Univariates
The table reports statistics for firm value, default, and financial characteristics across firm type (conglomerates vs. standalones), and tests for univariate differences. The details of the variables are in Appendix A.2. The sample consists of the intersection of the COMPUSTAT, CRSP, and the bankruptcy datasets over the period January 1990 - December 2014. Panel A reports statistics for all firms in the sample. Panel B reports statistics for the surviving firms in the dataset (firms that do not drop out the sample) until 2014, while Panel C reports the statistics for firms that remain in the panel for all the sample period (we exclude firms that disappear or enter in the sample before 2015). Column (4) reports the univariate test difference between conglomerates and standalone firms. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Panel A: All firms	Obs.	Conglomerates	Standalones	Difference	t-stat
	(1)	(2)	(3)	(4)	(5)
Excess value	40,545	-0.134	-0.053	-0.080***	(-12.67)
Excess PD Campbell	40,545	-0.098	0.022	-0.120***	(-12.38)
Excess PD (CRI)	28,286	-0.215	-0.085	-0.130***	(-11.17)
Default (Y/N)	40,545	0.012	0.014	-0.003*	(-2.33)
Failure (Y/N)	40,545	0.012	0.015	-0.003*	(-2.39)
Industry Distress	40,545	0.014	0.010	0.004***	(3.64)
Size	40,545	6.282	5.404	0.878***	(49.38)
Age	40,545	15.409	10.858	4.551***	(56.14)
EBITDA	40,545	0.124	0.116	0.008***	(6.84)
Capex	40,545	0.067	0.082	-0.015***	(-15.33)
Sales Growth (SG)	40,545	0.125	0.161	-0.036***	(-11.05)
Dividend ratio	40,545	0.011	0.008	0.003***	(15.53)
Leverage	40,545	0.244	0.202	0.041***	(20.67)
Panel B: Surviving firms	Obs.	Conglomerates	Standalones	Difference	t-stat
	(1)	(2)	(3)	(4)	(5)
Excess value	13,548	-0.173	-0.062	-0.112***	(-10.52)
Excess PD Campbell	13,548	-0.234	-0.082	-0.153***	(-9.84)
Excess PD (CRI)	11,799	-0.395	-0.214	-0.180***	(-10.02)
Industry Distress	13,548	0.015	0.014	0.001	(0.47)
Size	13,548	6.540	5.863	0.677***	(22.14)
Age	13,548	18.411	13.317	5.093***	(32.91)
EBITDA	13,548	0.133	0.128	0.004*	(2.21)
Capex	13,548	0.061	0.080	-0.019***	(-12.44)
Sales Growth (SG)	13,548	0.105	0.148	-0.042***	(-8.73)
Dividend ratio	13,548	0.014	0.011	0.003***	(6.53)
Leverage	13,548	0.216	0.180	0.036***	(11.36)

Table 3: Excess value
The table reports the estimation of the following equation:

$$y_{i,t} = \alpha + \beta\, Conglomerate_{it} + \Gamma X_{i,t-1} + \varepsilon_t \,,$$

where the dependent variable is the excess value over the period January 1990 - December 2014, computed as the natural logarithm of the ratio between a firm's market value and its imputed value at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median market-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. The variable "conglomerate" is an indicator variable equal to one if the firm is a multi-segments firm. The model controls for a vector of firm characteristics (listed in the table), including year and industry fixed effects. In all specifications, the standard errors are clustered at firm level. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Dep. var. = Excess value			
	All sample		Surviving firms	
	(1)	(2)	(3)	(4)
Conglomerate	-0.127***	-0.108***	-0.151***	-0.132***
	(-8.833)	(-7.632)	(-5.376)	(-4.775)
Age		-0.085***		-0.080***
		(-7.860)		(-3.948)
Assets	0.078***	0.083***	0.081***	0.085***
	(16.33)	(17.08)	(8.55)	(8.80)
CAPEX	0.562***	0.500***	0.525***	0.455***
	(7.98)	(7.13)	(3.29)	(2.91)
Sales growth	0.109***	0.077***	0.102***	0.072**
	(7.70)	(5.28)	(3.58)	(2.47)
Dividends	-0.966***	-0.768***	-0.832**	-0.716*
	(-3.665)	(-2.883)	(-2.221)	(-1.899)
EBITDA	-0.413***	-0.367***	-0.588***	-0.531***
	(-6.774)	(-6.024)	(-4.590)	(-4.111)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.094	0.100	0.191	0.196
N	40,545	40,545	13,548	13,548

Table 4: Excess default probability
The table reports of the following equation:

$$y_{i,t} = \alpha + \beta\, Conglomerate_{it} + \Gamma X_{i,t-1} + \varepsilon_t\,,$$

where the dependent variable is the excess default probability over the period January 1990 - December 2014, computed as the natural logarithm of the ratio between a firm's PD and its imputed PD at the end of the year. The imputed value is the sum of its segments' imputed value, obtained by multiplying the segment's most recent annual assets (sales) by the median PD-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. The variable "conglomerate" is an indicator variable equal to one if the firm is a multi-segments firm. The model controls for a vector of firm characteristics (listed in the table), including year and industry fixed effects. In all specifications, the standard errors are clustered at firm level. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Dep. var. = Excess PD			
	All sample		Surviving firms	
	(1)	(2)	(3)	(4)
Conglomerate	-0.035**	-0.035**	-0.080**	-0.080***
	(-2.027)	(-1.992)	(-2.487)	(-2.583)
Age		-0.029***		-0.050***
		(-2.857)		(-2.877)
Assets	-0.198***	-0.197***	-0.195***	-0.202***
	(-23.056)	(-22.982)	(-12.122)	(-12.913)
CAPEX	-0.549***	-0.571***	-0.348***	-0.167
	(-8.277)	(-8.576)	(-2.677)	(-1.323)
Sales growth	-0.007	-0.018	-0.016	-0.030
	(-0.519)	(-1.307)	(-0.623)	(-1.213)
Dividends	-3.595***	-3.523***	-2.406***	-2.617***
	(-7.942)	(-7.803)	(-4.403)	(-4.836)
Leverage	2.172***	2.171***	2.100***	0.788***
	(53.83)	(53.81)	(27.28)	(7.01)
Net income/Assets	-1.828***	-1.814***	-2.029***	-1.774***
	(-40.684)	(-40.340)	(-21.925)	(-20.132)
Current Assets/Liabilities	-0.060***	-0.061***	-0.062***	0.000
	(-17.557)	(-17.750)	(-9.807)	(0.05)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.448	0.448	0.442	0.475
N	40,545	40,545	13,548	13,548

Table 5: Quantile regression: survival probability
The table reports of the following equation:

$$\textit{by percentile (Survival probability)}: y_{i,t} = \alpha + \beta\, Conglomerate_{it} + \Gamma X_{i,t-1} + \varepsilon_t \,,$$

where the dependent variables is the excess value over the period January 1990 - December 2014, computed as the natural logarithm of the ratio between a firm's market value and its imputed value at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median market-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. The variable "conglomerate" is an indicator variable equal to one if the firm is a multi-segments firm. The model is performed on four subsamples split according to the 25th, 50th, and 75th percentiles of the firms survival probability (defined as one-year-ahead default probability). The model controls for a vector of firm characteristics (listed in the table), including year and industry fixed effects. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Dep. var. = Excess Value Survival probability			
	p(25)	p(50)	p(75)	p(100)
	(1)	(2)	(3)	(4)
Conglomerate	-0.056**	-0.082***	-0.087***	-0.133***
	(-2.073)	(-4.140)	(-4.699)	(-6.424)
Age	-0.086***	-0.073***	-0.069***	-0.065***
	(-4.491)	(-5.029)	(-4.972)	(-3.998)
Assets	0.115***	0.102***	0.071***	0.024***
	(13.39)	(13.65)	(11.04)	(4.17)
CAPEX	-0.071	-0.730***	-1.132***	-1.486***
	(-0.649)	(-7.376)	(-12.139)	(-14.014)
Sales growth	0.722***	0.622***	0.470***	0.214**
	(4.98)	(5.77)	(4.82)	(1.99)
Dividends	-0.005	0.052*	0.047*	0.085***
	(-0.169)	(1.94)	(1.96)	(3.64)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.139	0.153	0.143	0.181
N	9,996	9,710	10,326	10,513

Table 6: Quantile regression: leverage
The table reports of the following equation:

$$\textit{by percentile (Survival probability): } y_{i,t} = \alpha + \beta\, Conglomerate_{it} + \Gamma X_{i,t-1} + \varepsilon_t \,,$$

where the dependent variables is the excess value over the period January 1990 - December 2014, computed as the natural logarithm of the ratio between a firm's market value and its imputed value at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median market-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. The variable "conglomerate" is an indicator variable equal to one if the firm is a multi-segments firm. The model is performed on four subsamples split according to the 25th, 50th, and 75th percentiles of the firm leverage. The model controls for a vector of firm characteristics (listed in the table), including year and industry fixed effects. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Dep. var. = Excess Value			
	Leverage			
	p(25)	p(50)	p(75)	p(100)
	(1)	(2)	(3)	(4)
Conglomerate	-0.156**	-0.118***	-0.138***	-0.089**
	(-2.433)	(-2.882)	(-3.878)	(-2.179)
Age	-0.073*	-0.098***	-0.054**	-0.058**
	(-1.716)	(-3.028)	(-1.989)	(-2.057)
Assets	0.121***	0.064***	0.083***	0.097***
	(5.25)	(4.50)	(6.75)	(6.75)
CAPEX	-0.404*	0.042	-0.902***	-1.135***
	(-1.945)	(0.23)	(-4.331)	(-4.646)
Sales growth	-0.096	0.798***	0.516***	0.563***
	(-0.273)	(2.86)	(3.01)	(2.85)
Dividends	0.006	0.063	0.160***	0.055
	(0.08)	(1.34)	(2.88)	(1.44)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.238	0.238	0.229	0.264
N	3,392	3,646	3,509	3,001

Table 7: Excess default probability (CRI) - robustness
The table reports of the following equation:

$$y_{i,t} = \alpha + \beta\, Conglomerate_{it} + \Gamma X_{i,t-1} + \varepsilon_t\,,$$

where the dependent variable is the excess default probability over the period January 1990 - December 2014, computed as the natural logarithm of the ratio between a firm's PD and its imputed PD at the end of the year. The imputed value is the sum of its segments' imputed value, obtained by multiplying the segment's most recent annual assets (sales) by the median PD-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. Default probabilities are retrieved from the Credit Research Initiative (CRI) of the University of Singapore (RMI-NUS). The variable "conglomerate" is an indicator variable equal to one if the firm is a multi-segments firm. The model controls for a vector of firm characteristics (listed in the table), including year and industry fixed effects. In all specifications, the standard errors are clustered at firm level. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Dep. var. = Excess PD (CRI)			
	All sample		Surviving firms	
	(1)	(2)	(3)	(4)
Conglomerate	-0.092***	-0.070***	-0.144***	-0.130***
	(-4.439)	(-3.401)	(-4.082)	(-3.830)
Age		-0.087***		-0.090***
		(-6.897)		(-4.875)
Assets	-0.139***	-0.133***	-0.148***	-0.151***
	(-20.962)	(-19.996)	(-13.903)	(-14.683)
CAPEX	0.067	-0.021	0.209	0.299**
	(0.75)	(-0.230)	(1.54)	(2.25)
Sales growth	0.192***	0.151***	0.139***	0.105***
	(10.91)	(8.51)	(4.24)	(3.22)
Dividends	-4.572***	-4.540***	-4.938***	-5.018***
	(-11.553)	(-11.679)	(-9.431)	(-9.869)
Leverage	1.315***	1.308***	1.426***	0.388***
	(26.37)	(26.33)	(16.80)	(3.15)
Net income/Assets	-1.423***	-1.372***	-1.642***	-1.412***
	(-26.041)	(-25.264)	(-14.290)	(-12.306)
Current Assets/Liabilities	-0.080***	-0.083***	-0.091***	-0.042***
	(-15.333)	(-15.835)	(-10.749)	(-4.409)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.258	0.261	0.291	0.311
N	30,610	30,610	12,708	12,708

Table 8: Excess value and cross-segments cash flow correlation - robustness.
The table reports the estimation of the following equation:

$$y_{i,t} = \alpha + \beta\, CFCORR_{it} + \Gamma X_{i,t-1} + \varepsilon_t\ ,$$

where the dependent variable is the excess value over the period January 1990 - December 2014, computed as the natural logarithm of the ratio between a firm's market value and its imputed value at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median market-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. For conglomerates, the variable CFCORR is the cross-segment cash flow correlations across segment units, computed in several steps as in Kolasinski (2009). We first compute the average of the EBITDA/Assets ratio for all standalone firms for each quarter-year. In a second step, we compute for each year the correlation of this ratio across each segment-industry pair, by using rolling five-year windows. Next,we compute the average correlation across segments units in the conglomerate. The variable CFCORR is equal to one for all standalone firms. The model controls for a vector of firm characteristics (listed in the table), including year fixed effects. In all specifications, the standard errors are clustered at firm level. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Dep. var. = Excess value			
	All sample		Surviving firms	
	(1)	(2)	(3)	(4)
CFCORR	0.086***	0.066***	0.102**	0.081*
	(3.75)	(2.90)	(2.36)	(1.91)
Age		-0.085***		-0.88***
		(-8.254)		(-4.597)
Assets	0.083***	0.088***	0.086***	0.090***
	(14.136)	(14.739)	(7.291)	(7.578)
CAPEX	0.535***	0.463***	0.510***	0.421**
	(7.13)	(6.24)	(2.86)	(2.44)
Sales growth	0.107***	0.068***	0.114***	0.072**
	(6.92)	(4.27)	(3.74)	(2.26)
Dividends	-1.036***	-0.791***	-0.950**	-0.801*
	(-3.498)	(-2.635)	(-2.282)	(-1.905)
EBITDA	-0.383***	-0.331***	-0.552***	-0.474***
	(-6.017)	(-5.191)	(-4.150)	(-3.515)
Year FE	Yes	Yes	Yes	Yes
R-squared	0.090	0.096	*0.189*	0.195
N	34,425	34,425	11,364	11,364

Table 9: Excess default probability and cross-segments cash flow correlation - robustness
The table reports of the following equation:

$$y_{i,t} = \alpha + \beta\, CFCORR_{it} + \Gamma X_{i,t-1} + \varepsilon_t \,,$$

where the dependent variable is the excess default probability over the period January 1990 - December 2014, computed as the natural logarithm of the ratio between a firm's PD and its imputed PD at the end of the year. The imputed value is the sum of its segments' imputed value, obtained by multiplying the segment's most recent annual assets (sales) by the median PD-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. Following Kolasinski (2009), the variable CFCORR is the cross-segment cash flow correlations across segment units, computed in several steps. We first compute the average of the EBITDA/Assets ratio for all standalone firms for each quarter-year. In a second step, we compute for each year the correlation of this ratio across each segment-industry pair, by using rolling five-year windows. Next,we compute the average correlation across segments units in the conglomerate. The variable CFCORR is equal to one for all standalone firms. The model controls for a vector of firm characteristics (listed in the table), including year and industry fixed effects. In all specifications, the standard errors are clustered at firm level. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Dep. var. = Excess PD			
	All sample		Surviving firms	
	(1)	(2)	(3)	(4)
CFCORR	0.074***	0.069**	0.176***	0.151***
	(2.72)	(2.55)	(3.46)	(3.18)
Age		0.004		-0.033*
		(0.379)		(-1.700)
Assets	-0.189***	-0.189***	-0.183***	-0.191***
	(-21.338)	(-21.431)	(-11.724)	(-12.683)
CAPEX	-0.520***	-0.537***	-0.387***	-0.236*
	(-7.602)	(-7.829)	(-2.874)	(-1.828)
Sales growth	-0.021	-0.030**	-0.010	-0.033
	(-1.384)	(-1.981)	(-0.357)	(-1.245)
Dividends	-3.216***	-3.154***	-1.994***	-2.132***
	(-6.752)	(-6.665)	(-3.495)	(-3.793)
Leverage	2.086***	2.086***	2.039***	0.781***
	(49.36)	(49.38)	(24.40)	(6.63)
Net income/Assets	-1.754***	-1.742***	-1.937***	-1.665***
	(-38.324)	(-37.983)	(-20.584)	(-18.692)
Current Assets/Liabilities	-0.058***	-0.059***	-0.056***	0.003
	(-16.378)	(-16.578)	(-8.419)	(0.35)
Year FE	Yes	Yes	Yes	Yes
R-squared	0.399	0.399	0.382	0.421
N	34,425	34,425	11,364	11,364

Table 10: Excess vale and default probability on a restricted sample - robustness
The table reports of the following equation:

$$y_{i,t} = \alpha + \beta\, Conglomerate_{it} + \Gamma X_{i,t-1} + \varepsilon_t\,,$$

where the dependent variables are, respectively, the excess firm value (columns (1)-(2)) and default probability (columns (3)-(4)), over the period 1990-2014, on the restricted sample of firms that survive for all the years in our sample. The excess is value computed as the natural logarithm of the ratio between a firm's market value and its imputed value at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median market-to-assets multiplier of single-segment firms in the same industry. The excess default probability is computed as the natural logarithm of the ratio between a firm's PD and its imputed PD at the end of the year. The imputed value is the sum of its segments' imputed value, obtained by multiplying the segment's most recent annual assets (sales) by the median PD-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. The variable "conglomerate" is an indicator variable equal to one if the firm is a multi-segments firm. The model controls for a vector of firm characteristics (listed in the table), including year and industry fixed effects. In all specifications, the standard errors are clustered at firm level. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Dep. var.=	Excess Value		Excess PD	
	(1)	(2)	(3)	(4)
Conglomerate	-0.143***	-0.131***	-0.134**	-0.138**
	(-3.098)	(-2.934)	(-2.086)	(-2.186)
Age		-0.216***		0.076
		(-3.009)		(0.76)
Assets	0.078***	0.080***	-0.260***	-0.261***
	(5.00)	(5.03)	(-8.281)	(-8.262)
CAPEX	0.608*	0.602*	-0.801**	-0.797**
	(1.84)	(1.88)	(-2.575)	(-2.570)
Sales growth	-0.025	-0.049	0.064	0.072
	(-0.391)	(-0.755)	(1.16)	(1.33)
Dividends	-0.593	-0.336	-2.322**	-2.412**
	(-0.998)	(-0.580)	(-2.169)	(-2.284)
EBITDA	-0.127	-0.128		
	(-0.596)	(-0.601)		
Leverage			2.242***	2.246***
			(13.58)	(13.54)
Net income/Assets			-2.761***	-2.761***
			(-11.414)	(-11.478)
Current Assets/Liabilities			-0.042***	-0.041***
			(-2.835)	(-2.775)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.295	0.303	0.482	0.482
N	5,106	5,106	5,106	5,106

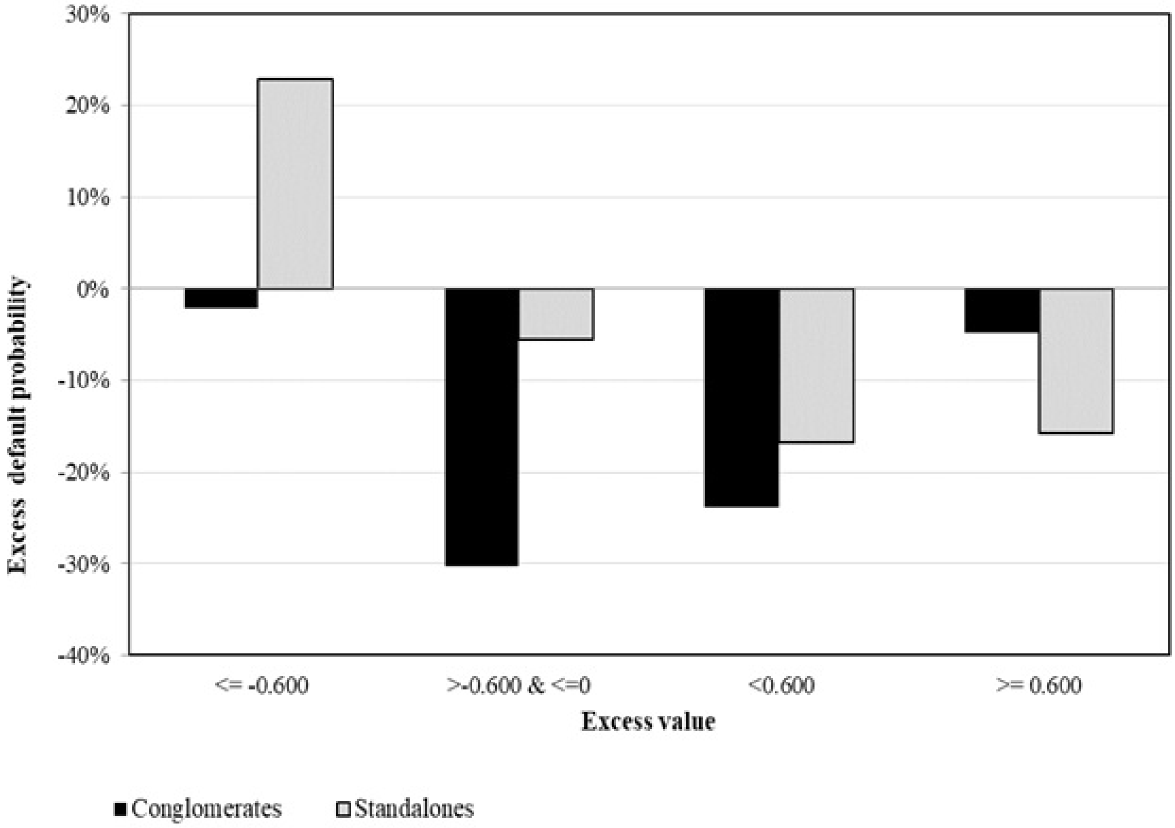
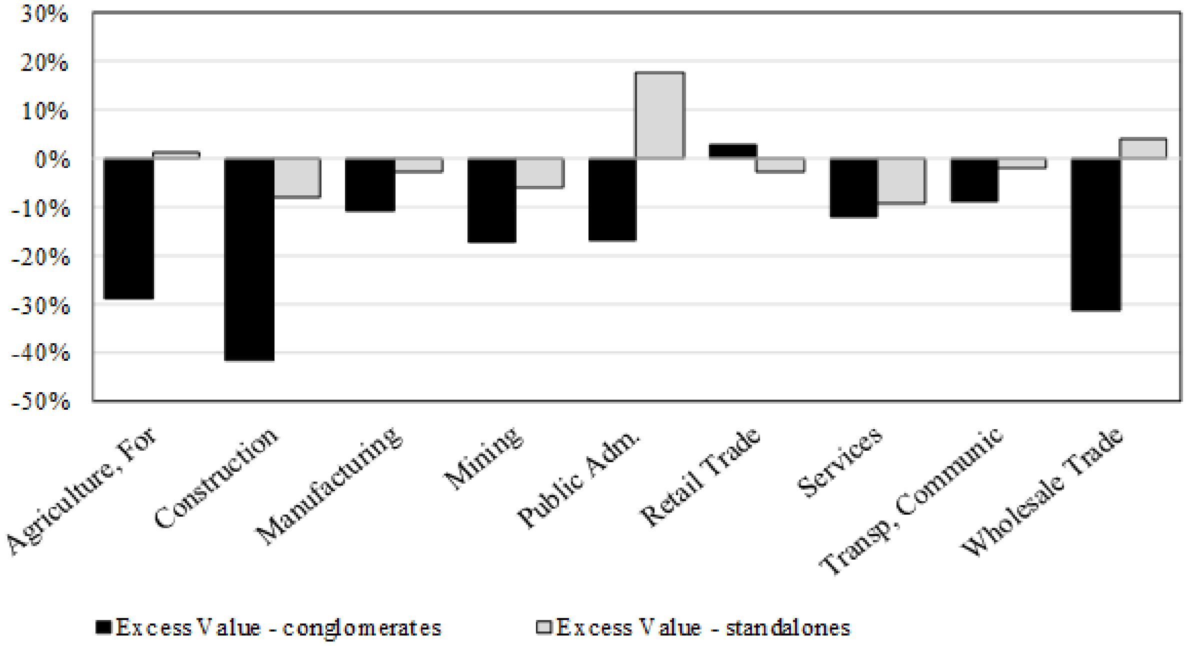


Figure 1: Excess default probability by excess values categories
This figure reports the excess probability of default of conglomerates and standalone firms for different intervals of the excess value. The excess value is the natural logarithm of the ratio between a firm's market value and its imputed value at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median PD-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. For each interval of the computed excess value, we report the value of the excess probability of default, computed as the natural logarithm of the ratio between a firm PD and its imputed PD at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment's most recent annual assets (sales) by the median PD-to-assets multiplier of single-segment firms in the same industry.



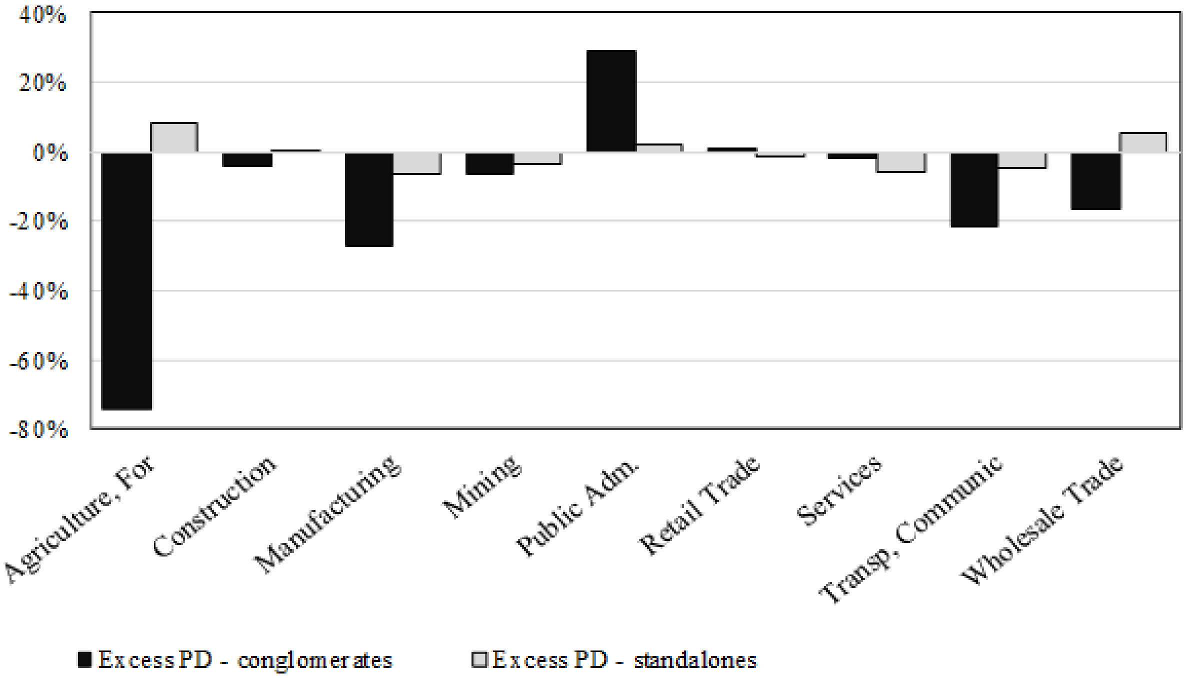
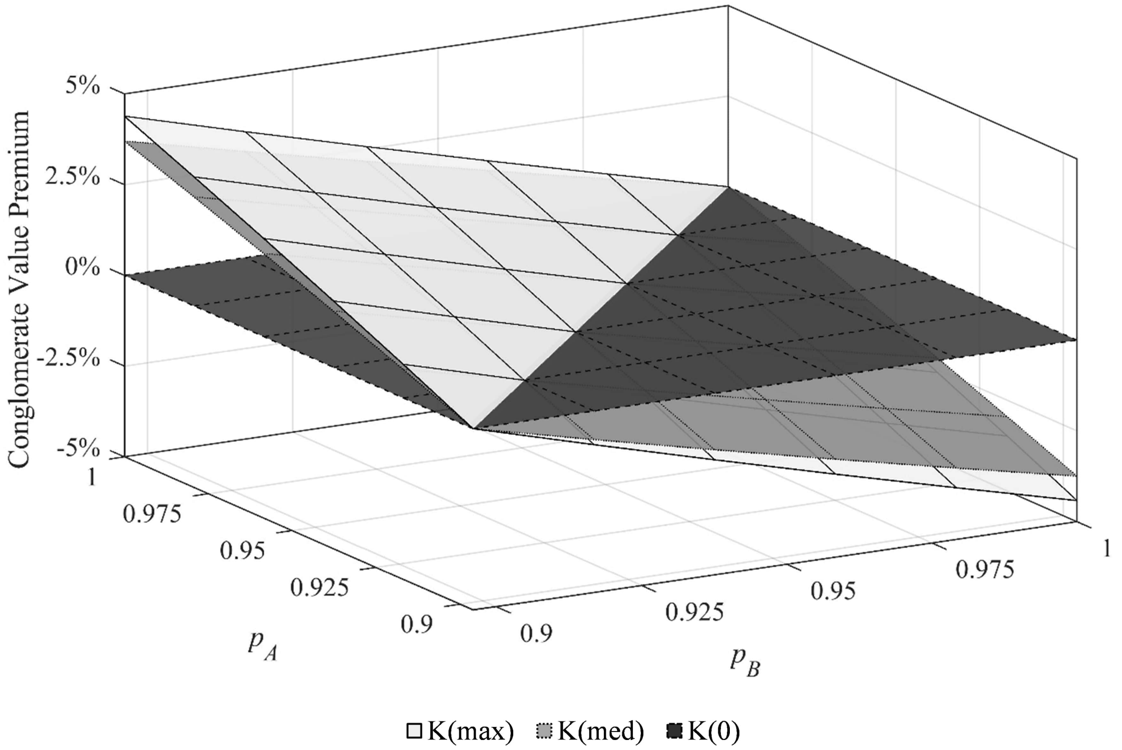


Figure 2: Excess value and excess default probabilities by industry
This figure reports the excess value (Upper Panel)and the excess probability of default (Lower Panel) for conglomerates and standalone firms across industries. The excess value is the natural logarithm of the ratio between a firms' market value and its imputed value at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segments' most recent annual assets (sales) by the median market-to-assets multiplier of single-segment firms in the same industry. The industry matching uses the narrower SIC including at least five single-segment firms. For each interval of the excess value, we report the value of the excess probability of default, computed as the natural logarithm of the ratio between a firm PD and its imputed PD at the end of the year. The imputed value is the sum of its segments' imputed values, obtained by multiplying the segment' most recent annual assets (sales) by the median PD-to-assets multiplier of single-segment firms in the same industry.



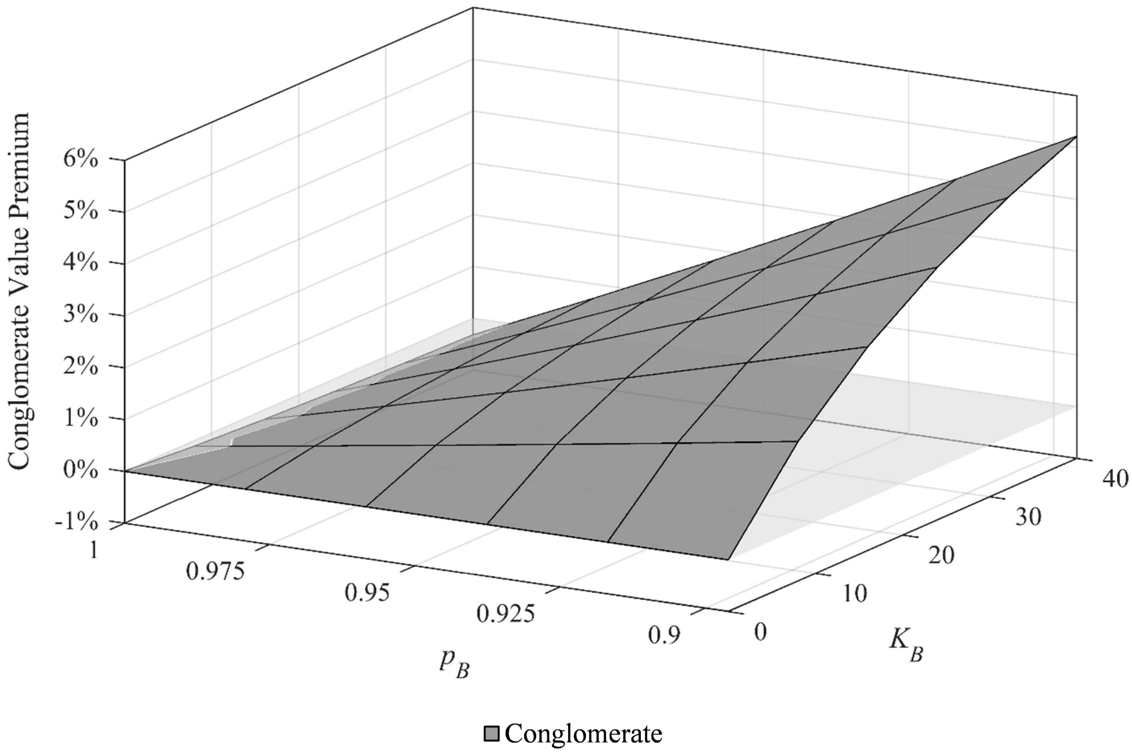


Figure 3: Sensitivity of the Conglomerate Premium

Both panels show the range of variation in the conglomerate value premium in Equation (**??**), standardized by the value of two standalone counterparts. The upper panel allows for different values of p_A and p_B and three different levels of bankruptcy costs for unit B (K_0, K_{med} and K_{max}). The bottom panel fixes p_A at its median value, allowing for different values of p_B and K_B.