The Survival Discount and the Contagion Premium

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In our model, companies with lower survival rates display an ex-post premium relative to those with higher survival rates, due to missing defaulted companies. Thus, one can estimate the survivorship bias by comparing company types with different survival rates, like conglomerates and focused firms. We find that the conglomerate discount drops from 12.3% to 2.4% as survival probability falls. Moreover, lower-survival conglomerates display a 15% contagion premium. These patterns are absent at the time of conglomerate formation, when there is no survivorship bias. We conclude that stock prices do not reflect the ex-ante expected value of companies with heterogeneous mortality.

Keywords: survivorship bias, default, coinsurance, contagion, conglomerate discount

JEL Classifications: G1, G14, G3

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In our model, companies with lower survival rates display an *ex-post* premium relative to those with higher survival rates, due to missing defaulted companies. Thus, one can estimate the survivorship bias by comparing company types with different survival rates, like conglomerates and focused firms. We find that the conglomerate discount drops from 12.3% to 2.4% as survival probability falls. Moreover, lower-survival conglomerates display a 15% contagion premium. These patterns are absent at the time of conglomerate formation, when there is no survivorship bias. We conclude that stock prices do not reflect the *ex-ante* expected value of companies with heterogeneous mortality.

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1 Introduction

Since the early work of Banz and Breen (1986), the survivorship bias in equity markets has been subject to scrutiny.[1] This bias originates from the exclusion of delisted companies from equity databases, together with the absence of balance sheet and price data for companies after they cease to exist.[2] Average stock prices, while reflecting the value of survivors, provide distorted information on the *ex-ante* expected value of companies unless the bias is negligible. This paper departs from previous studies by exploiting the heterogeneous mortality across companies to infer the size of the survivorship bias after using a model to clarify how incomplete information about defaulted companies affects the stock price-survival relationship.

The first implication of our model is that the average price of survivors will exceed the *ex-ante* values of all companies, both extant and defunct, in proportion to their bankruptcy probability because the worst-performing companies have gone out of business. This finding is consistent with Banz and Breen's (1986) study of the effect of the survivorship bias on stock returns. By comparing a database containing all companies to a restricted database excluding defunct ones, they find that businesses in the former database display higher average *ex-post* returns than those in the latter. The first implication of our model is also consistent with Brown, Goetzmann, and Ross (1995), who observe that there is a spurious relationship between observed equity returns and total risk of surviving securities.

The second implication of our model is that higher-survival company types will display an average *ex-post* discount relative to lower-survival types even if they are otherwise similar. We exploit this implication to measure the size of the *ex-post* selection bias in the data for three reasons. First, this prediction runs counter to the economically plausible prediction that higher-survival companies display at least the same *ex-ante* expected value as lower-survival ones (Leland, 2007; Banal-Estanol, Ottaviani and Winton, 2013). Therefore, finding a survival discount (or, equivalently, a contagion premium) in the data would indicate a measurement problem. Second, this approach to assessing the survivorship bias does not require a comparison between the observed market price and an *ex-ante*, unobserved expected value (as in Brown et

[1] Among others, Brown, Goetzmann, and Ross (1995) and Samuelson (1997) believe it may explain the equity premium puzzle, while Li and Xu (2002) contend that it is small.

[2] In the CRSP database of publicly listed companies, both de-listings and decade returns of -100% are frequent from 1926 to 2016. The median time that a common stock stays listed is seven and a half years (Bessembinder, 2018).

al. [1995] and Li and Xu [2002]). It instead relies on comparing the average prices of two sets of companies, controlling for their disparate characteristics besides survival probability. Third, this investigation will reveal whether differences in market prices across company types with different survival probabilities convey information about firms' *ex-ante* expected value differences, as is usually assumed in cross-sectional studies of asset returns.

Our empirical analysis compares diversified conglomerates to focused firms, because of their heterogeneous survival probabilities. Diversified conglomerates are better equipped to survive to industry crises relative to their focused counterparts (Dimitrov and Tice, 2006; Gopalan and Xie, 2011; Kuppuswamy and Villallonga, 2015; Santioni, Schiantarelli and Strahan, 2020). Consequently, we can borrow the empirical specifications of company differences, beyond survival probability, from the vast literature concerning the *ex-ante* diversification discount.

To isolate the *ex-post* survival discount, we use three methods. First, we study the co-variation of the survival probability, based on the survival models of Campbell, Hilscher, and Szilagyi (2008), with the discount measured in the early conglomerate discount literature. We then re-examine it for the *ex-ante* discount, for newly-formed conglomerates, following Graham, Lemmon, and Wolf (2002) and Villalonga (2004b). Finally, we rely on the method of Banz and Breen (1986) to examine whether the conglomerate discount widens as more defaulted companies are excluded from the sample.

We begin by investigating the existence of a coinsurance-contagion trade-off in our sample, as suggested by economic theories of conglomerate mergers. On the one hand, diversification allows for coinsurance between operating units that are exposed to different industry shocks (as in Boot and Schmeits [2000] and Lewellen [1971]). On the other hand, unprofitable units may drag profitable ones into bankruptcy (as in Banal-Estanol et al. [2013] and Leland [2007]). Our estimates of the default probabilities of US Compustat non-financial companies confirm that coinsurance dominates on average (in line with Borghesi, Houston, and Naranjo [2007]), since conglomerates have an 8% lower probability of default compared to focused companies. We then construct a conglomerate "excess default probability" measure in line with the "excess value" measure used in the early conglomerate discount literature. Although its mean value is negative (-0.014), the value for the upper quartile turns positive. This indicates that contagion dominates over coinsurance in 25% of our sample, thereby documenting the existence of the coinsurance-contagion trade-off for the first time.

Turning to our main experiments, we investigate whether the differential survival rates explain the variation in the conglomerate discount and the sign of this covariation, finding that low-survival conglomerates trade at a 15% premium compared to low-survival focused firms. Furthermore, we find that the conglomerate discount is much lower (2.4% and not statistically different from zero) for companies that are closest to distress than for companies belonging to the top decile of survival probability (12.3%) after accounting for the firms' observable characteristics. These patterns are consistent with the presence of a sizeable survivorship bias.

This conclusion survives the following refinements. First, the implications of our model of conglomerate mergers should carry over to models with endogenous leverage (e.g., Leland [2007] and Luciano and Nicodano [2014]) conditional on the level of debt, since coinsurance increases survival at any debt level. We therefore analyze the cross-section of company leverage, finding that the conglomerate discount is equal to 8.6% (14.2%) when companies belong to the top (bottom) leverage decile. Second, our results are robust to the alternative measures of diversification. Finally, we exacerbate the bias by eliminating all companies that became defunct during the sample period, following the experiment of Banz and Breen (1986).[3] In this case, consistent with the survivorship bias insight, the conglomerate discount increases.

Finally, we examine the discount on newly-formed conglomerates at the time of their formation, which is a proxy for the *ex-ante* conglomerate discount. We find that companies do not gain (or lose) value on average upon switching from focused to diversified. However, the value of high-survival companies that switch does increase, even if the change is not statistically different from zero. Moreover, all high-survival firms display higher excess value relative to low-survival ones. These patterns broadly align with the implications of our model for *ex-ante* valuation that summarize those of Leland (2007) and Banal-Estanol, Ottaviani, and Winton (2013). Since *ex-ante* there is no conglomerate premium or discount, we ascribe the whole size of the *ex-post* ones to a survivorship bias. These results indicate that *ex-post* differences in market prices across company types with different mortality rates do not convey unbiased information about the *ex-ante* expected value differences because of missing (data on) defaulted companies.

The rest of the paper proceeds as follows. Section 1.1 reviews closely related literature.

[3] Other papers that use the subsample of survivors to study the *ex-post* selection problem include Rohleder, Scholz, and Wilkens (2010), Carhart (2002), and Wermers (1997).

Sections 2 determines company borrowing costs and expected values at the *ex-ante* stage of firm creation, when all companies are alive. Section 3 computes the average price of surviving companies. Section 4 contains the empirical investigation of the survival discount and the contagion premium in the data. Conclusions follow. All proofs are in Appendix A, while Appendix A.2 provides details on variables included in the empirical analysis.

1.1 Related Literature

In our paper, the cross sectional correlation between the observed conglomerate discounts and survival probability is a manifestation of the survivorship bias. Thus, this paper provides a rationale for the *ex-post* conglomerate discount. On the contrary, prior research on the price differentials between conglomerates and focused firms highlights operational or financial aspects affecting the *ex-ante* value of diversified conglomerate mergers. These include reasons relating to the internal capital market (Almeida, Park, Subrahmanhyam, and Wolfenzon, 2011; Inderst and Müller, 2003; Rajan, Servaes and Zingales, 2000; Stein, 2002) and employees' incentives (Fulghieri and Sevilir, 2011), productivity (Schoar, 2002), profit uncertainty and discounting (Hund, Monk, and Tice, 2010), the measurement of the discount (Custodio, 2014; Mansi and Reeb, 2002), the acquisition of already disconted focused firms (Gomes and Livdan, 2004), among others. Our finding of no *ex-ante* discount or premium on newly-formed conglomerates is broadly in line with the assessment of Maksimovic and Phillips (2013). It suggests that the entire *ex-post* variation in conglomerate discounts stems from a survivorship bias.

The reader may wonder why we study conglomerates on Compustat when the *ex-ante* conglomerate discount turns positive in other databases, thereby suggesting a positive value of diversification (Villalonga, 2004a). We focus on Compustat for two related reasons. First, we are interested in distortions that derive from the survivorship bias rather than in the value of diversification per se. In this respect, our investigation of the cross-sectional variation in the discount shows that the survivorship bias leads to underestimating the *ex-ante* value of survival-enhancing diversification and overestimating the *ex-ante* value of default-enhancing diversification. Second, we wish to highlight that such distortions apply to the most widely used data in empirical finance. Since it stems from missing (data for) now-defunct companies, the survivorship bias will similarly affect other databases.

Last but not least, Linnainmaa (2013) contends that there is a (reverse) survivorship bias in mutual fund data impeding the recovery of the true alphas. If some mutual funds disappear due to negative idiosyncratic shocks, funds' estimated alphas understate their true alphas. He shows that the probability a mutual fund disappears decreases significantly as the fund's alpha estimate increases. In a similar vein, this paper exploits the correlation between default probability and discounts to argue that stock prices depart from the *ex-ante* expected value of companies due to a survivorship bias.

2 The Model

The model compares diversified companies that combine operating units to a combination of focused companies running only one operating unit. Diversification affects survival by permitting coinsurance across units but may result in contagion. To focus on survival, we will rule out other differences such as a unit's profitability, debt needs, and bankruptcy costs across diversified companies and their focused counterparts, in line with the literature on mergers motivated by purely financial synergies.

The next two sub-sections focus on pricing at the *ex-ante* stage of company creation, when all companies are alive. They describe the coinsurance-contagion trade-offs and the associated credit spreads that determine the value of each organization. Proposition 1 shows that the *ex-ante* unconditional expected value of diversified and focused companies coincides unless there are bankruptcy costs. This result reflects the literature on mergers motivated by purely financial synergies (Banal et al, 2013; Leland, 2007). Since there is no friction and all companies are alive at the stage of firm creation, average stock price will coincide with expected value.

2.1 Organizational Structures and Cash Flows

Each unit, indexed by $i = (A, B)$, raises an amount of debt D_i to invest in a project at the stage of company creation ($t = 0$). Competitive lenders earn a credit spread R_i, which is determined at $t = 0$ together with the *ex-ante* expected value. The operating profit of each unit is realized in $t = 1$ and is independently distributed across units. It will be High $\{H\}$ and equal to $X_i > 0$ with a probability of $p_i \in (0, 1)$, and it will be Low $\{L\}$ and equal to zero with a probability of $(1 - p_i)$. Our choice of values implies that each unit generates insufficient operating profits in state L to honor its own debt obligations. Later, lenders observe a private and perfect signal of future cash flows and may decide to declare bankruptcy. When a company defaults, its future profit conditional on survival, $K_i \geq 0$, is lost. Moreover, the prices of defaulted companies do not get recorded in databases while those of surviving companies do. It is thus possible to compute the average prices of survivors, before cash-flows are realized.

Entrepreneurs may choose to run focused companies, each containing one unit only. Their survival probability is equal to $p_i^{Sur} = p_i$, since each is independently liable to its own lenders. However, it is also possible to combine two units in a diversified conglomerate (C). Since the two units belong to the same company, they are jointly liable *vis-à-vis* lenders. Each profitable unit may therefore be able to help the insolvent one, or *vice versa* the latter may drag the former into bankruptcy. To represent this coinsurance-contagion trade-off, 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). We let the profit of unit A, in state $\{HL\}$, exceed the combined debt repayment of the two units, whereas the profit of unit B is lower than the combined service of debt. [4] Thus, a conglomerate will default when a lender's signal is either $\{LL\}$ or $\{LH\}$, the latter being a contagion state because A's losses drag B into bankruptcy. The conglomerate will survive when the signal is either $\{HH\}$ or $\{HL\}$, the latter being a coinsurance state because profits from A rescue B. The resulting survival probability of conglomerates, p_C^{Sur}, is equal to p_A because the conglomerate survives if and only if unit A survives. [5]

2.2 The Credit Spread and *Ex-ante* Expected Values

In this section, we first determine the credit spread charged to each organization. Paradoxically, contagion across units helps reduce the conglomerate credit spread. We then determine the expected value of companies before any default occurs, which will serve as a benchmark to show the effect of the survivorship bias.

Lenders of focused companies, $i = A, B$, receive debt repayment in state $\{H\}$ and collect nothing in state $\{L\}$. It follows that the credit spread for unit i, R_i, satisfying the lenders' zero

[4] We will assess that payoffs satisfy this restriction once credit spreads are determined.

[5] 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).

expected profit condition, $(1-p_i)\times 0 + p_i R_i = D_i$, is equal to:

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

In turn, the credit spread 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 spread 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 a probability of $p_A p_B$, or unit A is profitable but B is not, with a probability of $p_A(1-p_B)$. Moreover, they recover profit, X_B, upon the conglomerate default when there is contagion, with a probability of $p_B(1-p_A)$.

The Lemma in the Appendix states the ranking of credit spreads across organizational structures while making explicit the cash flow restrictions that support our state space and the derivations of Equations (1)-(3). It shows that:

$$R_C < R_A + R_B\,, \tag{3}$$

Conglomerates thus always enjoy better credit conditions than focused companies. This is due in part to coinsurance, which reduces the chances of default, but also to contagion, which delivers a higher recovery upon default to lenders.

Let us now turn to company *ex-ante* value. The proposition below, where F denotes the sum of two focused units while $\pi_i = p_i X_i - D_i$ for i=A,B denotes the expected profit after the service of debt, summarizes known results in the literature:

Proposition 1: *Assume costly bankruptcy ($K_i > 0$). Then, before any default occurs:*
a. Expected value, V_i, increases in survival probability and is equal to:

$$V_F = \pi_A + \pi_B + p_A^{Sur} K_A + p_B^{Sur} K_B \tag{4}$$

$$V_C = \pi_A + \pi_B + p_C^{Sur}(K_A + K_B) \quad (5)$$

for two focused companies and a conglomerate, respectively;

b. The conglomerate expected excess value relative to focused companies is positive if, and only if, the coinsurance probability exceeds the probability of contagion.

The expected value of all firm types increases in survival probability in part (a) of the proposition because higher survival probability saves on bankruptcy costs, K_i. Part (b) indicates that there is an expected conglomerate premium only if conglomerates survive more often than focused firms. This result reflects previous insight from Banal-Estanol et al. (2013), without tax-distortions, and Leland (2007), with tax distortions, in setups like ours that emphasize financial synergies.

Although such *ex-ante* discounts are not the focus of our paper, the empirical section will investigate these implications in an experiment focusing on newly-formed conglomerates. In this experiment, we will examine whether all high-survival firms (both newly-formed conglomerates and focused ones) display higher excess value relative to low survival ones. We will also examine whether the newly-formed conglomerates change their value relative to companies that remain focused, in order to detect price differentials induced by reasons other than the survivorship bias, including those suggested in previous studies of the *ex-ante* conglomerate discount.[6] Our resultswill reject the existence of an *ex-ante* discount or premium of conglomerate firms.

3 The Average Price of Surviving Companies

This section presents the main insight of our model, which draws on the average market prices after some companies have defaulted ("*ex-post*") and their current prices no longer exist.

We find that, due to past defaults, the average market price of surviving companies exceeds the *ex-ante* company value in direct proportion to their bankruptcy probability. This result provides the conceptual backing for the empirical observation in Banz and Breen (1981), who show the presence of a survivorship bias due to incomplete reporting of defaulted companies by databases. They compare the returns on two samples of equity data and find that the sample

[6]See Maksimovic and Phillips (2013) for a recent survey.

reporting information on the wider set of companies has higher returns, on average, than a restricted sample that excludes from the beginning all companies that defaulted later on. Our model does not however assume incomplete reporting by databases. The survivorship bias more generally arises from currently missing (market prices of) defaulted companies. A fortiori, it arises when databases additionally cancel currently available prices of defaulted companies.

3.1 Survival and Contagion Biases

Our first finding is that, due to a survivorship bias, there is a wedge between the average price of survivors and the *ex-ante* expected value of all companies. Moreover, such a wedge, which does not depend on the existence of bankruptcy costs, increases together with bankruptcy probability.

Proposition 2: *Assume some defaults have occurred. If so, the average market value of type i-survivors, MV_i, exceeds the ex-ante expected value of companies of that type, V_i for all i*

$$V_F = MV_A \times p_A^{Sur} + MV_B \times p_B^{Sur}\,, \tag{6}$$

$$V_C = MV_C \times p_C^{Sur}\,. \tag{7}$$

Proposition 2 implies that higher survival probability for a given company type results in relatively lower average market prices than the prices of a lower survival type. In other words, the correlation between the average price and survival probability is opposite to the one between *ex-ante* value and survival probability (see also Equation (A.11) and Equation (A.10)). The economic reason is that the prices of high-survival companies are available also after downturns, when they are lower, whereas the prices of defaulted companies do not. In statistical terms, the sample truncation in downturns, which eliminate the worst performers, is larger the higher the frequency of defaults.

We now turn to cross-sectional comparisons of the average values of different company types by comparing the average *ex-post* price of surviving conglomerates in Equation (A.11) to that of surviving focused companies in Equation (A.10). The former is lower if

$$(\pi_A + \pi_B)(p_C^{Sur})^{-1} < \pi_A(p_A^{Sur})^{-1} + \pi_B(p_B^{Sur})^{-1}\,, \tag{8}$$

that is, if $p_B^{Sur} < p_C^{Sur}$ or, equivalently, $p_A > p_B$. Thus, a conglomerate survival discount appears when coinsurance more than offsets contagion, or, equivalently, when the survival probability of conglomerates exceeds that of comparable focused companies. When the converse is true, a conglomerate contagion premium appears in the data.

This result appears in the first part of the following:

Proposition 3: *Assume some defaults have occurred. Then:*

a. There is a conglomerate discount if, and only if, coinsurance probability exceeds contagion probability:

$$MV_C - MV_F = \pi_A[(p_C^{Sur})^{-1} - (p_A^{Sur})^{-1}] + \pi_B[(p_C^{Sur})^{-1} - (p_B^{Sur})^{-1}] < 0\,. \tag{9}$$

b. With positive bankruptcy costs, the larger the ex-ante diversification premium is, the larger the diversification discount will be.

Proposition 3.a implies a positive correlation between the survival discount, generated by the survivorship bias, and the conglomerate excess survival probability. This is the opposite of the correlation implied by proposition 1 for the *ex-ante* conglomerate excess value. This opposite pattern will help us to identify the survival discount generated by the survivorship bias. Proposition 3.a also implies that cross-sectional differences in prices (or returns) do not reveal cross-sectional differences in *ex-ante* expected values (or returns), unless differential survival probability is accounted for. This result applies to conglomerates and focused companies in this model, but it clearly carries over to any pair of equity portfolios with potentially heterogenous mortality, such as parent companies and their subsidiaries.

3.2 From the Model to the Data

In our model, markets are perfect and the survival discount derives from inherent data limitations. Indeed, prices reflect survivors' values, but there are no prices for companies that defaulted. To deliver this insight straightforwardly, we have relied on simplifying assumptions concerning the determination of *ex-ante* values.

This section relaxes some of these assumptions before turning to the data. Two of them leave the implications of our model essentially unaltered. First, the level of debt is exogenous in our model while, in general, debt and bankruptcy costs respond to both coinsurance and contagion (as in Leland [2007] and Nicodano and Regis [2019]) in nonlinear ways. Insights into differential survival rates between organizations, and therefore into discounts, will carry over to these settings conditional on debt levels. Second, in the model, coinsurance takes the form of a transfer from A to B only. It is easy to add a state of nature where unit A supports B, as in Boot and Schmeits (2000) and Luciano and Nicodano (2014). Appendix A.1.1 provides such an extension, displaying the necessary variations in the definitions of survival probabilities and cash flow restrictions.

Below, we will discuss another generalization, allowing for the case where diversification reduces managers' efforts. This will shed light on the complex relationship between the *ex-ante* discount and the survival discount. In the simplest model from previous sections, without agency and bankruptcy costs, there is no *ex-ante* discount or premium, but agents observe an *ex-post* discount if coinsurance exceeds contagion probability. In the baseline model, which adds bankruptcy costs, the *ex-ante* premium is the mirror image of the *ex-post* discount (see Proposition 3.b). Below, we will see that, with managerial moral hazard affecting success probability but without bankruptcy costs, the larger is the *ex-ante* conglomerate discount the smaller the *ex-post* discount will be.

3.2.1 Managerial Incentives, *Ex-ante* and *Ex-post* Discounts

The previous sections show that, compared to focused companies, diversified companies suffer from an *ex-post* discount because of their superior survival skills, while *ex ante* there is neither a premium nor a discount if bankruptcy costs are equal to zero. These results were obtained in a setting where coinsurance and contagion do not distort managerial incentives. When diversification distorts incentives, diversified companies may display an *ex ante* discount relative to focused ones. An Appendix, available upon request, makes this intuitive notion concrete, allowing the probability of success for unit A to be endogenous and non-contractible. We assume that managerial effort increases the success probability of unit A and that lenders try to detect it through monitoring. As in Boot and Schmeits (2000), coinsurance reduces incentives to exert effort because the manager of unit A does not fully internalize the positive consequences of his or her effort on unit B. Our model for conglomerates reinforces this insight because unit A may also contaminate unit B while enjoying lower funding costs. These agency costs diminish both the *ex-ante* expected value of conglomerates as well as the survival discount. This case highlights the complex relationship between the *ex-ante* and the *ex-post* conglomerate discount. In the current extension of the model without bankruptcy costs to managerial moral hazard, the *ex-ante* discount is larger while the *ex-post* discount is smaller because moral hazard in conglomerates reduces survival probability. This discussion highlights that the joint investigation of *ex-post* and the *ex-ante* discounts yields useful information.

4 Measurng the Survival Discount and the Contagion Premium

In this section, we measure the size of survivorship in US data, exploiting the previous insights into the relationship between default probabilities and survival discounts. We rely on methods from three strands of empirical literature: research on the survivorship bias, on default risk and on the conglomerate discount. In the next section, we outline two ingredients of our method; we then present the sample and detail the variable construction before implementing the method.

4.1 Empirical Strategy

Our measure of default probability (PD) for each firm-year is based on the following hazard rate model:

$$P_{t-1}(Y_{i,t} = 1) = [1 + exp(-a - bx_{i,t-1})]^{-1} \tag{10}$$

where Y_{it} is an indicator variable equal to one when the company goes bankrupt at time t. The vector x includes the predictive variables from Campbell et al. (2008), who elaborate on previous work on survival probability by Shumway (2001) and Chava and Jarrow (2004). We also estimate an additional specification of the survival model that includes the "conglomerate dummy", which is an indicator variable that is equal to one if the company engages in industry diversification. This allows us to determine whether conglomerates' survival probability exceeds that of focused companies, which is a necessary condition for conglomerates to trade at an average *ex-post* discount according to our model of the survivorship bias. As in Campbell et al.

(2008), we experiment with two different dependent variables, a narrower one (default) and a broader one (failure), as alternative indicators of financial distress. Default events include cases filed under both Chapter 7 and Chapter 11 while failure events also include default on a bond. The next section reports the details of the variables' construction.

Next, we correlate the conglomerate discount and the survival probability. More precisely, we run a quantile regression relating the excess market value of conglomerates, within each survival probability quantile, to a conglomerate dummy along with other controls. We expect the conglomerate discount to be higher in quantiles that include companies with higher survival probability. Since differential survival probabilities may derive from company characteristics other than diversification, the percentile regression of the conglomerate discount also controls for several covariates (as in Villalonga [2004b] and many others), using the following regression model:

$$ExcessValue_{i,t} = \alpha + \beta Conglomerate_{it} + \Gamma X_{i,t-1} + \varepsilon_t \,, \tag{11}$$

where $X_{i,t-1}$ is a vector of controls including company characteristics and year fixed effects. The coefficient of the conglomerate dummy measures the benchmark discount of conglomerate companies.

4.2 Data and Sample

Our sample combines several data sources from the years 1980-2014. Firstly, we retrieve information on multi-segment companies from Compustat-Historical Segments. Previous studies associate each segment with a similar independent company in the same industry to compute the discount of conglomerate companies relative to the focused companies. We follow a similar approach, applying the sample selection as in Lamont and Polk (2001) and Berger and Ofek (1995). We drop firms that have segments in financial (SIC 6000-6999) and utilities (SIC 4900-4999) services, firms with total sales below $20 million, and firms with aggregated firm segments sales above 1% of total firm sales in Compustat. We also drop segments with missing sales and SIC codes; firms operating in other non-economic activities, such as membership organizations (SIC 8600), private households (SIC 8800), or unclassified services (SIC 8900); and all segments that do not have at least five similar single-unit companies in the same industry.[7]

Finally, following Berger and Ofek (1995), we compute the excess value of conglomerate and focused companies as the natural logarithm of the ratio between a company's market value and its imputed value, which we define in the next subsection. After those modifications, we have a total of 87,427 firm-year observations (for a total of 11,438 companies) from 1980 to 2014, of which 26,484 (30%) are observations from multi-segment companies.

To estimate the survival probability, we retrieve information on company bankruptcy from three sources. The first is the Compustat North America database, which indicates if a company was delisted and provides the motivation for the delisting. We keep only those delistings attributed to bankruptcy filings and liquidations. The second source is CRSP, which also provides information about all public companies delisted due to a distress event. We keep delistings for liquidation (code 04), bankruptcy (code 574), and stocks that were delisted when the price fell below an acceptable level or for insufficient capital (codes 552 and 560, respectively). The third source is the UCLA-LoPucki Bankruptcy Research Database (BRD), which reports bankruptcy filings (both Chapter 7 and Chapter 11) in the United States bankruptcy courts of the major public companies since October 1, 1979.[8] After combining those sources, we have 1,519 default events from 1980 to 2014, which represent 1.68% of the total observations and 13.5% of the firms in the sample.

In all our analyses, we use the PDs as computed in Campbell et al. (2008). For robustness, we also retrieve the PDs from the Credit Research Initiative (CRI) of the University of Singapore (RMI-NUS). The CRI probabilities are built on the forward intensity model developed by Duan, Sun, and Wang (2012). This dataset provides the individual companies' PDs for a subsample of 32,258 US public and private companies. We can match 18,651 observations for a total of 4,280 companies in our sample.[9] Finally, we retrieve firm characteristics from Compustat North America dataset. Specifically, we keep all firms that have information available on their size, leverage, EBITDA, sales, and capital expenditures. Appendix A.2 defines the complete set of

[7]We match each segment to a focused company according to four, three, and two-digit SIC codes. We follow this procedure to obtain results that are comparable with prior ones. Such filtering, however, does impact the survival bias, as we are conditioning the measurement of the discount on surviving focused companies.

[8]We are grateful to UCLA-LoPucki for offering us free access to their database. 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 2020 dollars).

[9]Data are available at www.rmicri.org.

variables used in the analysis, along with descriptive statistics (Table A.1).

Table 1 reports the number of active firms, conglomerates, defaults, and failures per year after applying these modifications. It also reports the variation in the number of firms for each year due to mergers, new entries (as in Ramey and Shapiro [1998]), and firms that drop from the sample for unspecified reasons.[10]

Conglomerates represent 30% of active US companies in our sample and 42% of all assets in Compustat. The average yearly number of default events from 1980 to 2014 is 1.6%, consistent with past results (Campbell et al., 2008). 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 therefore exceeds the total number of defaults. Overall, the table shows a noticeable variation in the number of firms entering and exiting the sample.

4.2.1 Variables

Following the conglomerate discount literature (see, among others, Berger and Ofek [1995] and Villalonga [2004b]), our main dependent variable is the firm's excess value of both conglomerates and focused companies, computed as the natural logarithm of the ratio between its market value and its imputed value. The imputed value is the average of the market values of the firms' segment units, the latter being computed by multiplying the segments' sales to the median market-to-sales multiplier of the focused companies in the same industry as the segment unit. We implement industry matching using the narrower SIC, including at least five single-segment companies.

To estimate the effect of conglomeration on the probability of default, we also compute a new dependent variable, the "excess default probability," which captures the difference in default probability between conglomerates and focused companies. We define the excess default probability as the natural logarithm of the ratio between a company's PD and its imputed PD at the end of the year. The imputed PD is set equal to that of the core industry, computed as the asset-weighted median default probability of all focused companies in the same industry,

[10] We identify such variations for robustness checks.The acquisition of a distressed company may not only affect the *ex-ante* expected value of conglomerates (as in Gomes and Livdan [2004] and Graham, Lemmon and Wolf [2002]) but may also increase the survival discount since low-valuation single-segment companies disappear from the database.

according to the SIC code of the segment reporting the highest sales within the firm.

Given the relevance of diversification, we also measure the cash flow correlation across segment units (CFCORR). Following Hann et al. (2013), we first compute the average of the EBITDA/assets ratio for all focused companies for each quarter-year. Second, we compute the industry cash flows as the residuals from a regression of the average industry cash flow of focused firms using the average cash flow of the market and the Fama and French (1993) factors for each year and industry. Next, we estimate pairwise industry correlations using the previous five-year industry cash flows for each year in the sample, and we impute the industry pairwise correlation according to the segment units and the segments' SIC codes. The cross-segment cash flow correlation for firm i in year t with n number of segments is computed as follows:

$$CFCorr_{it(n)} = \sum_{p=1}^{N} \sum_{q=1}^{N} w_{ip(j)} w_{iq(k)} \times Corr_{jk}[t-10, t-1](j,k) \tag{12}$$

where $w_{ip(j)}$ are the weights (sales of the segment over total firm sales) of segment p of firm i operating in industry j, and $Corr\left([t-10, t-1](j,k)\right)$ is the correlation of industry cash flows between industries j and k over the five-year period before year t. A high correlation of segment cash flows is a proxy for lower coinsurance across divisions with focused firms, at the maximum level having a correlation equal to one and zero coinsurance.

4.3 Empirical Analysis

To compute the firm default probability, we first estimate the survival model following Equation (10) on the Compustat sample, and we report the results in Table 2. The model controls for the vector of explanatory variables of Campbell et al. (2008), listed in Table 2 and explained (for brevity) in Appendix A.2. We also estimate a modified version of the model in columns (5) and (6), where we add the conglomerate dummy to the specification to test whether conglomerates have different survival probabilities.

The coefficients of the control variables confirm the findings of Campbell et al. (2008); larger size, higher income, and higher stock returns are associated with lower default probabilities. Conversely, higher leverage and stock volatility are associated with higher default risk. Columns (5)-(6) also show that conglomerates have lower default probabilities compared to focused firms. We compute the economic effect from the probit estimation and find that conglomerates have an 8% lower default probability than focused companies.

From the estimation in column (3), we retrieve the survival odds ratios, and we can compute the probability of default for each company year accordingly. Finally, for each industry (four-, three-, and two-digit SIC codes) in each year, we calculate the asset-weighted industry default probability, and we impute to each firm the corresponding core-industry default probability. Figure 1 portrays the excess PD for different intervals of the excess value of conglomerates and focused companies. On the x-axis, it reports the excess value from -1.386 to 1.386, as in Villalonga (2004b). On the y-axis, it reports the excess default probability of conglomerates and focused companies. This figure indicates that conglomerate firms with a severe value discount (left side of the distribution) have a much lower excess default probability than focused firms, which broadly supports the hypothesis that there is a correlation between firm survival probability and the conglomerate discount.

Table 3, panel A, reports the univariate statistics of the main variables used in the analysis and the differences in company characteristics between conglomerates and focused companies. The t-test differences are estimated with an OLS regression, clustered at the firm level. Panel A uses the full sample, including companies that enter or exit the database after the sample began. Consistent with past findings (Villalonga [2004a]), the table shows that conglomerates' mean value is 6% lower than that of their segments. Interestingly, it also shows that the raw default probability is not statistically different between conglomerates and focused firms if one does not control for firms' observable characteristics as in Equation (10).

According to our theory, conglomerates that suffer from a survival discount have lower PD than their segments because coinsurance exceeds contagion. Consistent with this view, the table shows that conglomerates' mean and median excess PDs from the CRI database are 7% lower than their segments' or 19% lower when looking at the estimated excess default probabilities as in Campbell at al. (2008). [11] This suggests that coinsurance prevails on average over contagion.

In line with past results, conglomerates are larger with greater leverage, and dividend ratios, but have fewer investments and lower sales-to-growth ratios. The average segments cash-flow correlation of conglomerates is 43%, with considerable variation in cash flow correlation, ranging from a minimum of -99% to a maximum of 100%, as shown in Table A.1.

[11] Table A.1 reports that in the upper quartile of the distribution contagion exceeds coinsurance.

Table A.1 also shows that the (unmatched) estimated survival probability has little variability above the 50^{th} percentile. Therefore, we mostly explore the bottom half of the distribution of the survival probability in our percentile regressions where the sample is divided according to 10^{th}, 25^{th}, 50^{th}, and 100^{th} percentiles of companies' survival probability. Table 3, panel B reports the univariate statistics of the main variables used in the analysis according to the 10^{th}, 25^{th}, and 50^{th} percentiles of companies' survival probability and the statistical t-test of average differences between conglomerates and focused firms for each subsample, estimated with an OLS regression clustered at the firm level. Panel B shows that conglomerates with lower survival probabilities trade at a premium in the raw data relative to their focused peers. When survival probabilities increase for both focused and conglomerate firms, the conglomerate premium turns into a discount.

We now turn to the estimation of the benchmark diversification discount, as in Equation (11). Columns (1) and (2) of Table 4 report the results when the excess value is the dependent variable and the vector of company characteristics includes industry (two-digit SIC code) and year-fixed effects. In all specifications, we cluster at the company level.[12] Column (1) shows that the diversification discount is equal to 15% after controlling for company and industry characteristics, confirming traditional findings. Column (2) includes company age among the controls. Consistent with our theory of a survival discount, its negative coefficient indicates that the stock prices of all companies fall as their age increases because older companies survived downturns. At the same time, the benchmark conglomerate discount decreases to 12% since age helps to control for the lower mortality of diversified companies, thereby reducing the survival discount. [13]

Columns (3) and (4) of Table 4 estimate a similar specification for the excess default probability of conglomerates and focused firms, showing that similar control variables explain a considerable share of the variation in the excess PDs. This is consistent with our model that jointly determines the market value and default probability of each organization. Estimates show that conglomerate default probability is, on average, 9.2% lower than the default probability of focused companies in the corresponding core industry, which confirms that, on average, the

[12]We also cluster at the industry level in the robustness tests.

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

coinsurance function of corporate diversification dominates over contagion among conglomerate units.

Thus far, we have demonstrated that conglomerate firms, on average, have lower values and greater survival probabilities than focused companies. We will now investigate a cross-section of company discounts from companies with different survival rates. In particular, we estimate company excess value on four sub-samples divided according to 10^{th}, 25^{th}, 50^{th}, and 100^{th} percentiles of companies' survival probability, as in Equation (11). Therefore, companies in the lowest percentile are those with the highest default probabilities, and, according to our theory, they should also have a lower value discount. Table 5 reports the results of this quantile regression. The diversification discount decreases to 2% when companies are closer to distress in the lower quantile of the survival probability (column [1]) and increases with survival abilities up to 13%.[14] The table also reports the t-test for the difference in the coefficient between columns (1) and (4), which confirms that firms closer to distress have a significantly lower discount compared to firms with better survival probabilities.

To corroborate these results, we run a different model using interaction terms that capture the value discount (premium) of conglomerate firms with high(low) survival probabilities. Table 6 reports the results of this regression, which includes among the controls the variable of high survival (or low survival in column [3]), which is an indicator variable equal to one when the firm survival probability is above the median of the year for our entire sample. In column (4), we report additional controls related to different firm events (mergers, new entries, exits for unspecified reasons) which may confound to our results. The diversification discount increases to 18% (15% plus 3%) when companies have high survival probabilities, while it decreases by 15% for companies closer to distress.

Company leverage is not usually included in the excess value regression. One may argue, however, that company 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 companies. For this reason, we estimate a quantile regression of the company discount where the dependent variable is the excess value and the samples are divided according to 10^{th}, 25^{th}, 50^{th}, and 100^{th} percentiles of

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

company leverage. Table 7 shows that the diversification discount falls to 8% when leverage brings the company closer to distress (column [4]). When companies are more likely to survive due to lower leverage (column [1]), the conglomerate discount increases to 14%.

In summary, the (average and median) survival probability of conglomerates exceeds that of focused companies. Moreover, conglomerates with better survival probabilities than their component segments suffer from higher market discounts, in line with Proposition 3.a.

4.3.1 Is There an *Ex-ante* Conglomerate Discount?

Even if our theory indicates that the conglomerate discount in the previous tables is due to an *ex-post* sample selection bias, we cannot rule out the possibility that this result captures, at least in part, an *ex-ante* effect on conglomerate firm value. In this section, we measure the discount on a sample of newly-established conglomerates whose value is unlikely to be affected by an *ex-post* survivorship bias within a short time span such as one year.

To assess the existence of an *ex-ante* discount driven by higher conglomerate survival, we rely on a method originally devised to address the concern that both conglomerate formation and the *ex-ante* discount are jointly endogenous. This method, used by Lang and Stulz (1994), Graham et al. (2002), Hyland and Diltz (2002), and Villalonga (2004b), applies a longitudinal approach to the conglomerate discount estimation. The idea is that, for the discount to be interpreted as evidence of value destruction, the cross-section evidence of a discount is insufficient, and one needs to look at changes in the diversification status. In their experiments, firms that switch from focused to conglomerate should display an *ex-ante* discount if diversification is expected to decrease value.

We employ this type of experiment to determine whether newly-formed conglomerates with high survival abilities display a discount in the year after their formation, accounting for their propensity to diversify. Such a result would challenge our claim that the conglomerate discount found in the previous table is an *ex-post* discount due to the survivorship bias. We begin the experiment by identifying 381 firms that transitioned from being a focused firm to a conglomerate firm.[15] We also restrict our sample to those firms and to focused firms that never change their status. The subsample includes the 381 diversifying firms with data from one year before until

[15] Villalonga (2004b) finds 150 firms in a sample from 1978–1997.

one year after diversification plus the 30,173 single-segment firm-years with data one year before and after the change.

We first estimate a difference-in-difference propensity score matching, where the treated firms are those that switch from focused to conglomerate, and the control firms are focused firms that never change their status. In doing so, we use two sets of controls: a set of standard controls that includes firms' assets, EBITDA, capex, industry q and lagged industry-adjusted q, and an enhanced set of controls that also includes firm age, R&D intensity, dummies for major exchange, S&P index inclusion, and foreign incorporation. Both models include year effects. We report the estimation of the propensity to diversify in Appendix A.2, Table A.3. Columns (1) and (2) refer to our sample while, in columns (3) and (4), we report the estimates from Villalonga (2004b) for comparison purposes.

The coefficients have a similar magnitude and sign in most cases. Columns (1)-(4) of Table 8 report the difference in difference estimation on the treated firms that start to diversify. Each estimation is performed according to two propensity score models: the reduced model and the enhanced model. To illustrate, column (1) reports the difference-in-difference estimation according to the propensity score reduced model, while column (2) reports the difference-in-difference estimation according to the propensity score enhanced model. In columns (3) and (4), we estimate a triple difference propensity score matching where our interaction variable is "high survival," an indicator variable equal to one if the firm has a survival probability above the median in the year before the change of status from focused to conglomerate. The results confirm that there is no discount associated with high survival conglomerates at the stage of conglomerate formation. In columns (3) and (4), we see that firms becoming conglomerates have the same value in the year after the switch (first row). This also holds true for high-survival conglomerates that have a similar value after (second row) and before (third row) the switch. Consistent with Proposition 1(a), all firms with higher survival probabilities display higher values.

In more detail, the coefficient of "switch status×after" shows that the excess value of focused firms that become conglomerates relative to firms that remain focused does not change after the switch. In turn, the coefficient of "switch status×after×high survival" measures whether the excess value is any higher for firms that switch with a high prior survival probability relative to their focused peers that also have high survival probabilities. The coefficient is positive (0.015-0.035), as we would expect from Proposition 1b, but is not statistically different from zero. The coefficient of "switch status×high survival" also indicates that the excess value for high-survival focused companies that switch is no higher than for low-survival focused companies that do not switch. The coefficient "high survival×after" shows the excess value changes after the event for high-survival firms, in general. This coefficient is negative (-0.02-0.04) and, again, not statistically different from zero. The comparison between switching and non-switching high-survival firms after the event therefore reveals an even larger gain for the former relative to the latter. The coefficient of "high survival" shows a premium of 35% for all high-survival firms (both before/after and switching/not switching), consistent with Proposition 1(a). The coefficient of "treated" indicates the excess value gain from shifting status relative to the value of the control group of focused firms that did not switch. Companies that switched lost some value relative to the value they would have had as focused companies, but the change is not statistically significant.

The above results indicate that the conglomerate discount (contagion premium) found in previous sections is entirely an *ex-post* phenomenon induced by the survivorship bias. Ultimately, they show that the effect of the survivorship bias is large in equity prices, as initially suggested by both Brown, Goetzman, and Ross (1995) and Samuelson (1997).

4.3.2 Robustness Tests

We provide further tests of our baseline results. First, to additionally control for unobserved heterogeneity in firms' characteristics, we run our baseline regression with the addition of firm fixed-effects. Results in Table 9 confirm that the discount of firms close to distress is 2.5% lower than the discount of firms with higher survival abilities. Second, we replicate our quantile regression by replacing the survival probability estimated according to Campbell et al. (2008) with the survival probability found in Duan et al. (2012). The results are in Table 10. For robustness purposes, following the approach of Wermers (1997) and many others,[16] we also conducted end-of-sample conditioning, eliminating from the beginning of the sample all the companies that were delisted during the sample period. If our conjecture is correct, we should

[16] Carhart (2002), Blake and Timmermann (1998), Otten and Bams (2004), and Deaves (2004) also follow this approach.

observe an increase in the conglomerate discount of the reduced sample. The results, reported in columns (1) and (2) of Table 10, confirm that the conglomerate discount is more severe (16%) for companies that survive in the sample for the entire period.

Until now, we have used the conglomerate dummy to capture industry diversification. However, the dummy indicates whether the company operates in more than one segment, whereas diversification is better captured by the number of segments, the number of industries, or the coinsurance degree across segment units. We, therefore, estimate our main regression with those diversification measures, and we drop from the sample fake conglomerate firms, that is, firms operating in the same industry with multiple segments. We identify segment industries at the four-digit SIC level. We compute the coinsurance measure as one minus the segments' cash flow correlation, the latter computed following Equation (12). The results are in Table 11.

In columns (1)-(4), we estimate different specifications on the complete sample while, in columns (5)-(8), we estimate the same specification on the sample of surviving companies. The results confirm a negative correlation between each measure of diversification and the excess value, which deteriorates for firms surviving throughout the overall sample.[17] Finally, our results hold when using different clustering (not reported in the tables), including industry (three-digit SIC codes), industry-year, and firm-year clustering. Overall, the robustness section confirms the existence of a survivorship bias that reduces the excess value of conglomerate firms consistent with Proposition 3a.

5 Conclusion

The insight of this paper is simple. The price and balance sheet data of companies that defaulted are missing. We only see the prices of companies that survived. Thus, the price of survivors - while reflecting the expectations of their own future cash flows - will exceed the expected values of their company type the more so the higher is the type-specific bankruptcy probability. The inference on *ex-ante* expected returns, based on comparing available prices, is valid only if their bankruptcy probability is similar.

This paper shows that the survival discount (and the contagion premium) exists in databases,

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

such as Compustat, that do keep track of past listings of now-defunct companies. *A fortiori*, it applies to databases that forget about such past listings - a problem which was the focus of the pioneering study by Banz and Breen (1986).

Our empirical analysis shows that higher survival probability results in higher discounts, relative to lower survival company types, due a survivorship bias. Thus, it seems that the economic function of diversification, namely enhancing survival, is hard to detect in market prices. The implications of this observation go beyond diversified conglomerates, however, since survival varies by size, industry, book-to-market, country and across business cycles. We leave these extensions 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 company types:

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

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

$$X_B \geq D_B p_B^{-1} \tag{A.2}$$

In state $\{LH\}$, unit B is unable to rescue unit A. Since conglomerate lenders require a lower interest rate than focused 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 need to prove that $R_C < R_A + R_B$, that is:

$$[D_A + D_B - p_B(1-p_A)X_B]p_A^{-1} < D_A p_A^{-1} + D_B p_B^{-1}$$
$$[D_B - p_B(1-p_A)X_B]p_A^{-1} < D_B p_B^{-1}$$
$$[D_B - p_B(1-p_A)X_B]p_B < D_B p_A$$
$$p_B^2(1-p_A)X_B > D_B p_B - D_B p_A$$
$$X_B > D_B(p_B - p_A)[p_B^2(1-p_A)]^{-1} \equiv X_B^* \,.$$

This inequality always holds because X_B, by (Equation (A.2)), exceeds $D_B p_B^{-1}$ which in turn exceeds X_B^*:

$$D_B(p_B - p_A)[p_B^2(1-p_A)]^{-1} < D_B p_B^{-1}$$
$$(p_B - p_A)[p_B(1-p_A)]^{-1} < 1$$
$$p_B - p_A < p_B(1-p_A)$$
$$p_A > p_A p_B \,,$$

since $p_B < 1$ holds by assumption.

Proposition 1: *ex-ante* company 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, focused companies expected profit is equal to:

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

which proves Equation (4) since $p_A^{Sur} = p_A$ and $p_B^{Sur} = p_B$. In turn, conglomerate expected profit is equal to

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

As for part (b) and (c), results derive directly from combinations of Equations (4)-(5). Finally, comparing (A.5) and (A.6) and re-arranging terms we find that conglomerate profits are higher than those of focused companies if the diversification effect prevails on the contagion effect:

$$p_B K_B < p_A K_B\,, \tag{A.7}$$

or $p_A > p_B$, with the conglomerate excess value relative to focused companies equal to

$$V_C - V_F = p_A(1-p_B)K_B - p_B(1-p_A)K_B. \tag{A.8}$$

Proposition 2: *ex-ante* and *ex-post* company values

Formally, to determine the average market price of a surviving company, MV_i, after some firms defaulted ("*ex-post*"), we ask whether the state is high or low.

Let us start with focused units. The probability of state $\{H\}$, when a focused company is alive, is equal to one, because, in other states, it would have gone bankrupt. It follows that the average stock price of a focused company, when it is alive, is equal to the high cash flow realizations net of the debt repayment; that is,

$$MV_i = X_i + K_i - R_i = \pi_i(p_i^{Sur})^{-1} + K_i\,. \tag{A.9}$$

In turn, the combined market value of two focused companies, when both are alive, is equal to

$$MV_F = \pi_A(p_A^{Sur})^{-1} + K_A + \pi_B(p_B^{Sur})^{-1} + K_B\,. \tag{A.10}$$

We similarly determine the *ex-post* average value of a surviving conglomerate. The probability of state $\{HH\}$, when a conglomerate is traded after some firms have defaulted, is lower than one, because the conglomerate may have survived thanks to A's rescue of unit B. This 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. In turn, the probability of state $\{HL\}$, when the conglomerate is alive, (i.e., $Pr(HL)/[Pr(HH) + Pr(HL)]$), is equal to $(1 - p_B)$. Thus, the average market value of a surviving conglomerate is equal to:

$$
\begin{aligned}
MV_C &= p_B(X_A + K_A + X_B + K_B - R_C) + (1 - p_B)(X_A + K_A + K_B - R_C) = \\
&= (\pi_A + \pi_B)(p_C^{Sur})^{-1} + K_A + K_B\,.
\end{aligned}
\tag{A.11}
$$

Appropriately combining Equations (4), and (5), this proves the proposition.

Proposition 3: Survivorship Bias and Survival Discount

To prove part (a), we determine the difference in *ex-post* company values, a magnitude that echoes what is called the "conglomerate excess value" (or "conglomerate discount" when negative) in the empirical conglomerate discount literature.

Subtracting (A.10) from (A.11) delivers the conglomerate excess value relative to focused companies:

$$
\begin{aligned}
MV_C - MV_F &= (\pi_A + \pi_B)(p_C^{Sur})^{-1} + K_A + K_B + \\
&\quad - \pi_A(p_A^{Sur})^{-1} - K_A - \pi_B(p_B^{Sur})^{-1} - K_B = \\
&= \pi_A[(p_C^{Sur})^{-1} - (p_A^{Sur})^{-1}] + \pi_B[(p_C^{Sur})^{-1} - (p_B^{Sur})^{-1}] = \\
&= (p_B X_B - D_B)[p_A^{-1} - p_B^{-1}]\,,
\end{aligned}
\tag{A.12}
$$

since $p_C^{Sur} = p_A^{Sur}$. The first term in parenthesis is positive by assumption, hence the sign of the excess value is negative if and only if $p_A > p_B$. This condition ensures that coinsurance more than offsets contagion in conglomerates, leading to a higher probability of survival in conglomerates than in a combination of focused units.

To prove part (b), we just need to appropriately combine Equations (4), and (5), as follows:

$$V_C - V_F = (p_C^{Sur} - p_B^{Sur})K_B, \tag{A.13}$$

This shows that the *ex-ante* excess value of a conglomerate is an increasing function of its relative survival ability, if bankruptcy costs, K_B, are positive. On the contrary, the *ex-post* excess value of a conglomerate is a decreasing function of its relative survival ability, irrespective of bankruptcy costs (see Equations (A.12). Therefore, the larger the *ex-ante* premium of a company due to survival, the larger its *ex-post* discount due to the survivorship bias will be.

A.1.1 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. focused companies 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 $p_C^{Sur} = (p_A^H + p_B^H - p_A^H p_B^H +$

$p_A^M p_B^M$). Within this framework, the credit spread charged by the lenders, satisfying their zero expected profit condition, is equal to

$$R_i = D_i(p_i^M + p_i^H)^{-1} = D_i(p_i^{Sur})^{-1} \tag{A.14}$$

for a focused,

$$\begin{aligned} R_C &= (D_A + D_B - p_A^M p_B^L X_A^M - p_A^L p_B^M X_B^M)(p_A^H + p_B^H - p_A^H p_B^H + p_A^M p_B^M)^{-1} \\ &= (D_A + D_B - p_A^M p_B^L X_A^M - p_A^L p_B^M X_B^M)(p_C^{Sur})^{-1} \end{aligned} \tag{A.15}$$

for a conglomerate. As before, we can show that the following inequality holds:

$$R_C < R_A + R_B\,. \tag{A.16}$$

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 (4)-(5)), stock price definitions (Equations (A.9)-(A.11)), 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 focused companies 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

CONGLOMERATE is an indicator variable that is equal to one if the company engages in industry diversification.

EXCESS VALUE is computed as the natural logarithm of the ratio between a company's market value and its imputed value. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. The industry matching is done by using the narrower SIC including at least five single-segment companies.

EXCESS DEFAULT PROBABILITY is computed as the natural logarithm of the ratio between a company'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 PD is set equal to the one in the core industry, computed as the asset weighted median default probability of all focused companies, and attributed according to the SIC code of the segment reporting the highest sales within the firm. The industry matching uses the narrower SIC including at least five single-segment companies. For robustness tests, default probabilities are retrieved from the Credit Research Initiative (CRI) of the University of Singapore (RMI-NUS). The CRI probabilities are built on the forward intensity model developed by Duan et al. (2012).

A.2.2 Independent Variables - Multivariate Regressions

AFTER is an indicator variable equal to one for the year following the switch of a firm from focused to diversified.CALC is the ratio of company Current assets (ca) to company Current liabilities (cl).

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

CFCORR is the cross-segment cash flow correlation. We first compute the average of the ebitda/assets (lag) for all focused companies 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 company Earnings before Extraordinary Items to company Total Assets.

HIGH SURVIVAL is an indicator variable equal to one when the firm has a survival probability (1-PD) higher than the sample median of the year.

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

MB (market-to-book) is the ratio between the market value of company 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 company Net Income and company Total Assets.

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

SIZE is the natural logarithm of company total assets.

A.2.3 Independent Variables - Survival Analysis

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

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

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

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

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

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

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

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

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

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

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

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

WC is the company Working Capital over total assets.

Table A.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 UCLA-LoPucki Bankruptcy Research Database, over the years 1980-2014. For each variable, column (1) reports the number of observations (firm-year), columns (2)-(3) the mean and standard deviation, columns (4)-(10) the percentile distribution. Panel A refers to the main variables used in our analysis, 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	87,427	-0.072	0.671	-1.386	-1.386	-0.512	-0.041	0.351	1.137	1.386
Excess PD	87,427	-0.014	0.414	-1.284	-1.284	-0.232	-0.043	0.214	0.712	1.126
Excess PD (CRI)	27,327	-0.048	0.754	-1.399	-1.371	-0.684	0.000	0.577	1.169	1.400
PD (Estimated - Campbell et al. (2008))	87,427	0.051	0.026	0.000	0.009	0.038	0.046	0.058	0.092	0.558
PD (CRI)	27,327	0.008	0.031	0.000	0.000	0.000	0.001	0.005	0.034	0.883
Default (Y/N)	87,427	0.011	0.103	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Failure (Y/N)	87,427	0.011	0.106	0.000	0.000	0.000	0.000	0.000	0.000	1.000
Numb. Segments	26,484	2.873	1.078	2.000	2.000	2.000	3.000	3.000	5.000	10.000
CFCORR	87,427	0.411	0.566	-0.992	-0.891	-0.022	0.511	1.000	1.000	1.000
Panel B: Control Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Size	87,427	5.329	1.586	2.240	2.604	4.128	5.119	6.308	8.298	11.363
Age	87,427	16.912	12.146	0.000	2.000	7.000	13.000	24.000	41.000	64.000
EBITDA	87,427	0.125	0.114	-0.723	-0.259	0.075	0.131	0.188	0.296	0.438
CAPEX	87,427	0.079	0.089	0.000	0.001	0.026	0.052	0.097	0.256	0.661
Sales growth (SG)	87,427	0.152	0.300	-0.631	-0.394	-0.002	0.098	0.238	0.694	2.929
Dividends (Y/N)	87,427	0.010	0.021	0.000	0.000	0.000	0.000	0.013	0.043	0.331
Leverage	87,427	0.203	0.182	0.000	0.000	0.031	0.174	0.325	0.549	0.788
LTAT	87,427	0.467	0.203	0.062	0.089	0.308	0.468	0.614	0.811	0.981
CACL	87,427	2.652	1.863	0.000	0.000	1.506	2.172	3.217	6.341	14.874
NITA	87,427	0.020	0.126	-2.254	-0.469	0.003	0.044	0.080	0.136	0.336
TLTA	87,427	0.443	0.204	0.039	0.073	0.279	0.440	0.592	0.789	0.969
EXRET	87,427	-0.008	0.123	-0.584	-0.358	-0.074	-0.004	0.065	0.185	0.602
NIMTA	87,427	0.006	0.108	-2.144	-0.387	0.002	0.030	0.048	0.081	0.331
TLMTA	87,427	0.356	0.229	0.007	0.024	0.162	0.320	0.520	0.785	0.978
EXRETAVG	87,427	-0.015	0.068	-0.484	-0.212	-0.051	-0.011	0.026	0.088	0.264
SIGMA	87,427	0.049	0.057	0.001	0.001	0.010	0.030	0.066	0.174	0.409
CASHMTA	87,427	0.093	0.113	0.000	0.000	0.017	0.053	0.127	0.320	1.016
Market-to-Book (MB)	87,427	2.523	2.536	0.089	0.307	1.097	1.778	2.982	6.964	33.108
PRICE	87,427	18.819	17.748	0.100	0.650	6.375	13.750	25.640	53.500	239.724

Table A.2: Pairwise Correlation

The table reports the pairwise correlation for the main variables of our analysis. The sample consists of the intersection of the Compustat, CRSP, and the UCLA-LoPucki Bankruptcy Research Database, over the years 1980-2014. The symbols * denote statistical significance at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
PD	-0.3504*													
CRIPD	-0.2185*	0.2693*												
Default	0.0128*	0.1387*	0.0264*											
Failure	-0.0577*	0.0413*	0.0386*	0.008										
Conglomerate	-0.0595*	0.0446*	0.0444*	0.008	0.9672*									
CFCORR	-0.0375*	-0.1469*	-0.0619*	-0.6220*	-0.005	-0.004								
Numseg.	0.020	-0.1849*	-0.012	-0.1056*	0.001	- 0.003	-0.6186*							
Age	-0.0659*	-0.2016*	0.00	-0.2670*	-0.007	-0.004	0.2711*	0.1897*						
Size	0.2490*	-0.3536*	-0.1199*	-0.1660*	-0.0151*	-0.0123*	0.2060*	0.3410*	0.3373*					
Leverage	-0.0372*	0.1034*	0.1494*	-0.0772*	0.0696*	0.0704*	0.0735*	0.0370*	0.0454*	0.1517*				
EBITDA	0.2294*	-0.3285*	-0.1192*	-0.0247*	-0.0581*	-0.0611*	0.006	0.0468*	0.0342*	0.1418*	-0.0779*			
CAPEX	0.1382*	-0.0241*	-0.0311*	0.0542*	-0.0262*	-0.0264*	-0.0788*	-0.019	-0.1731*	0.0485*	0.0721*	0.2476*		
Sales growth	0.1626*	-0.0275*	-0.0417*	0.0785*	-0.0287*	-0.0313*	-0.0811*	-0.0378*	-0.2726*	0.0123*	-0.0255*	0.1958*	0.2889*	
Dividends	0.1252*	-0.1882*	-0.0300*	-0.1124*	-0.0199*	-0.0189*	0.1075*	0.0951*	0.2172*	0.1306*	-0.1036*	0.2406*	-0.0208*	-0.0870*

* p<0.1

Table A.3: Propensity to diversify

This table reports the propensity score estimation on the subsample of firms that change their status from single to multiple segment firms. The dependent variable is the variable "treated", an indicator variable equal to one if the company change status from single to multi-segment firms, zero for focused firms. Columns (1)-(2) report the probit estimates from two different models for the propensity to diversify of the firms in our sample. The sample in columns (1) and (2) includes all the firms that change their status from one to multiple segment with data one year before, and one year after the change of status, plus focused firms, over the years 1980 - 2014. for comparison purposes, in columns (3)-(4) we report the same models estimates from Villalonga (2004b) on a sample period ranging from 1976 to 1997. The model controls for a vector of company and industry characteristics (listed in the table), including year fixed effects. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Model 1 (1)	Model2 (2)	Model 1(V) (3)	Model 2 (V) (4)
Log of assets	0.299***	0.209***	0.132***	0.223***
	(13.316)	(7.599)	(6.640)	(6.370)
EBIT/sales	0.277	0.352	-1.163***	-1.910***
	(1.076)	(1.042)	(-2.630)	(-3.190)
Capex/sales	-1.612***	-1.011**	-0.145	-0.133
	(-3.435)	(-1.989)	(0.680)	(-0.470)
Industry q (t-1)	-0.093***	-0.060	0.079***	0.108***
	(-2.626)	(-1.456)	(2.820)	(3.450)
Industry-adjusted q (t-1)	-0.063*	-0.030	-0.092	0.045
	(-1.854)	(-0.824)	(-1.650)	(0.810)
S&P		0.034		-0.196
		(0.337)		(-1.400)
Major exchange		0.000		-0.070
		(0.098)		(-0.066)
Dividends paid		0.100		-0.283
		(0.747)		(-1.240)
Foreign incorporation		-0.475		0.026
		(-0.224)		(0.280)
RD/assets		-0.130		2.301*
		(-0.195)		(1.800)
Log of age		0.552***		0.003
		(11.262)		(0.030)
Fraction diversified firms in the industry		0.268		1.098***
		(0.869)		(4.120)
Fraction sales of diversified firms in the industry		-0.077		0.44***
		(-0.346)		(2.120)
Year FE	Yes	Yes	Yes	Yes
Pseudo R-squared	0.098	0.128	0.030	0.100
N	27,695	27,695	24,689	22,527

References

Almeida, H., and T. Philippon, 2007, The Risk-Adjusted Cost of Financial Distress, *Journal of Finance* 62(6), 2557-2586.

Banal-Estañol, A., Ottaviani, M., and A. Winton, 2013, The Flip Side of Financial Synergies: Coinsurance versus Risk Contamination, *Review of Financial Studies* 26 (12), 3142-3181.

Banz, R.W., and W.J. Breen, 1986, Sample-Dependent Results Using Accounting and Market Data: Some Evidence, *Journal of Finance* 41(4), 779-793.

Berger, P.G., and E. Ofek, 1995, Diversification's Effect On Firm Value, *Journal of Financial Economics* 37, 39-65.

Bessembinder, H., 2018, Do Stocks Outperform Treasury Bills?, *Journal of Financial Economics* 129, 440-457

Blake, D., and A. Timmermann, 1998, Mutual Fund Performance: Evidence from the UK, *Review of Finance* 2(1), 57–77.

Boot, A.W.A., and A. Schmeits, 2000, Market Discipline and Incentive Problems in Conglomerate companies with Application to Banking, *Journal of Financial Intermediation* 9, 240-273.

Borghesi, R., Houston, J., and A. Naranjo, 2007, Value, Survival, and the Evolution of Firm Organizational Structure, *Financial Management* 36, 5-31.

Brown, S.J., Goetzmann, W.N., and S.A. Ross, 1995, Survival, *Journal of Finance* 50(3), 853-873.

Campbell, J.Y., Hilscher, J., and J. Szilagyi, 2008, In Search of Distress Risk, *Journal of Finance* 63, 2898-2939.

Carhart, M.M., 2002, On Persistence in Mutual Fund Performance *Journal of Finance* 52, 57 - 82.

Chava, S., and R.A. Jarrow, 2004, Bankruptcy Prediction with Industry Effects, *Review of Finance* 8, 537-569. *The Review of Financial Studies*, 23(6), 2523-2559

Custodio, C., 2014, Mergers and acquisitions accounting and the diversification discount, *The Journal of Finance* 69(1), 219-240.

R. Deaves, 2004, Data-conditioning biases, performance, persistence and flows: The case of Canadian equity funds, *Journal of Banking & Finance* 28(3), 673-694.

Dimitrov, V., and S.,Tice, 2006, Corporate Diversification and Credit Constraints: Real Effects across the Business Cycle, *The Review of Financial Studies* 19(4), 1465-1498.

Duan, J-C., J. Sun, and T. Wang, 2012, Multiperiod Corporate Default Prediction: A Forward Intensity Approach, *Journal of Econometrics* 170(1), 191-209.

Fulghieri, P., and M. Sevilir, 2011, Mergers, Spin-Offs and Employee Incentives, *Review of Financial Studies* 24, 2207-2241.

Gomes, J.F., and D. Livdan, 2004, Optimal Diversification: Reconciling Theory and Evidence, *Journal of Finance* 59(2), 507-535.

Graham, J.R., Lemmon M., and J. G. Wolf, 2002, Does Corporate Diversification Destroy Value?, *Journal of Finance* 57, 695-720.

Hann, R.N., Ogneva, M., and O. Ozbas, 2013, Corporate Diversification and the Cost of Capital, *Journal of Finance* 68(5), 1961-1999.

Hund, J., Monk, D., and S. Tice, 2010, Uncertainty about average profitability and the diversification discount, *Journal of Financial Economics* 96, 463-484.

Inderst, R., and H.M. Müller, 2003, Internal versus External Financing: An Optimal Contracting Approach, *The Journal of Finance* 58, 1033-1062.

Johnson, S., Boone, P., Breach, A., and E. Friedman, 2000, Corporate governance in the Asian financial crisis, *Journal of Financial Economics* 58, 141-186.

Kolasinski, A.C., 2009, Subsidiary debt, capital structure and internal capital markets, *Journal of Financial Economics* 94, 327-343.

Leland, H.E., 2007, Purely Financial Synergies and the Optimal Scope of the Firm: Implications for Mergers, Spin-offs and Structured Finance, *Journal of Finance* 62, 765-807.

Lewellen, W.G., 1971, A pure financial rationale for the conglomerate merger, *Journal of Finance* 26, 521-537.

Li, H.,and Y. Xu, 2002, Survival Bias and the Equity Premium Puzzle, *The Journal of Finance*, 57(5), 1981-1995

Linnainmaa, J.T., 2013, Reverse Survivorship Bias, *The Journal of Finance*, 68, 789-813.

Luciano, E., and G. Nicodano, 2014, Guarantees, Leverage, and Taxes, *Review of Financial Studies* 27(9), 2736-2772.

Maksimovic,V., and G. Phillips, 2013, Conglomerate Firms, Internal Capital Markets, and the Theory of the Firm, *Annual Review of Financial Economics*, 5(1), 225-244

Mansi, S.A., and D.M. Reeb, 2002, Corporate Diversification: What Gets Discounted?, *Journal of Finance* 57, 2167-2183.

Matsusaka, J.G., 2001, Corporate Diversification, Value Maximization, and Organizational Capabilities, *Journal of Business* 74, 409-431.

Nicodano, G., and L. Regis, 2019, A Trade-Off Theory of Ownership and Capital Structure, *Journal of Financial Economics*, forthcoming.

Otten, R., and D. Bams, 2004, How to measure mutual fund performance: economic versus statistical relevance, *Accounting and Finance* 44(2), 203-222.

Rajan, R.G., Servaes, H., and L. Zingales, 2000, The Cost of Diversity: The Diversification Discount and Inefficient Investment, *Journal of Finance* 50, 35-80.

Ramey, V., and M. Shapiro, 1998, Capital churning. *Unpublished Working Paper*, University of California, San Diego.

Rohleder, M., Scholz,M., and M. Wilkens, 2010, Survivorship Bias and Mutual Fund Performance: Relevance, Significance, and Methodical Differences, *Review of Finance* 15(2), 441-474.

Santioni, R., Schiantarelli, F., and P.E. Strahan, 2020, Internal Capital Markets In Times Of Crisis: The Benefit of Group Affiliation In Italy, *Review of Finance*, 24(4), 773-811.

Schoar, A., 2002, Effects of Corporate Diversification on Productivity, *The Journal of Finance*, 57, 2379-2403.

Shumway, T., 2001, Forecasting Bankruptcy More Accurately: A Simple Hazard Model, *Journal of Business* 74, 101-124.

Stein, J., 2002, Information Production and Capital Allocation: Decentralized versus Hierarchical companies, *Journal of Finance* 57, 1891-1921.

Villalonga, B., 2004a, Diversification Discount or Premium? New Evidence from the Business Information Tracking Series, *Journal of Finance* 59, 479-506.

Villalonga, B., 2004b, Does Diversification Cause the "Diversification Discount"?, *Financial Management* 33, 5-27.

Wermers, R., 1997, Momentum Investment Strategies of Mutual Funds, Performance Persistence, and Survivorship Bias. Unpublished Working Paper, University of Colorado.

Table 1: Number of companies per year

This table lists the total number of active companies, the number of active conglomerates, defaults, failures, new entries and exits of firms. One observation is at firm-year level. We define default an indicator variable equal to one if the firms defaults in a specific year, while failure is an indicator variable equal to one if the firm defaults or has a D rating on its bonds. We retrieve default information from Compustat North America (delisted, bankruptcy filings and liquidations), CRSP (delisted due to a distress event), and from the UCLA-LoPucki Bankruptcy Research Database (Chapter 7 and Chapter 11). We define new entries as companies with end of period gross capital not bigger than 20% of the end of period net capital during the company's first year in the data set (as in Ramey and Shapiro [1998]). The sample period includes all non-financial and non-utility firms in the US, over the years 1980 - 2014.

Year	Active Firms	Conglomerates	Default	Default (%)	Failures	Entries	Exits
1980	2,093	1,128	24	24	184	0	113
1981	2,129	1,119	21	21	182	120	114
1982	2,168	1,073	22	22	203	176	112
1983	2,255	1,043	23	23	249	289	181
1984	2,388	1,013	31	31	259	422	200
1985	2,391	950	25	25	290	395	194
1986	2,442	897	25	25	270	511	175
1987	2,607	855	33	33	305	675	240
1988	2,572	788	44	44	252	680	212
1989	2,502	749	56	57	469	660	136
1990	2,509	741	52	53	409	711	112
1991	2,594	736	44	46	473	737	95
1992	2,804	768	30	33	561	882	103
1993	3,126	779	27	27	725	1,057	168
1994	3,428	784	48	49	886	1,214	237
1995	3,729	789	47	48	1,044	1,368	239
1996	4,077	786	67	69	1,287	1,478	352
1997	4,128	768	108	109	1,371	1,524	461
1998	3,772	1,187	140	147	1,231	1,360	452
1999	2,979	954	118	120	874	1,164	359
2000	2,740	707	92	99	665	1,128	359
2001	2,438	674	70	76	565	838	214
2002	2,249	612	34	41	547	714	185
2003	2,138	594	18	24	596	702	162
2004	2,147	590	23	26	620	820	195
2005	2,141	596	23	24	650	847	194
2006	2,103	596	34	35	615	893	214
2007	2,106	568	46	49	523	904	207
2008	1,952	546	40	43	431	713	145
2009	1,830	516	29	30	461	619	150
2010	1,844	511	33	35	481	705	148
2011	1,796	527	28	29	529	736	133
2012	1,736	514	25	27	513	722	132
2013	1,731	507	27	30	529	742	117
2014	1,783	519	24	25	512	728	157
Total	87,427	26,484	1,531	1,599	19,761	27,234	6,967

Table 2: Default Probability Estimation

The table reports the estimates of the default probabilities according to the model of Campbell, Hilscher, and Szileghyi (2008), where the dependent variable is an indicator variable equal to one when the company goes bankrupt, or fail, in t, and X a vector of variables listed in the table. Columns (1)-(4) report different versions of the survival model, while in columns (5) and (6) we add the dummy conglomerate to the baseline estimation. The estimates are computed with robust standard errors. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Dep. Var.:	Default	Failure	Default	Failure	Default	Failure
	(1)	(2)	(3)	(4)	(5)	(6)
Conglomerate					-0.302***	-0.298***
					(-4.798)	(-4.859)
NITA	-1.893***	-1.881***				
	(-18.352)	(-18.244)				
NIMTAAVG			-1.639***	-1.621***	-1.638***	-1.619***
			(-13.141)	(-13.176)	(-13.053)	(-13.083)
TLTA	4.289***	4.417***				
	(29.48)	(30.48)				
TLMTA			3.251***	3.410***	3.321***	3.479***
			(27.46)	(28.88)	(27.73)	(29.16)
EXRET	-1.331***	-1.356***				
	(-7.268)	(-7.536)				
EXRETAVG			-3.315***	-3.255***	-3.307***	-3.248***
			(-8.966)	(-8.868)	(-8.958)	(-8.860)
SIGMA	2.937***	2.954***	1.437***	1.451***	1.391***	1.405***
	(8.56)	(8.76)	(4.26)	(4.38)	(4.12)	(4.25)
RSIZE	-0.204***	-0.196***	(0.028)	(0.023)	(0.022)	(0.018)
	(-4.399)	(-4.332)	(-1.083)	(-0.953)	(-0.889)	(-0.751)
CASHMTA			-1.968***	-1.857***	-1.959***	-1.849***
			(-6.836)	(-6.773)	(-6.854)	(-6.790)
MB			0.059***	0.059***	0.058***	0.057***
			(7.90)	(7.85)	(7.69)	(7.65)
PRICE			-0.035***	-0.035***	-0.033***	-0.033***
			(-8.000)	(-8.266)	(-7.704)	(-7.953)
Constant	-6.521***	-6.564***	-5.431***	-5.497***	-5.404***	-5.471***
	(-62.541)	(-62.963)	(-51.946)	(-53.091)	(-51.771)	(-52.922)
N	87,427	87,427	87,427	87,427	87,427	87,427

Table 3: Univariates

The table reports statistics for all variables used in the sample. Panel A reports the statistics for company value, default, and financial characteristics across company type (conglomerates vs. focused companies), and tests for univariate differences. Panel B reports the univariate statistics of the main variables used in the regressions according to 10^{th}, 25^{th}, and 50^{th} percentiles of companies' survival probability, and the statistical t-test of average differences between conglomerates and focused firms for each group. The details of the variables are in Appendix A.2. The sample consists of the intersection of the Compustat, CRSP, and the UCLA- LoPucki Bankruptcy Research Database (BRD) over the years 1980 - 2014. The test difference between conglomerates and focused companies are estimated with an OLS regression, clustered at firm level. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Focused		Conglomerates			
	Mean	Sd	Mean	Sd	Difference	t-stat
Excess value	0.016	0.674	-0.064	0.651	-0.079***	(-7.026)
Excess PD (estimated)	-0.121	1.217	-0.312	1.358	-0.192***	(-8.169)
Excess PD (CRI)	-0.044	0.728	-0.117	0.771	-0.074***	(-4.741)
Default (Y)	0.019	0.136	0.014	0.119	-0.005***	(-3.552)
Mergers (Y)	0.236	0.425	0.204	0.403	-0.032***	(-6.950)
Survival probability	98.30	3.147	98.34	2.895	0.040	(1.09)
New entries	0.353	0.478	0.216	0.412	-0.137***	(-23.225)
CFCORR	1	0	0.430	0.578	-0.570***	(-73.333)
Leverage	0.210	0.196	0.244	0.175	0.034***	(10.84)
Size	5.198	1.625	6.023	1.935	0.826***	(21.00)
Age	12.929	10.832	20.188	13.163	7.259***	(26.35)
EBITDA	0.116	0.130	0.124	0.099	0.008***	(4.79)
Capex	0.073	0.091	0.069	0.072	-0.003***	(-2.820)
Sales Growth (SG)	0.151	0.273	0.112	0.247	-0.038***	(-16.034)
N	60,943		26,484			

Table 3: Univariates - continued

Panel B: Survival skills quintiles	10%			25%			50%		
	Mean	Sd	Diff	Mean	Sd	Diff.	Mean	Sd	Diff.
Excess value	-0.287	0.605	0.020	-0.283	0.600	0.063***	-0.171	0.606	-0.045***
Size	5.191	1.695	0.713***	5.204	1.755	0.573***	5.184	1.666	0.630***
Age	14.617	10.534	4.439***	15.081	11.071	3.596***	15.577	11.423	5.889***
EBITDA	0.034	0.129	0.016***	0.074	0.111	0.021***	0.103	0.113	0.012***
Capex	0.059	0.081	-0.005***	0.067	0.086	-0.004*	0.071	0.086	-0.004**
Sales Growth (SG)	0.049	0.275	-0.011**	0.104	0.269	-0.001	0.130	0.261	-0.024***
Dividend ratio	0.004	0.014	0.003***	0.006	0.017	0.001**	0.009	0.021	0.003***
Leverage	0.431	0.195	0.005	0.341	0.181	-0.004	0.247	0.171	0.020***
N	8,651			13,035			21,851		

Table 4: Excess value and default probability of conglomerate firms

The table reports the results of the estimation of the following equation:

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

where the dependent variable are the excess value and the excess default probability, over the years 1980 - 2014, of conglomerates and focused firms. The excess value is computed as the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC code, for industries including at least five single-segment companies in the year of the analysis. The excess default probability is computed as the natural logarithm of the ratio between a company's PD and its imputed PD at the end of the year. The imputed PD is set equal to the one in the core industry of the firm, identified as the SIC code of the segment reporting the highest sales within the firm. The imputed PD is computed as the asset weighted median default probability of all focused companies in the correspondent industry, attributed by using the narrower SIC code. The variable "conglomerate" is an indicator variable equal to one if the company is multi-segments. The model controls for a vector of company 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.

	Excess value		Excess default prob. (PD)	
	(1)	(2)	(3)	(4)
Conglomerate	-0.155***	-0.123***	-0.092***	-0.080***
	(-13.694)	(-10.579)	(-5.690)	(-4.843)
Age		-0.102***		-0.041***
		(-14.380)		(-4.167)
Leverage		-0.106***	2.418***	2.410***
		(-3.902)	(62.47)	(62.39)
Assets	0.080***	0.094***	-0.233***	-0.228***
	(21.35)	(23.31)	(-37.780)	(-36.805)
CAPEX	0.180***	0.237***	-0.629***	-0.610***
	(3.86)	(5.07)	(-9.492)	(-9.170)
Sales growth	0.404***	0.345***	-0.184***	-0.208***
	(32.51)	(27.69)	(-10.820)	(-12.128)
Dividends	1.392***	1.437***	-2.678***	-2.623***
	(6.33)	(6.36)	(-8.593)	(-8.487)
EBITDA			-1.433***	-1.435***
			(-19.326)	(-19.390)
NITA			-1.257***	-1.244***
			(-23.341)	(-23.161)
CACL			-0.130***	-0.132***
			(-33.047)	(-33.152)
p-value (t-test)	(0.000)	(0.000)	(0.000)	(0.000)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj-R2	0.085	0.097	0.393	0.393
N	87,427	87,427	87,427	87,427

Table 5: Conglomerate discount by survival probability

The table reports the estimates of the following equation:

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

where the dependent variables is the excess value over the within survival probability quintiles, over the years 1980 - 2014. The excess value is computed as the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC including at least five single-segment companies. The variable "conglomerate" is an indicator variable equal to one if the company is multi-segments. The model is performed on four subsamples split according to the 10^{th}, 25^{th}, 50^{th}, and 100^{th} percentiles of companies' survival probability. We define the survival probability as 1 minus one-year-ahead default probability, computed according to the model in Cambpell et al. (2008). The model controls for a vector of company 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 percentiles			
	p(10)	p(25)	p(50)	p(100)
	(1)	(2)	(3)	(4)
Conglomerate	-0.024	-0.047***	-0.070***	-0.123***
	(-1.305)	(-3.137)	(-5.206)	(-7.819)
Age	-0.040***	-0.028***	-0.062***	-0.126***
	(-3.235)	(-3.151)	(-7.644)	(-13.723)
Assets	0.108***	0.067***	0.038***	0.065***
	(17.46)	(13.52)	(8.41)	(11.85)
EBITDA	-0.841***	-1.308***	-1.240***	-0.434***
	(-12.361)	(-18.796)	(-19.891)	(-6.603)
CAPEX	0.154*	0.251***	0.110*	0.187***
	(1.71)	(3.59)	(1.81)	(2.98)
Sales growth	0.023	0.071***	0.163***	0.368***
	(1.00)	(3.59)	(9.07)	(20.78)
Dividends	-0.552	-0.041	0.602*	1.429***
	(-1.165)	(-0.113)	(1.838)	(5.541)
p-value (t-test) column (4)-(1)				0.000
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj-R2	0.320	0.287	0.205	0.094
N	8,683	13,062	21,870	43,871

Table 6: The contagion premium of conglomerate firms

The table reports the results of the estimation of the following equation:

$$y_{i,t} = \alpha + \beta_1\,Conglomerate_{it} + \beta_2\,lowsurvival_{it} + \beta_3\,Conglomerate_{it} \times lowsurvival_{it} + \Gamma X_{i,t-1} + \varepsilon_t\,,$$

where the dependent variable are the excess value of conglomerates and focused firms, over the years 1980 - 2014. The excess value is computed as the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC code, for industries including at least five single-segment companies in the year of the analysis. The variable "conglomerate" is an indicator variable equal to one if the company is multi-segments. The variable "low survival" is an indicator variable equal to one for firms with a survival rate below the median of the year. In column (3), we also control for additional firm events: firms involved in M&A, whether the firm is a new entry firm, or firms that exits the sample for unspecified reasons. The model controls for a vector of company 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	(1)	(2)	(3)
Conglomerate	-0.123***	-0.180***	-0.180***
	(-10.579)	(-2.473)	(-11.987)
Conglomerate× low survival		0.151***	0.152***
		(9.31)	(9.44)
Low survival firm		-0.599***	-0.592***
		(-58.393)	(-58.190)
M&A (Y)			0.019**
			(2.56)
New entry firm			0.067***
			(9.69)
Exit firm			-0.059***
			(-4.828)
Age	-0.102***	-0.094***	-0.081***
	(-14.380)	(-14.704)	(-12.302)
Leverage	-0.106***	0.618***	0.616***
	(-3.902)	(22.41)	(22.40)
Firm controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adj-R2	0.085	0.205	0.208
N	87,427	87,427	87,427

Table 7: Conglomerate survival discount by leverage groups

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 is the excess value, over the years 1980 - 2014, computed within leverage quintiles. The excess value is computed as the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC code, for industries including at least five single-segment companies in the year of the analysis. The variable "conglomerate" is an indicator variable equal to one if the company is multi-segments. The model is performed on four sub-samples split according to the 10^{th}, 25^{th}, 50^{th}, and 100^{th} percentiles of the company leverage. The model controls for a vector of company characteristics (listed in the table), including year and industry fixed effects. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Leverage quintiles			
Dep. Var.: Excess Value	p(10) (1)	p(25) (2)	p(50) (3)	p(100) (4)
Conglomerate	-0.142***	-0.131***	-0.122***	-0.086***
	(-4.440)	(-4.697)	(-6.593)	(-6.590)
Age	-0.149***	-0.179***	-0.094***	-0.066***
	(-7.673)	(-10.659)	(-7.838)	(-8.518)
Assets	0.159***	0.111***	0.084***	0.101***
	(13.28)	(10.34)	(12.74)	(23.35)
EBITDA	0.450***	0.269***	0.012	-0.544***
	(5.21)	(2.69)	(0.17)	(-9.000)
CAPEX	-0.185	0.304**	0.377***	0.337***
	(-1.147)	(2.42)	(4.16)	(6.73)
Sales growth	0.473***	0.426***	0.395***	0.235***
	(13.84)	(11.11)	(15.80)	(16.23)
Dividends	1.066***	2.012***	1.435***	1.309***
	(2.87)	(3.80)	(3.60)	(4.31)
p-value (t-test)				0.091
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj-R2	0.156	0.146	0.092	0.122
N	12,545	9,375	21,859	43,675

Table 8: Discount of newly-formed conglomerates

The table reports the results of the estimation of the following equation:

$$y_{i,t} = \alpha + \beta\, treated_i + \beta_1\, treated_i \times after_t + \Gamma X_{i,t-1} + \varepsilon_t$$

where the dependent variable is the excess value of treated and control groups. The treated group is composed by firms that change their status from focused to conglomerate firms (multisegment firms), while focused firms compose the control group. We estimate the difference-in-difference regression as in Villalonga (2006b) over a window of one year before/after the change. The excess value is computed as the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC code, for industries including at least five single-segment companies in the year of the analysis. The model controls for a vector of company characteristics used throughout, including year and firm 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	(1)	(2)	(3)	(4)
Switch status×after	-0.004	0.001	0.012	-0.009
	(-0.149)	(-0.008)	(0.208)	(-0.164)
Switch status×after×high survival			0.015	0.035
			(0.227)	(0.523)
Switch status×high survival			0.015	0.004
			(0.220)	(0.053))
High survival×after			-0.020	-0.038
			(-0.721)	(-1.368)
Treated	-0.048	-0.041	-0.020	-0.004
	(-1.462)	(-1.281)	(-0.343)	(-0.068)
High survival			0.346***	0.349***
			(10.916)	(11.398)
Propensity score model	Reduced	Enhanced	Reduced	Enhanced
Firm Controls	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Year FE	Yes	Yes	Yes	Yes
Adj-R2	0.094	0.092	0.139	0.141
N	30,554	30,516	30,441	30,441

Table 9: Excess value and default probability of conglomerate firms: Fixed effects - robustness

The table reports the results of the estimation of the following equation:

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

where the dependent variable are the excess value (columns (1)-(2), and (5)-(8), and the excess default probability (columns (3)-(4)), over the years 1980 - 2014, of conglomerates and focused firms. In columns (5)-(8), the model is performed on four subsamples split according to the 10^{th}, 25^{th}, 50^{th}, and 100^{th} percentiles of companies' survival probability. We define the survival probability as 1 minus one-year-ahead default probability computed according to Cambpell et al. (2008). The excess value is computed as the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC code, for industries including at least five single-segment companies. The excess default probability is computed as the natural logarithm of the ratio between a company's PD and its imputed PD at the end of the year. The imputed PD is set equal to the one in the core industry of the firm, identified as the SIC code of the segment reporting the highest sales within the firm. The imputed PD is computed as the asset weighted median default probability of all focused companies in the correspondent industry, attributed by using the narrower SIC code. The variable "conglomerate" is an indicator variable equal to one if the company is multi-segments. The model controls for a vector of company characteristics used throughout, including year and firm 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

					Excess value Survival probability			
	Excess value		Excess PD		p(10)	p(25)	p(50)	p(100)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Conglomerate	-0.111***	-0.093***	-0.041*	-0.053**	-0.068*	-0.083***	-0.085***	-0.091***
	(-8.732)	(-7.369)	(-1.906)	(-2.418)	(-1.760)	(-2.933)	(-3.844)	(-4.583)
Age		-0.279***		0.198***	-0.120**	-0.082**	-0.192***	-0.292***
		(-20.627)		(8.40)	(-2.363)	(-2.341)	(-7.258)	(-14.713)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj-R2	0.590	0.602	0.607	0.609	0.731	0.708	0.668	0.590
N	87,427	87,427	87,427	87,427	8,683	13,030	21,843	43,871

Table 10: Conglomerate Discount by survival probability-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 is the excess value over the years 1980 - 2014, computed as the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC including at least five single-segment companies. The variable "conglomerate" is an indicator variable equal to one if the company is multi-segments. The model is performed on four subsamples, split according to the 10^{th}, 25^{th}, 50^{th}, and 100^{th} percentiles of companies' survival probability as computed in Duan et al. (2012). The model controls for a vector of company 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(10)	p(25)	p(50)	p(100)
	(1)	(2)	(3)	(4)	(5)	(6)
Conglomerate	-0.185***	-0.144***	-0.037	-0.092***	-0.079***	-0.125***
	(-8.328)	(-6.427)	(-1.119)	(-3.196)	(-3.365)	(-5.190)
Age		-0.138***	-0.080***	-0.100***	-0.134***	-0.200***
		(-9.924)	(-3.914)	(-5.619)	(-9.357)	(-14.037)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj-R2	0.124	0.143	0.190	0.163	0.148	0.135
N	27,327	27,327	3,748	5,616	10,960	18,656

Table 11: Excess value and measures of diversification - robustness

The table reports the estimates of the following equation:

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

where the dependent variable is the excess value of all firms in the sample, computed as the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC including at least five single-segment companies. We use different proxies for the variable diversification: the number of segments, the coinsurance across segments (one minus the segment cash-flow correlation), and the number of three digits SIC code industries in which the firm is operating. We estimate the model on the complete sample of companies (columns (1)-(3)), and on the sample of surviving companies (columns (4)-(6)). The model controls for the vector of company characteristics used throughout, including year and industry fixed effects. The sample include all non-financial, and non-utility firms, over the years 1980-2014. 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)	(5)	(6)	(7)	(8)
Conglomerate	-0.106***				-0.133***			
	(-7.45)				(-4.96)			
LnSeg		-0.116***				-0.136***		
		(-8.95)				(-6.00)		
Coinsurance			-0.0715***				-0.0760***	
			(-6.18)				(-3.41)	
NumIndustries				-0.0560***				-0.0631***
				(-8.56)				(-5.52)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	78073	78073	78073	78073	27750	27750	27750	27750
Adj-R2	0.096	0.098	0.095	0.097	0.098	0.101	0.095	0.099

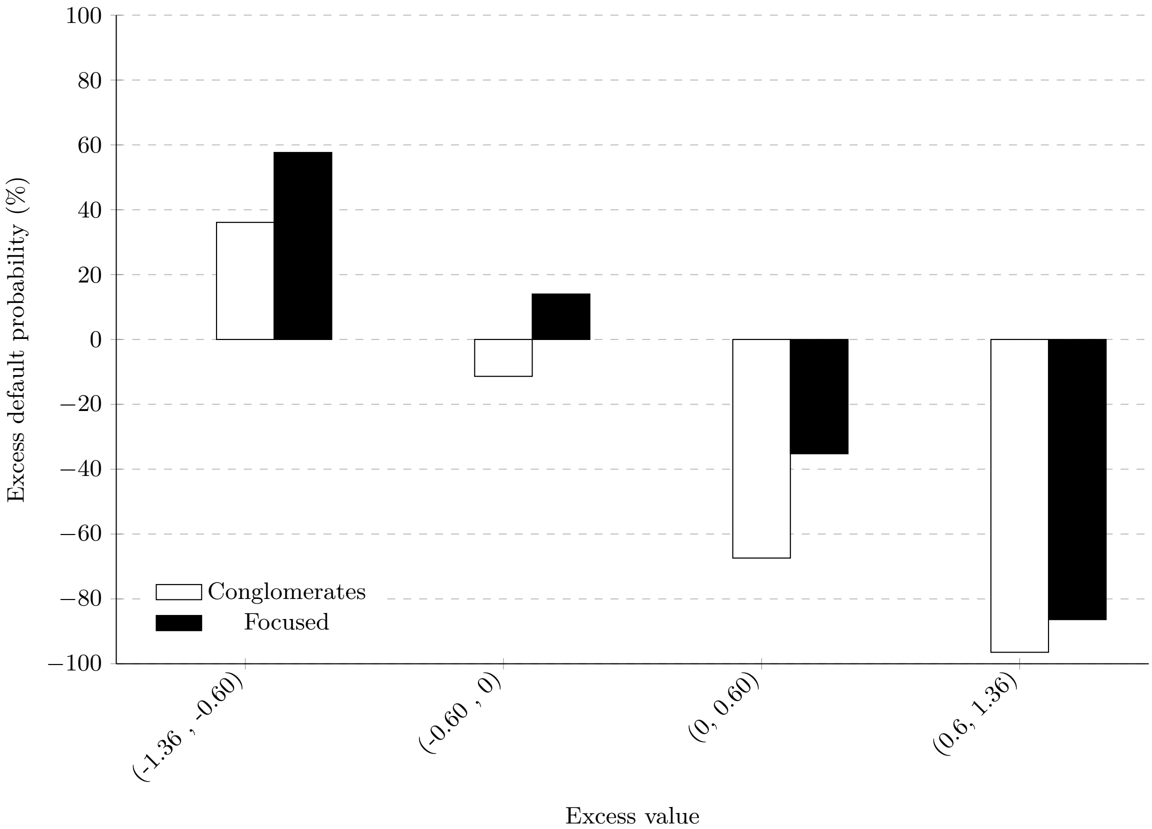

Figure 1: Excess default probability by excess values categories

This figure reports the excess probability of default of conglomerates and focused companies for different intervals of the excess value. The excess value is the natural logarithm of the ratio between a company's market value and its imputed value at the end of the year. The imputed value is the average of the market values of the segment units of the conglomerates, the latter computed by multiplying the segments sales to the median market-to-sales multiplier of the focused companies in the same industry of the segment unit. We implement the industry matching using the narrower SIC including at least five single-segment companies. 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 company PD and its imputed PD at the end of the year. The company PD is computes following Cambpell et al (2008), as reported in Table 3. The imputed value is the default probability in the correspondent core industry of the conglomerate (or standalone) firm, where the core industry for the conglomerate is the industry of the correspondent segment with the highest sales. We retrieve information on company bankruptcy from Compustat North America database, CRSP, and UCLA- LoPucki Bankruptcy Research Database (BRD). The sample period goes from 1980 to 2014.

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