Asset Tangibility, Macroeconomic Risks, and the Diversification Discount

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Abstract

This paper develops a structural model of firm diversification to study the role of organizational flexibility as a tool to manage liquidity in the presence of aggregate productivity and financial shocks. The model features endogenous diversification and refocusing in a two sector economy, where each sector is characterized by a different level of asset tangibility. The estimated model is able to generate the average diversification discount as well as its substantial decrease during recessions and credit crunches as observed in the data. This decrease in the discount can be attributed to tighter collateral constraints of young single-segment firms with low asset tangibility. Counterfactual experiments show that the value of organizational flexibility –the ability to dynamically diversify and refocus– accounts for 10.5% of firm value, of which we attribute 38% to financial pooling benefits and 62% to the option to refocus.

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1 Introduction

Recent empirical literature has documented a substantial increase in intangible capital accumulation of U.S. firms. However, capital with lower tangibility reduces the amount a firm can pledge as collateral. Therefore, lower asset tangibility can make firms more vulnerable to adverse aggregate shocks such as a recession or a credit crunch when liquidity is low. The difficulty in raising funds in such events could lead to costly external financing or even the inability to undertake profitable investment opportunities. Firms can manage liquidity not only by adjusting their debt and cash holding policies[1], but also by their choice of organizational structure. Specifically, firms can choose to operate as single-segments or as conglomerates and borrow against their pooled physical assets. This paper builds a structural model of the firm to study the role of organizational structure in managing liquidity and mitigating the effect of adverse macroeconomic shocks.

We first document new stylized facts on asset tangibility and firm valuation. Using a panel of single-segment firms, we find that Tobin's q of firms with higher asset tangibility are less affected by credit crunches and recessions, which confirms the intuition that lower asset tangibility may have a negative impact on firm value in bad aggregate states. Consistent with existing empirical evidence[2], we also find that the percentage of firms entering our sample dataset with low asset tangibility has steadily increased over time. Finally, we find that the economy-wide diversification discount, defined as the difference between the mean Tobin's q of single-segment firms and conglomerates, decreases during credit crunches and recessions. The reductions in this discount seem to be driven mostly by the decreases in Tobin's q of low tangibility single-segment firms, suggesting the importance of the collateral channel in bad times. Moreover, these time-series variations are economically sizable, and they highlight that organizational structure of firms is an important channel to consider for

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[1]See recent paper by Falato, Kadyrzhanova, and Sim (2014) that studies the connection between cash holdings and the rise in intangible capital.

[2]Jovanovic and Rousseau (2005), Corrado, Hulten, and Sichel (2009), Corrado and Hulten (2010) provide extensive documentation of the recent trend in increasing accumulation of intangible capital.

liquidity management.

We then develop a structural model that builds on a partial equilibrium environment with heterogeneous firms. On the real side, firms are subject to aggregate and idiosyncratic productivity shocks and choose to invest in physical capital facing adjustment frictions. They can operate in either one or two sectors, as in the framework of Gomes and Livdan (2004), thus choosing diversification and refocusing endogenously. In contrast to Gomes and Livdan (2004), sectors in this model are characterized by different levels of asset tangibility. Asset tangibility does not impact the marginal productivity of capital, but determines the value of assets that can be pledged. On the financing side, there are financial frictions and firms fund investment using debt and equity financing, following the work of Hennessy and Whited (2005). Firms also face sectoral shocks to the collateral value of their assets in the intraperiod loan market, which is modeled similarly to Jermann and Quadrini (2012).

The model is quantitatively disciplined by the data through calibration of the shocks and estimation of key model parameters using the Simulated Method of Moments (SMM). These model parameters are chosen such that the distance between a relevant set of moments in the data –including our new stylized facts– and the corresponding moments in the model simulated data is minimized.

The first result of our estimation is that the model can generate the average diversification discount of 0.23 that is observed in the data. As in Maksimovic and Phillips (2002) and Gomes and Livdan (2004), it is the self-selection of firms that generates this discount. Small single-segment firms tend to be high growth firms and thus have high Tobin's q. Once they exhaust their growth options, they find it optimal to diversify into a new sector. These conglomerates tend to be slower growing and thus have lower Tobin's q.

The second result is that our estimated model is able to reproduce the empirical fact regarding the effect of asset tangibility on Tobin's q for single-segment firms. Regressions in the simulated data show that firms in the low tangibility sector see an additional reduction in value in the event of a recession or a credit crunch. The reason for this result is that adverse

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aggregate shocks tighten the collateral constraint of low tangibility firms more than they do for high tangibility firms. A tightening of the collateral constraint forces firms to reduce leverage, which in turn leads to lower profits, lower investment, and more costly external financing. All of these adjustments translate into lower valuations and lower Tobin's q. This mechanism explains why a recession or credit crunch impacts Tobin's q of low tangibility firms more adversely.

The third result of the paper is that our estimated model can replicate the time series variations of the diversification discount. In particular, the discount decreases during recessions and credit crunches just as in the data. All firms experience lower profits, reduce leverage and investment, and ultimately see a decrease in their market value. However, conglomerates valuations do not decrease as much as those of single-segments because the latter are the most productive firms in the economy. In other words, one unit of forgone investment has a more adverse effect on single-segments. Note that the economic channel behind this result is different from the insights of a static model proposed in Lewellen (1971). In particular, it is not the higher debt capacity of conglomerates that leads to their higher investment and thus a lower reduction in Tobin's q during credit crunches. Our model shows that leverage and investment are the result of dynamic decisions where firms trade off the cost of being financially constrained in bad states of the world with the opportunity cost of investment. In making their leverage decisions, single-segment firms anticipate their lower debt capacity during credit crunches and conglomerates also take into account their ability to pool collateral and cash flows. However, the more productive firms have higher opportunity costs of investment and thus lever up more. In fact, in our model, conglomerates, being the less productive firms, have lower leverage and lower investment both during and outside of credit crunches. Our model highlights that conglomerate and single-segment firms face different investment opportunities and therefore have different demands for funds.

Using the estimated model, we show that the model ingredients necessary to replicate the time series dynamics of the diversification discount quantitatively are new firm entry

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and heterogeneity in asset tangibility. In an economy without new firm entry, we find that aggregate shocks have no impact on the diversification discount. In such economy, all single-segment firms are mature firms and hence are not that much more productive than conglomerates. In addition, mature single-segment firms are also less financially constrained than young fast growing single-segments. Thus mature and financially unconstrained single-segments do not suffer more than conglomerates during a recession or credit crunch, which leaves the discount unchanged. In an economy with high asset tangibility in both sectors, we find that the model can produce only half of the percentage decrease in the discount during a recession or a credit crunch. This highlights that low asset tangibility firms contribute substantially to the reduction of the discount during bad times.

A structural model of firm diversification is particularly useful to quantify the benefits that are attached to the conglomerate structure because it can control for the effect of self-selection. We use counterfactual experiments to estimate the value of organizational flexibility that we define as the ability to dynamically conglomerate and refocus. We find that it accounts for 10.5% of average firm value. We further decompose the value of organizational flexibility into two components: (i) financial pooling benefits, and (ii) the option to refocus. Financial pooling gives conglomerates the ability to pool cash flows and allocate funds optimally across divisions and the ability to pool assets from both divisions to pledge collateral against their intraperiod loan. This enhanced financial flexibility provides a great financing hedge against idiosyncratic productivity and financial risks and is estimated to account for 38% of the value of organizational flexibility. The option to refocus gives conglomerates the ability to shed a division when a segment becomes so unproductive that it does not warrant paying for the fixed cost of operation. This option provides a real side hedge against idiosyncratic productivity risks and is estimated to account for 62% of the value of organizational flexibility.

Our study contributes to a large literature on the diversification discount. There has been a long standing debate on whether conglomerates are valued at a discount compared to

a portfolio of similar single-segment firms. While many empirical papers such as Lang and Stulz (1994) and Berger and Ofek (1995) argue that such a discount indeed exists, others such as Campa and Kedia (2002) and Villalonga (2004) question their findings. The issue is the endogeneity of firms' decision to diversify, and hence, constructing a proper set of comparable single-segment firms is crucial to empirically estimate the "treatment" effect of organizational structure. Other empirical papers, such as Dittmar and Shivdasani (2003) and Ahn and Denis (2004), employ a different approach and examine the changes in organizational structure and subsequent improvements in investment efficiency and valuation of firms. However, as pointed out by Whited (2001) and Colak and Whited (2007), the endogeneity of firm restructuring decisions and measurement errors in q as a proxy for investment opportunities can also confound these empirical results. The structural dynamic framework proposed in our paper allows us to properly evaluate the link between firm valuation and organizational structure. The estimated model allows us to perform various counterfactual exercises and disentangle the value of organizational flexibility from self-selection effect by constructing ideal treatment groups using simulated data.

Recent papers look at the time series performance and investment patterns of firms to extract the time-varying financial pooling benefits of conglomeration. Dimitrov and Tice (2006) shows that bank-dependent single-segment firms see higher drops in sales and inventory growth rates during recessions compared to bank-dependent conglomerates. Yan (2006), Kuppuswamy and Villalonga (2010), and Hovakimian (2011) also show that excess value of conglomerates is related to credit market conditions. More recently, Matvos and Seru (2014) estimates that 16% to 30% of the valuation improvement in conglomerates during the recent financial crisis is due to their ability to pool resources across divisions. Our paper complements these studies by showing explicitly the full dynamics of firms' optimal policies –investment, financing and organizational choice– in response to aggregate productivity and financial shocks and how such policies are related to different valuations of single-segments and conglomerates in the time series.

Our paper is also related to a much more recent but growing literature on asset tangibility and liquidity management. Almeida and Campello (2007) investigates the link between asset tangibility and investment while Falato, Kadyrzhanova, and Sim (2013) explores the link between corporate cash holdings and intangible capital accumulation of firms. Our paper links the asset tangibility of firms to their performance during recessions and credit crunches and shows that organizational choice is also a relevant tool in liquidity management. Merger or conglomeration as a tool to manage liquidity even in the absence of operational synergies has also been noted by Almeida, Campello and Hackbarth (2011). They show that liquidity mergers are more likely to occur in industries where assets are easily transferable across firms.

Methodologically, our paper belongs to a growing literature of structural estimation. Hennessy and Whited (2005, 2007) and DeAngelo, DeAngelo, and Whited (2011) estimate a dynamic structural model and study investment and leverage dynamics. Yang (2008) embeds a neoclassical firm model in a general equilibrium framework that studies firms' decision to purchase or sell assets. Nikolov and Whited (2013) and Morellec, Nikolov, and Schurhoff (2012) explore the role of agency frictions on corporate cash holding and leverage decisions respectively. In the same spirit, our paper proposes a dynamic model of firm investment and financing and extend it to include diversification decisions in order to study the role of organizational structure in liquidity management. Our model is closest to Gomes and Livdan (2004), which estimates a dynamic model of a firm with decreasing returns to scale production technology. Their model is able to rationalize the average diversification discount, which arises as firm's optimal organizational response to idiosyncratic productivity shocks. However, their model does not include a financing side and aggregate shocks, and therefore cannot address the time series variations of the discount as we do in our model.

The rest of the paper is organized as follows. Section 2 presents new stylized facts that motivates the model, which is described in Section 3. The estimation strategy is presented in Section 4 and the numerical results are in Section 5. Section 6 concludes.

2　New Stylized Facts

This section presents new stylized facts regarding asset tangibility, aggregate risks, and firm valuation. First, we show that recessions and credit crunches affect single-segment firm values differently based on the tangibility of their assets. We also document the composition of new firm entry in our sample dataset. Finally, we present some evidence that suggests that recessions and credit crunches affect the diversification discount negatively.

2.1　Data Description

The stylized facts presented in this section cover the years 1979 to 2012. Our data comes from COMPUSTAT Industry Quarterly database and COMPUSTAT Segment files. Segment level information such as sales, assets, capital expenditures, and operating profits are matched to the firm level financial information from the quarterly database. Following standard practice in the literature, we exclude segments in regulated industries: Transportation (SIC codes 4000-4799), Telecommunication Services (4800-4899), Utilities (4900-4999), Financial Services (6000-6999). We use firm level financial information from COMPUSTAT Industry Quarterly database and identify firms as either single-segment or conglomerate based on the number of segments reported at fiscal year end in the Segment files.

Recent empirical work has shown that COMPUSTAT segment data may be unreliable for estimating the diversification discount due to poor industry classification of segments[3]. However, this issue is irrelevant to our methodology as we do not construct the market value of a conglomerate by imputing the value of each segment from single-segment firm values in the same industry. We use observed Tobin's q of conglomerates and single-segment firms in sample and compare them to simulated data generated from our structural model.

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[3]See Denis, Denis, and Sarin (1997), Hyland and Diltz (2002), and Villalonga (2004)

2.2 Cross-Sectional Fact: Asset Tangibility

In this subsection, we describe the effect of asset tangibility on single-segment firm valuation responses to a credit crunch or a recession. The asset tangibility ratio of a firm is denoted by $TANG$ and is constructed as the ratio of the firm's property, plant, and equipment, $PP\&E$ (item *ppent* in COMPUSTAT), to its book value of total assets (item *at*). $PP\&E$ includes items such as land and building, machinery and equipment, and property held for future use that are valued at cost while total assets includes cash and short-term investments, receivables, inventories, investments, and tangible and intangible assets[4]. Asset tangibility is commonly used in the capital structure literature[5] to measure the collateral value of firms' capital.

In order to investigate the linkage between asset tangibility and aggregate risks, we regress Tobin's q on asset tangibility, bad aggregate events, and their interactions. A bad liquidity event, or credit crunch, is represented by the variable $CRUNCH$, which is a dummy variable equal to 1 if the TED spread is greater than 1 percent[6]. The definition for recessions follows the classification of recession quarters by the National Bureau of Economic Research (NBER) and are represented by the variable $RECESSION$. Table I reports the regression results for 3 different specifications.

The first salient feature of the data is that Tobin's q decreases with asset tangibility. This is consistent with the view that high-growth firms are high Tobin's q firms as they tend to be in technology and human-capital intensive sectors and therefore have low physical capital to assets ratios. The second regression specification shows the response of Tobin's q to bad aggregate events. As can be expected, coefficients on the credit crunch and the recession are negative. Both credit crunches and recessions lower Tobin's q for all firms, given that they correspond to bad macroeconomic times. The third regression specification shows that the

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[4]We could also measure tangibility by removing cash and short-term investments from total assets. Our findings are robust to this alternate definition.

[5]See Campello and Giambona (2013) for a recent example.

[6]Our findings are robust to redefining the crunch period when the TED spread is greater than 1.5 percent.

interaction terms of credit crunch and recession with the tangibility ratio are positive. This means that firms with more tangible physical capital are not affected as negatively by the adverse aggregate events. The difference in the tangibility ratio between the top and bottom 25% (10%) of firms in our sample is 0.28 (0.56). That means that Tobin's q decreases by an extra 0.08 (0.17) in the event of a credit crunch and by extra 0.03 (0.06) in the event of a recession for the bottom firms, compared to the top firms.

These regression results suggest that asset tangibility is an important factor that seems to impact firm valuations. Our model has a role for asset tangibility and incorporate a two-sector economy with different levels of asset tangibility.

2.3 Time Series Fact: Firm Entry

New firms enter the economy, and as a result new firms enter our sample dataset. We find that on average 6.2% of new single-segment firms enter the sample each year over the 1980-2012 period. In addition, we find that on average 64% of new firms entering the sample have a tangibility ratio below the median of the overall sample. Figure I plots the entry rate, as well as the composition of new firms. The entry of low asset tangibility firms in our sample dataset is consistent with the aggregate evidence offered in Falato, Kadyrzhanova, and Sim (2013). The authors show a dramatic rise in the ratio of intangible capital to total assets from 1970 to 2010.

The entry of low asset tangibility firms into our dataset is incorporated in our model simulations such that this important composition effect is part of our analysis.

2.4 Aggregate Fact: Diversification Discount

While there has been some previously documented evidence linking the time series variations of conglomerate values to external capital market conditions, the evidence covers exclusively the recent financial crisis as in Kuppuswamy and Villalonga (2012) or a shorter time frame excluding the crisis as in Yan (2006) and Hovakimian (2011).

In this paper, the diversification discount is defined as the in-sample difference between the mean Tobin's q of single-segments and conglomerates. Unlike other measures found in the literature, this measure makes no attempt to control for or match characteristics between single-segment and conglomerate firms. Instead, we describe the properties of the data in sample and compare them to a panel of simulated data, which is produced by the model. The typical problem of selection that plagues empirical work is therefore circumvented by comparing the data to model-generated data, where the variables of interest are endogenously determined.

In this subsection, we investigate the time series properties of the diversification discount. Figure II plots the diversification discount with the TED spread (top panel) and with the NBER recessions (bottom panel) over the period 1979-2012, all at the quarterly frequency. As can be seen, the diversification discount varies quite substantially over time. In our sample period, the average discount is 0.23 with the volatility of 0.11. The negative correlation between the TED spread and diversification discount is most apparent during the recent financial crisis.

Table II reports the time series regression results of diversification discount on the credit crunch and recession dummies. The regression results show that the diversification discount is significantly reduced during credit crunches, and that with a magnitude of 0.11, the reduction is economically important. These results broadly confirm the view that credit conditions have significant impact on the firm values, especially for single-segment firms. The coefficients on $RECESSION$ show that diversification discount is negatively affected by recessions. However its magnitude is about half of a credit crunch and the coefficient is only marginally significant.

The stylized facts presented here serve as a motivation for our model: macroeconomic risks play an important role in the values of conglomerate and single-segment firms. Our model features productivity and financial shocks.

3 Model

The following section describes the various components of the model, formalizes the firm problem, and explains the solution method in detail.

3.1 Production

Time is discrete and firms solve an infinite horizon problem. It is assumed that there are two industries or sectors in the economy. Firms can operate in either one of the two sectors or both. The model can easily be extended to include more industries. However, the goal of this paper is to understand how firms choose to diversify or refocus in response to exogenous (productivity and financial) shocks and to understand its effects on firm performance. A two sector framework should adequately capture the costs and benefits of diversifying or refocusing. Moreover, as documented in Lang and Stulz (1994), there is a statistically and economically significant drop in firm value as firms expand from one to two sectors whereas there is weak marginal effect of diversification on firm performance as they expand from two or more sectors.

The two industries are denoted by $j \in \{1, 2\}$. Firms face idiosyncratic productivity shocks in each industry, denoted by z_1 and z_2[7]. In addition, all firms in the economy face an aggregate shock denoted by z_a. Both idiosyncratic and aggregate productivity shocks are assumed to follow an AR(1) process:

$$\log z_j' = \rho_j \log z_j + \sigma_j \epsilon_j, \quad j \in \{1, 2\},$$

$$\log z_a' = \rho_a \log z_a + \sigma_a \epsilon_a,$$

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[7]It is assumed that each firm observes its productivity shocks in both industries, regardless of whether it currently operates in one or both industries. The model could be extended to incorporate learning about productivity in a prospective industry for a single-segment firm. Introducing learning does not change the strategic motive of a diversifying firm besides lowering the expected payoff from diversification and thereby delaying entry into new industries. However, this would come at the cost of substantial complexity and is not the main focus of the paper.

where ϵ_1, ϵ_2, and ϵ_a are i.i.d. with standard deviations σ_1, σ_2, and σ_a, respectively. For simplicity, firm level productivity shocks in each industry are assumed to have no correlation[8].

A firm is said to be "single-segment" or a "stand-alone" if it operates only in one industry and "diversified" or a "conglomerate" if it operates in both. A firm that operates in sector j produces final good y_j. Production in each sector requires capital k_j and labor n_j and is assumed to have a Cobb-Douglas production possibility frontier. Cash flows in sector j is given by $y_j = F(z_a z_j, k_j, n_j)$, where the production function is:

$$F(z, k, n) = z k^{\alpha_k} n^{\alpha_n}, \quad 0 < \alpha_k + \alpha_n < 1.$$

Firms hire labor at a constant wage rate W, i.e., the supply of labor is assumed to be infinitely elastic. Firms invest in physical capital every period, investment in sector j is defined as:

$$i_j = k'_j - (1 - \delta)k_j,$$

where k_j is the physical capital installed in sector j, which depreciates at rate δ.

Firms face quadratic adjustment costs in each sector in accumulating capital specified by the functional form:

$$\phi(k, k') = a_1 \left(i/k\right)^2 k \, \mathbf{1}_{\{i \geq 0\}} + a_2 \left(i/k\right)^2 k \, \mathbf{1}_{\{i < 0\}}.$$

Special cases arise when firms are shutting down or acquiring a division. It is assumed that firms pay a premium ϕ_B for each unit of capital acquired in order to diversify into a new sector:

$$\phi(0, k') = \phi_B k'$$

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[8]Relaxing this assumption could introduce non-trivial implications for the product markets. In particular, it could introduce strategic motives for firms to diversify in industries with less or negatively correlated productivity shocks or cash flows. However, the focus of our paper is not on which industries firms choose to diversify in, but rather on the dynamics of diversification and refocusing and how such dynamics change over the business and credit cycles.

Similarly, firms sell at a discount ϕ_S for each unit of capital divested when shutting down a division:

$$\phi(k, 0) = \phi_S k.$$

Firms pay a fixed cost f to operate in each sector. Due to the adjustment costs of capital, ϕ, and fixed costs, f, associated with running a division, firms reallocate capital gradually. In other words, after observing the productivity shocks in each industry, firms do not reshuffle capital to the more productive sector every period right away. Therefore, despite the observability of the firm's idiosyncratic productivity shocks in both industries, capital reallocation among divisions and entry and exit of firms in each industry are non-trivial decisions.

The firm enters every period with pre-allocated capital in each sector, so both k_1 and k_2 are state variables. In order to have a parsimonious notation, the set of all shocks are collected in the exogenous state vector s. Operating income of the firm is thus denoted by:

$$\pi(k_1, k_2, n_1, n_2, s) \equiv \sum_{j=1,2} \left(F(z_a z_j, k_j, n_j) - W n_j - f \mathbf{1}_{\{k_j > 0\}} \right). \tag{1}$$

3.2 Financing

Firms have access to defaultable one-period debt, priced by risk-neutral competitive lenders. Denoting by $\mathbf{1}_{DEF}$ the indicator for default where $\mathbf{1}_{DEF} = 1$ if the firm defaults, the bond price is given by:

$$\tilde{q}'(k_1', k_2', b', s) = \beta \, \mathbb{E} \left[(1 - \mathbf{1}_{DEF}') + \chi(1 - \phi_S) \min((k_1' + k_2')/b', 1) \, \mathbf{1}_{DEF}' \right]$$

where $\chi \leq 1$ is the recovery rate on the physical capital in the event of default. Debt interest payments are tax-deductible, so the effective bond price is given by:

$$q' = \frac{1}{1 + (1 - \tau)(\tilde{q}'^{-1} - 1)}$$

The budget constraint of the firm is given by equating the sources of funds: after-tax profits and new debt issue, to the uses of funds: financial payouts and investments.

$$(1 - \tau)\pi(k_1, k_2, n_1, n_2, s) + q'b' = d + b + i_1 + i_2 + \phi(k_1, k_1') + \phi(k_2, k_2') \tag{2}$$

Liquidity risk is introduced via intra-period loan as in Jermann and Quadrini (2012). Central to this intra-period loan, l, is the assumption that revenue is realized at the end of the period, but the firm must borrow intra-period in order to finance its working capital, which includes operating costs and financial payouts (including taxes). Since the firm starts the period with outstanding debt, b, and chooses the new debt, b', it must pay its bondholders $b - q'b'$. The firm must also pay for labor and investments, and distribute dividends to its shareholders. Therefore, the intraperiod loan is given by:

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\begin{aligned}
l = {} & W(n_1 + n_2) + i_1 + i_2 + \phi(k_1, k_1') + \phi(k_2, k_2') + f\left(1 + \mathbf{1}_{\{k_1 k_2 > 0\}}\right) \\
& + d + b - q'b' + \tau\pi(k_1, k_2, n_1, n_2, s).
\end{aligned}
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Given the budget constraint of the firm in Equation 2, it follows that

$$l = F(z_a z_1, k_1, n_1) + F(z_a z_2, k_2, n_2).$$

The total amount of intraperiod loan the firm needs to borrow is equal to its revenue. Using the same set up as in Jermann and Quadrini (2012), we also assume the presence of limited enforceability in debt contracts and financial shocks to liquidation value.

In the event of default, the intraperiod lender can only recover the funds by liquidating the physical capital as the firm can always divert its current period cash flows. Given that the intraperiod loans are assumed to be junior to intertemporal debt, intraperiod lender could only recover physical capital net of current debt outstanding in the event of default. In addition, this net recovery value is affected by current macroeconomic conditions. Such

liquidity considerations are introduced into the model using financial shocks, denoted by ξ. With probability ξ, physical capital can be fully recovered, but with probability $1 - \xi$ the recovery value is zero.

A sector heterogeneity is introduced in the form of different recovery values of capital for each sector. Sector j faces an exogenous sector-specific financial shock denoted by ξ_j. A single-segment firm faces the following enforcement constraint:

$$\xi_j \left(k_j' - q'b' \right) \geq l, \quad j \in \{1, 2\}.$$

On the other hand, a conglomerate firm faces:

$$\xi_1 \left(k_1' - \left(\frac{k_1'}{k_1' + k_2'} \right) q'b' \right) + \xi_2 \left(k_2' - \left(\frac{k_2'}{k_1' + k_2'} \right) q'b' \right) \geq l.$$

Notice that debt is naturally allocated to each sector based on the next-period collateral. Regardless of which sector(s) a firm operates in, it faces the following enforcement constraint:

$$\xi \left(k_1' + k_2' - q'b' \right) \geq F(z_a z_1, k_1, n_1) + F(z_a z_2, k_2, n_2), \tag{3}$$

where $\xi = \xi_1 \frac{k_1'}{k_1' + k_2'} + \xi_2 \frac{k_2'}{k_1' + k_2'}$ is the asset-weighted financial shock that firms face. ξ_1 and ξ_2 are exogenous processes that will be mapped to the data in the estimation section. The larger the ξ, the higher is the total debt capacity of the firm. Higher intertemporal debt, b', also makes the enforcement constraint tighter and hence lowers the amount of intra-period loan l the firm can borrow. On the other hand, higher physical capital relaxes the enforcement constraint. In other words, having higher collateral to pledge allows the firm to borrow more either intertemporally or intratemporally. The financial shock is also collected in the exogenous state vector: $s = (z_a, z_1, z_2, \xi)$.

Financial frictions are modeled by assuming that firms face quadratic cost for issuances of equity financing. Equity issuances are defined as negative dividend payouts. Hence, net

equity issuances are given by,

$$\psi(d) = \left(1 + L_1 \, \mathbf{1}_{\{d<0\}}\right) d - \frac{1}{2} L_2 \, (d/k)^2 \, k \, \mathbf{1}_{\{d<0\}}, \tag{4}$$

where $L_1, L_2 \geq 0$ are parameters that govern the severity of financial frictions.

3.3 Firm Problem

The timing of the firm problem is as follows: (i) firms begin the period with capital, k_j, in each sector, and debt, b, (ii) firms observe productivity shock in each sector, z_j, aggregate shock, z_a, and financial shock, ξ, (iii) contingent on no default, firms simultaneously make decisions on how much labor to hire, n_1 and n_2, how much to invest (thereby whether to diversify or refocus), k'_1 and k'_2, and how much intertemporal debt to issue, b', (iv) firms decide to default if their continuation value is negative.

The firm problem can be recursively stated as follows. Given the bond price schedule $q'(k'_1, k'_2, b', s)$, firms maximize:

$$V(k_1, k_2, b, s) = \max_{\mathbf{1}_{DEF}} \left\{ 0 \, , \, \max_{k'_1, k'_2, b', n_1, n_2} \quad \psi(d) + \beta \, \mathbb{E}\left[V(k'_1, k'_2, b', s')\right] \right\},$$

subject to,

$$(1-\tau)\pi(k_1, k_2, n_1, n_2, s) + q'b' = d + b + i_1 + i_2 + \phi(k_1, k'_1) + \phi(k_2, k'_2),$$

$$\xi\left(k'_1 + k'_2 - q'b'\right) \geq F(z_a z_1, k_1, n_1) + F(z_a z_2, k_2, n_2).$$

3.4 Model Solution

There are no analytical solutions to the firm problem, therefore numerical methods are used to solve a discretized version. The capital stock for each division, k_1 and k_2, lies on an unevenly spaced grid of 20 points, where increments are increasing with the level of capital,

such that firms face similar choices in their investment rate regardless of their size. Debt is defined on an equally spaced grid with 11 points on the interval $[0, 2/3 * \max(k_1 + k_2)]$. We verify that none of the state variables hit the upper bound in their respective grid, ensuring that there is no artificially imposed inequality constraint.

The numerical solution is obtained by solving the model via value function iteration (VFI) on the Bellman equation. This yields the value function $V(k_1, k_2, b, s)$ and the policy function $\{k_1', k_2', b', n_1, n_2\} = g(k_1, k_2, b, s)$. Other useful policies are computed using these optimal policies. Specifically Tobin's q is constructed as the ratio of the market value to the book value of assets, i.e., Tobin's $q \equiv (V + b)/(k_1 + k_2)$.

The estimation strategy is explained in Section 4 and the numerical results are reported in Section 5.

4 Model Estimation

This section presents the estimation strategy in detail. The model is calibrated at the annual frequency. Shocks are calibrated using macroeconomic data for the US. A set of model parameters are chosen to replicate the institutional features. All the remaining model parameters are estimated using the simulated method of moments (SMM).

4.1 Calibration of Shocks

Aggregate Productivity. The aggregate productivity process is estimated using the annual series of detrended US GDP. The calibrated values are given by $\rho_a = 0.8$, and $\sigma_a = 0.02$. The aggregate cost process is discretized into a three-state Markov chain[9].

Idiosyncratic Productivity. The idiosyncratic productivity processes are assumed to also be persistent. Following Gomes and Livdan (2004), the calibrated values are given by

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[9]All exogenous shocks are discretized using the quadrature based procedure of Hussey and Tauchen (1991).

$\rho_j = 0.95$, and $\sigma_j = 0.02$[10]. Each idiosyncratic cost process is discretized into an eight-state Markov chain.

Financial Shock. The aggregate financial shock process is discretized into a three-state Markov chain. The grid is chosen such that it represents a tightening of credit. The first grid point represents normal credit times such that pledgeability of collateral is the highest. The second grid point corresponds to a mild credit tightening, whereas the third grid point represents a large reduction in collateral value. The grid is formally denoted by $\xi = (\xi_H, \xi_M, \xi_L)$, where $\xi_H > \xi_M > \xi_L$ represent the level of physical capital pledgeability.

In this model, sector 1 and 2 are mapped into the "high" and "low" tangibility sectors (described in the data section), respectively. The ability to pledge more tangible assets during a credit crunch is valuable for intraperiod borrowing. This fact will guide the calibration of the sectoral shocks: ξ_1 and ξ_2. The fact that "high" tangibility firms can pledge capital more effectively in bad credit states than "low" tangibility firms leads to the following conditions: $\xi_{1,p} > \xi_{2,p}$ for $p \in \{M, L\}$. The grids are parameterized as follows[11]:

$$
\begin{aligned}
\xi_1 &= \bar{\xi} \left(1 \, , \, 1 - \theta\Delta \, , \, 1 - \Delta \right), \\
\xi_2 &= \bar{\xi} \left(1 \, , \, 1 - \theta\Delta \, , \, 1 - \Delta \right)^\omega,
\end{aligned}
$$

where $\bar{\xi} < 1$, $\theta < 1$, $\Delta < 1$, and $\omega > 1$ are credit shock parameters that can be estimated to best fit the data. The parameter Δ represents the (percentage) loss in collateral value in the credit crunch state, whereas the parameter θ controls the size of the mild credit tightening. It is important to note that in good credit times, physical capital is pledged equally for "high" and "low" tangibility firms, that is $\xi_{1,H} = \xi_{2,H} = \bar{\xi}$. It is only when credit tightens in the economy that firms are differentially affected, based on the level of asset tangibility.

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[10]The value for the persistence parameter is in line with many prior studies. The corporate finance literature has often assumed that idiosyncratic measures of productivity are very persistent, e.g., Cooley and Quadrini (2001), Gomes (2001), and Hennessy and Whited (2005).

[11]This implementation is not unique and was chosen for transparency and parsimony.

The transitions between these states is estimated using the series of TED spread[12], described in Section 2. Annual TED spreads can be mapped into a ξ state using the following rules: (i) $\xi = \xi_H$ if TED $\leq 0.75\%$, (ii) $\xi = \xi_M$ if $0.75\% <$ TED $\leq 1.25\%$, and (iii) $\xi = \xi_L$ if $1.25\% <$ TED. Figure III shows the TED spread along with the mapping to the financial shock grid. The converted TED spread data is used to estimate the historical transition probabilities for Markov chain ξ.

4.2 Exogenously Chosen Parameters

The time preference parameter β is set to 0.976, which corresponds to a 2.5% annual risk-free real interest rate. The corporate tax rate is set to 30%. Debt recovery rate is assumed to be 90%. The equity issuance parameters are $L_1 = 0.15$ and $L_2 = 1.5$. The buying and selling frictions rate are set to 5%. The wage rate is set to 0.5. The returns to scale in capital α_k is set to 0.3, and the returns to scale in labor α_n is set to 0.6, such that production exhibits decreasing returns to scale. The depreciation rate is set to 7%. All these parameters are in line with previous corporate studies and are not crucial to obtaining the main results of the paper. Calibration of these parameters seems appropriate here. The exogenous parameters are summarized in Panel A of Table III.

4.3 Simulated Method of Moments

Many parameters are not directly observable and cannot be readily calibrated. The approach taken here is to estimate these parameters using the simulated method of moments, which target moments of the data obtained from the dataset of firms described in the data section.

Tangibility Discount Regression. One important stylized fact described in the data section is the differential effect of a credit crunch on firm valuation, depending on asset tangibility. This effect can be tested in our model by running regressions in a panel of

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[12]The quarterly spreads are averaged to obtain an annual figure.

simulated data. Asset tangibility in the data, measured by $TANG$, is a continuous variable whereas the model only has 2 levels of asset tangibility, that is sector 1 and sector 2. We map the data to the model by categorizing single segment firms into 2 types. Firms with tangibility greater (lower) than the sample average are mapped to sector 1 (2). Given such categorization, we can compute aggregate Tobin's q series for each sector.

In order to identify the effect of asset tangibility, we define the tangibility discount as the in-sample difference between the mean Tobin's q of single-segments in sector 2 and sector 1. Therefore such discount captures the effect of being a single segment with low asset tangibility, compared to high asset tangibility.

A regression of the tangibility discount for single-segment firms on aggregate risks can help isolate the differential effect of credit crunches and recessions on firm valuations. A credit crunch is denoted by $CRUNCH_t$ and is an indicator variable defined as the lowest grid point of the financial shock. Similarly a recession is denoted by $RECESSION_t$ and is an indicator variable defined as the lowest grid point of the aggregate productivity shock. We run the following regression specification in the time series:

$$TANG\ DISCOUNT_t\ =\ \beta_0^{TD}\ +\ \beta_1^{TD}\ CRUNCH_t\ +\ \beta_2^{TD}\ RECESSION_t\ +\ \epsilon_t.$$

The sample estimates from our dataset are reported in Table IV.

Diversification Discount Regression. The same diversification discount regression ran in the data is ran in the simulated data. We run the following regression in the time series:

$$DIV\ DISCOUNT_t\ =\ \beta_0^{DD}\ +\ \beta_1^{DD}\ CRUNCH_t\ +\ \beta_2^{DD}\ RECESSION_t\ +\ \epsilon_t.$$

The sample estimates from our dataset are reported in Table II and Table IV.

Estimation Strategy. The vector of parameters to be estimated include technology and credit shock related parameters: fixed production cost f, positive capital adjustment cost

a_1, negative capital adjustment cost a_2, financing shock in normal credit time $\bar{\xi}$, size of the credit crunch Δ, size of the intermediate credit crunch θ, and the differential impact on low tangibility capital ω. This vector is denoted by $\Theta \equiv \left(f, a_1, a_2, \bar{\xi}, \Delta, \theta, \omega \right)$.

These model parameters are chosen such that the distance between a set of moments in the data and the corresponding set of moments in the artificial simulated data is minimized. Using aggregate time series data, the set of moments include: (i) mean fraction of conglomerates, (ii) mean leverage and Tobin's q, for both single-segment and conglomerates, (iii) 3 tangibility discount regression coefficients, and (iv) 3 diversification discount regression coefficients. The estimation problem is to choose 7 model parameters that maximizes the fit with 11 moments of the data.

5   Quantitative Analysis

This section presents the quantitative implications of the model. First, the estimation results are presented. Simulations of the estimated model are used to understand the dynamics of diversification and refocusing, and the impact of a recession and a credit crunch. Next, we perform a sensitivity analysis in order to understand the identification and how model parameters impact the results. Finally, we use counterfactual experiments to quantify the various economic channels at work in the model.

5.1   Estimation Results

The model economy is simulated for an expanding panel of firms. The initial cross-section starts with 664 firms and ends with 12,092 firms in the last period. The number of periods is set to 120[13]. New single-segment firms are added at a 6% rate each period. One third of these new single-segment firms are set to operate in sector 1 and the other two thirds in sector 2. This mix is similar to the 64% figure for low tangibility firms entering our dataset.

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[13]The first 70 periods in the simulated sample are discarded to mitigate the effect of the initial conditions.

Parameter estimates. Panel B of Table III reports parameter estimates along with their standard errors. The financing shock is estimated to be $\bar{\xi} = 0.18$, thus physical capital can be pledged for 18 cents on the dollar in the intraperiod loan market during normal credit conditions. The magnitude of the credit shock is estimated to $\Delta = 0.54$, which means that a credit crunch reduces collateral value by 54%. The intermediate credit shock is estimated to be $\theta = 0.287$ of the total credit crunch, which means that an intermediate credit crunch reduces collateral value by 15.5%. The differential effect of a credit crunch on low tangibility firms is pinned down by $\omega = 2$, which means that a credit crunch reduces collateral value of low tangibility firms by 79%.

Simulated moments. Moments are computed both in the data and simulated data, and are reported with t-statistics testing the difference in Table IV. Overall, most of the simulated moments are fairly close to the data, as indicated by the low $t-$stat for most moments.

The composition of the economy is similar to that of the data, with about 50% of firms being conglomerates. Average leverage in the simulated model matches the data well for conglomerates, but overshoots in the case of single-segment firms (and is statistically different from the data). The high single-segment leverage produced by the model reflects the fact that single-segments that enter the economy are very productive and therefore issue a lot of debt in order to grow rapidly. Adding financial frictions specific to young firms, such as limited access to public debt markets for small firms, could help the fit at the cost of more complexity.

Average Tobin's q are somewhat higher than in the data but the differences are not significantly different from zero. This highlights the fact that more parameters could be estimated or more realistic features could be added to the model. The diversification discount is successfully matched as well as the impact of a recession and a credit crunch.

The average tangibility discount produced by the model is statistically different from the data. In the data, single-segments in the low tangibility sector have a much higher Tobin's q than those in the high tangibility sector. Sectors are symmetric in the model, except for a

deeper credit tightening when an aggregate credit crunch hits the economy. Thus our model produces a small negative tangibility discount by assumption, which is at odds with the data. Further differences regarding the effect of different asset tangibility is therefore required to improve the fit with the data. The regression coefficients with respect to recessions and credit crunches in the tangibility discount regression are well estimated, which means that these adverse macroeconomic events have a stronger effect on single-segment firms operating in the low tangibility industry in the model as well.

Broadly speaking the model is able to replicate first moments as well as the dynamics of firm valuations, both in the cross-section and in the time series. This will allow us to use this baseline economy as a laboratory to explore and quantify the various economic channels at work.

5.2   Dynamics of Diversification and Refocusing

Using simulations, this section describes firms' decision to diversify or refocus. As shown in the optimization problem of the firm, firm's decision on optimal organizational form is determined jointly with other variables such as investment, debt, and dividend policies. The transition dynamics of these variables can also be studied surrounding diversification and refocusing events using simulations.

Decision to Diversify or Refocus. Simulated data shows that the probability of becoming a conglomerate increases as the productivity of operating in the other industry is high. Once a single-segment firm has installed enough capital and its marginal productivity is low enough, installing capital in another division becomes attractive and diversification is more likely.

Conversely, conglomerates are more likely to refocus and shed the division with relatively low productivity. This is due to the presence of a fixed cost of operating. When this fixed cost is high relative to current profits of a given division, it may be valuable for the conglomerate to shut it down and not incur a stream of negative cash flows.

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Transition Dynamics. To illustrate the transition dynamics, we use simulated data to construct a "typical" diversification and refocusing. Figures IV and V show sector productivity, physical capital, profitability, investment rate, labor, leverage, dividend payout rate, and Tobin's q surrounding firm diversification and refocusing, which happens at time 0.

Figure IV shows that firms choose to diversify as productivity in the other sector surpasses that of the current sector of operation. Upon diversification, investment rates spike up and remain high for a few periods as firms invest aggressively in the new productive sector. Firms also increase labor accordingly to complement a higher capital stock. These new installments of capital are financed by increasing leverage as well as issuing equity. Figure IV also shows that Tobin's q steadily decreases after diversification. As conglomerates grow, their marginal productivity of capital slowly decreases until they reach steady state. The absence of growth options at that point leads to a lower Tobin's q, compared to a fast growing single-segment firm. This dynamic of firm value upon diversification is consistent with empirical results documented by Hyland and Diltz (2002). Our model shows that despite the decrease in firm value, diversification is consistent with the optimal firm decision as firms face lower productivity in their current sectors and expand into productive ones.

Figure V shows that conglomerates choose to refocus when one of their divisions become significantly unproductive. By selling off a division, firms use the funds to reduce leverage and distribute dividends. Notice that Tobin's q increases upon refocusing as capital is being allocated more efficiently. That means that a conglomerate has the option to sell a division, reallocate capital, reduce leverage, and thus become a less financially constrained single-segment firm. These results are consistent with the empirical evidence documented by Ahn and Denis (2004) and Dittmar and Shivdasani (2003) that both firm value and investment efficiency increase immediately upon refocusing. In our model, it is not the organizational structure that improves firm value and investment efficiency of refocused firms, but rather it is the productivity shocks that drive organizational choice and capital reallocation decisions, which subsequently increase firm value.

5.3 Recession and Credit Crunch Dynamics

We can study the impact of adverse aggregate shocks on the economy by using simulations. We construct a panel dataset and feed in a specific time path for the aggregate shocks. We can generate a 2-period recession by setting the aggregate productivity shock z_a to its lowest value at times 0 and 1, and at steady state otherwise. Similarly, we can generate a 2-period credit crunch by setting the financial shock to its lowest value ξ_L at times 0 and 1, and at the high value ξ_H otherwise. We can then observe how the economy responds to a crisis as well as how it recovers. The diversification discount is connected to the response of single-segments versus conglomerates during recessions and credit crunches. Therefore, this section builds intuition toward understanding the dynamics of the diversification discount.

Effect of a recession. Figure VI shows the simulation results for single-segment firms in sector 1 (plotted with dotted lines), single-segment firms in sector 2 (plotted with dashed lines), and conglomerates (plotted with solid lines). Productivity decreases during a recession, thus both profits and investment decrease. The lower need for funds leave leverage and dividend policy roughly unchanged for all firms. However, as single-segments are more productive and faster growing firms in the economy (as can be seen by the high investment rates), a decline in aggregate productivity has a larger adverse impact on firm values. Tobin's q of single-segment firms decreases by 0.06 while that of conglomerates decreases by 0.04, resulting in a mild 0.02 decrease in the diversification discount. The discount quickly recovers when the recession ends, as this effect is mostly driven by temporarily low profits.

Effect of a credit crunch. A credit crunch effectively tightens the enforcement constraint, which can be relaxed by either decreasing intraperiod loan l or debt b'. In order to lower its intraperiod loan l, a firm has to reduce output F by decreasing labor n. However, this will greatly reduce current profits π and tighten the budget constraint. Reducing debt b' will also tighten the budget constraint. In turn, firms can lower investment and issue equity in order to increase the sources of funds. However, lowering investment could lead to suboptimal

capital allocation and issuing equity could prove very costly. The simulation results show that firms respond to a credit shock by adjusting all of these margins. In other words, firms equate the the marginal benefits of investment and labor to the marginal costs of external financing.

Figure VII shows the simulation results for single-segment firms in sector 1 (plotted with dotted lines), single-segment firms in sector 2 (plotted with dashed lines), and conglomerates (plotted with solid lines). Although the responses of single-segments and conglomerates are qualitatively similar, they are quantitatively very different.

In response to a credit crunch, single-segment firms in sector 1 reduce their leverage by 13% and profits by 5%. In turn, they raise their sources of funds by issuing 10% more equity and reducing investment by 15%. The financial costs of extra equity issuance and the opportunity cost of forgone investment of a fast growing firm leads to a reduction in value, as shown by a 0.12 decrease in Tobin's q.

Single-segment firms in sector 1 face a 54% reduction in the value of their collateral, whereas single-segment firms in sector 2 face a much deeper 79% reduction. As a result, single-segments in sector 2 reduce their leverage by 6% and profits by 16%. In turn, they issue 2% more equity and curb investment by 20%. The combination of large reductions in investment rates and profits –due to a large reduction in collateral value– and the high marginal productivity of capital –due to the high entry rate of young firms in the economy– is extremely costly for single-segments in sector 2, hence generating a large 0.3 drop in their Tobin's q.

Conglomerates pool assets from their divisions to use as collateral, thus the reduction in the value of collateral is a convex combination of the credit crunches faced by single-segments in sector 1 and sector 2. Thus conglomerates face a credit tightening similar in magnitude as its counterpart as single-segment firms. In addition, conglomerates are not as fast growing as single-segments, therefore a decrease in investment due to a credit crunch is less costly. Finally, cash flow pooling gives conglomerates an advantage in reallocating

resources efficiently. Overall, a credit crunch is expected to have a lower quantitative impact on conglomerates' valuation in comparison to single-segments. Figure VII shows that conglomerates reduce leverage by 15% and profits by 8%, and offset these by issuing 7% more equity and reducing investment by 10%. These mild responses only have a small impact on value, as shown by the 0.1 decrease in Tobin's q.

These dynamics translate into a substantial 0.09 decrease in the diversification discount, i.e., a third of its normal time level. Similarly to a recession, a credit crunch only has a temporary effect on the diversification discount, as firm values quickly recover once firms can expand their balance sheet as credit becomes available.

5.4   Sensitivity Analysis

This section analyzes the sensitivity of the simulated moments to the estimated parameters, which determines our structural identification. Table V reports the simulated moments for different values of the model parameters in Θ. For each of the estimated parameters, we consider two values equidistant from the baseline estimation in either direction. For f and $\bar{\xi}$, we choose a 5% window, and for a_1, a_2, Δ, θ, and ω, we choose a 25% window. Our discussion focuses on the key effect of each of parameters, quantifying the difference in various moments between the lower value and higher value of each parameter.

Production cost f. An increase in the fixed costs of production drastically lowers the percentage of conglomerates in the economy, as conglomerates shed divisions given the higher cost of operation. Higher operating cost leads to a decrease in leverage and an increase in default, as firms are effectively less productive. When default risk is high, so is the risk sharing benefit of conglomerates and thus raises the diversification discount. The discount even turns into a premium in the case where f is the highest.

The regression coefficients β_{crunch}^{DD} and $\beta_{recession}^{DD}$ decrease in magnitude with f. This indicates that conglomerates do not overperform single-segments during bad times by as much

when operating costs are high. As expected, rising operating costs hamper a conglomerate's ability to make better use of its financing advantage.

Positive investment adjustment costs a_1. An increase in capital adjustment costs is value reducing. Because single-segments are more productive firms, they need to invest at a high rate. Higher adjustment costs thus limit their growth, and as a result, leverage, investment and dividends are reduced. Slower growth leads to lower Tobin's q for single-segments. In contrast, as conglomerates are slower-growing and less financially constrained, higher adjustment costs of capital do not have as much of an effect on their leverage, investment, and therefore their Tobin's q.

The diversification discount decreases with a_1 and it is mostly due to lower valuation of single-segment firms. Similarly, during a credit crunch, the discount shrinks due to poorer performance of single-segment firms as higher adjustment costs make recovery in investment slower.

Negative investment adjustment costs a_2. In contrast, increasing negative capital adjustment costs has little effect on firms as they do not disinvest very often. The impact on the diversification discount is therefore extremely small.

Financing shock $\bar{\xi}$. The value of collateral in the intraperiod loan market increases as the financing shock parameter $\bar{\xi}$ rises. Consequently, leverage increases for all firms. This expansion of credit leads to an increase in the investment rate, which is a slight 1.5% for conglomerates and a dramatic 11% for single-segments.

The extensive margin is also affected: single-segment firms diversify much faster as they see an increase in their transition rate, thus leading to an economy with more conglomerates overall. Both of these results arise from an expansion of credit due to the collateral channel.

Credit crunch Δ. The size of the credit contraction is given by the credit crunch parameter Δ. As the crunch gets deeper, firms insure against it by reducing leverage, about

6% on average. In addition, single-segment firms reduce issuance of equity and investment, to further insure against a greater tightening of credit. A deeper credit crunch generates precautionary motives that are greater for single-segments because they are limited in their ability to insure against a credit crunch unlike conglomerates that can pool collateral across divisions. This effect is reflected by a decrease in the diversification discount.

Intermediate credit crunch θ**.** The intermediate credit crunch parameter θ has a small effect on firm policies. A deeper intermediate credit crunch leads to tighter credit in the economy overall. Leverage is reduced slightly and investment and dividend policies are virtually unchanged. Similar to an increase in the size of the credit crunch Δ, an increase in θ reduces the diversification discount, but the effect is quantitatively smaller.

Differential credit crunch impact ω**.** The differential credit crunch impact parameter ω controls the strength of the tangibility channel. Increasing this parameter leads to a deeper credit tightening for the low asset tangibility firms.

Because single-segments are the most productive firms and have limited financial pooling, they are the most affected and have to reduce leverage, which in turns leads to a decrease in investment. The ability to pool cash flows and collateral gives conglomerates financial flexibility, thus their valuation does not suffer as much when ω rises. As a result, Tobin's q for single-segments decreases by more than for conglomerates, thus reducing the diversification discount.

5.5 Counterfactual Experiments

A structural model is particularly useful to evaluate the strength of the various channels as self-selection can be cleanly separated using counterfactual experiments. Understanding these channels is important to uncover what is critical to our results as well as to quantify the value of organizational structure flexibility and its components. All the results are reported in Table VI.

Effect of asset tangibility. The effect of asset tangibility is explored by solving a different version of the baseline model, in which sector 2 has similar asset tangibility as sector 1, i.e., ω is set to 1. In addition, the mix of new firm entry in this economy is set to half and half between the two sectors, thus sectors are identical in this specification. The results are given in the second column of Table VI.

The symmetry of asset tangibility can be diagnosed by the regression coefficients in the tangibility discount regression. The $CRUNCH$ and $RECESSION$ coefficients are starkly reduced and economically insignificant, which means that credit crunches and recessions have no differential effect on single-segments operating in sector 2.

Due to an increase in collateral value during credit crunches, single-segment firms in sector 2 expand their balance sheet by increasing leverage by 1%, equity issuance by 2%, and investment by 1.5%. Such expansion of the balance-sheet leads to a 0.26 increase in Tobin's q.

Conglomerates also increase their leverage –by 3%– as the collateral value of their asset in sector 2 is higher. However they do not invest more. It is not surprising that single-segments alone increase investment as they are the most productive and most financially constrained firms in the economy. Overall conglomerates see a 0.05 increase in their Tobin's q.

The diversification discount almost doubles, while its sensitivity to aggregate shocks is slightly reduced. Thus the impact of aggregate shocks is reduced by more than half in percentage terms. Therefore the ability of conglomerates to pool collateral is less valuable –on average and in bad aggregate states– when all sectors in the economy have similar asset tangibility.

Effect of new firm entry. The effect of new firm entry can be analyzed by preventing new firms from entering into the economy. This counterfactual experiment can help us isolate the effect of young very productive single-segment firms. The results are given in the third column of Table VI.

Without new firm entry, the stationary distribution has a lot fewer small fast growing

firms, which yields a much lower demand for investment. In other words, single-segment firms are more mature and experience slower growth, relative to the baseline. As a consequence, the demand for external financing is reduced commensurately. Single-segments experience a large 20.5% drop in investment, leading to a reduction of 7% in leverage and 15% in equity issuance. In contrast, conglomerates face a mild 3% drop in investment, along with a reduction of 3% in leverage and 2.5% in equity issuance.

This reduction in productivity of single-segments relative to conglomerates translates into a lower relative performance, thus reducing the diversification discount. There is an additional selection effect that increases the discount during a credit crunch. Most of the single-segment firms operate in sector 1, given that refocusing in sector 2 is less advantageous due to worse performances during a credit crunch. This selection effect leads to a better performance for single-segments (as they are mostly operating in sector 1) compared to conglomerates during a credit crunch (as they have asset in place in sector 2). Therefore, the absence of new firm entry generates counterfactual results compared to the data.

Value of organizational structure flexibility. The value of organizational structure flexibility can be evaluated by comparing the baseline economy to a restricted economy where firms are restricted to operate as single-segments. The results are given in the fourth column of Table VI.

Without the option to diversify, risk sharing in the economy is limited to using financial policies alone, that is debt and dividend payout. In particular, the lack of diversification prevents single-segment firms to efficiently diversify: (i) idiosyncratic productivity shocks as they cannot pool cash flows, and (ii) financial shocks as they cannot pool assets as collateral. Precautionary motives lead firms to self-insure by reducing leverage by 2% and equity issuance by 7%, compared to the average firm in the baseline economy. Such reduction in external financing leads to slower growth, as investment rates drop by about 9%.

This contraction of the aggregate balance sheet leads to a decrease in Tobin's q from 1.53 in the baseline to 1.37 in the single-segment economy. Therefore, the value of organizational

structure flexibility, that is the ability to dynamically conglomerate and refocus, is estimated to be worth 10.5% of Tobin's q in the baseline economy. Note that this benefit includes the risk sharing achieved on the financing side by pooling cash flows and collateral (as a conglomerate) and the risk sharing achieved on the real side by optimally allocating capital by shedding an unproductive division (when a conglomerate refocuses).

Value of financial pooling. The value of financial pooling can be evaluated by comparing an economy where firms are restricted to be single-segments to an economy where firms are restricted to be conglomerates. The difference between these economies can be interpreted as the "treatment" effect of being a conglomerate versus single-segment. This measure is free of selection as the organizational structure is exogenously fixed in both of these economies. The results are given in the fourth and fifth columns of Table VI.

Conglomerates can achieve better risk sharing from operating in two sectors. They can pool cash flows from separate divisions and allocate funds to the most productive division, hence mitigating idiosyncratic productivity risks. In addition, conglomerates can pool assets from separate divisions in order to pledge collateral for the intraperiod loan. Such financial benefit is a clear advantage over two segments operating separately and is especially valuable to mitigate financial shocks. However, conglomerates face the risk of not allocating capital efficiently as, in this restricted model, they are not allowed to shed an unproductive division and refocus. This could prove costly if productivity of a division is very low and would not warrant paying the fixed cost of operation. The financial pooling benefits allow conglomerates to increase leverage by 4% and equity issuance by 10.5%, compared to the single-segments only economy. Such increase of external financing leads to faster growth, as investment rates rise by about 11%.

This expansion of the aggregate balance sheet leads to an increase in Tobin's q from 1.37 in the single-segments only economy to 1.43 in the conglomerates only economy. Therefore, the value of financial pooling, i.e., randomly pairing two segments and operating as conglomerates, is estimated to be worth 4% of Tobin's q in the baseline economy. Note that this

benefit includes solely the risk sharing achieved on the financing side by pooling cash flows and collateral. Given that refocusing is not allowed in this exercise, conglomerates bear the cost of not allocating capital optimally in some states of the world, i.e., when shedding an unproductive division would be beneficial.

Value of refocusing. The value of refocusing can be extracted by comparing an economy where firms are restricted to be conglomerates to the baseline, where firms can dynamically conglomerate and refocus. Thus we want to compare the first and fifth columns of Table VI.

When removing the option to refocus, conglomerates loose the ability to shed a division. This generates a loss in value, as the conglomerate is forced to pay the fixed cost of operation for an unproductive division.

In the conglomerates only economy, new young conglomerates enter the economy. Similar segments enter the economy in the baseline, but in the form of separate single–segments. The financial pooling benefits of the conglomerate-born firms allow them to grow at a slightly faster pace. Their investment rates are about 2.5% higher than in the baseline economy. This growth is mostly financed by a mild 3.5% increase in equity issuance as leverage is unchanged.

The ability to optimally shed divisions leads to an increase in Tobin's q from 1.43 in the conglomerates only economy to 1.53 in the baseline. Therefore, the value of refocusing is estimated to be 6.5% of Tobin's q in the baseline economy. Note that the sum of the value of refocusing and the value of financial pooling adds up to the value organizational structure flexibility, which is equal to 10.5% of Tobin's q in the baseline economy.

6   Conclusion

This paper proposes a dynamic model of the firm in a two sector economy where each sector has different collateral value of assets and firms choose to diversify or refocus in response to productivity and financial shocks in the economy.

The model is structurally estimated to the data and is able to rationalize the time-series dynamics of the diversification discount. Specifically, the decrease in the discount during recessions and credit crunches are caused by young and fast growing single-segment firms, especially those with low asset tangibility, that experience a larger decrease in value compared to conglomerates due to tighter financial constraints.

Our quantitative results show that the value of organizational flexibility, defined as the ability to dynamically diversify and refocus, accounts for 10.5% of firm value, of which we attribute 38% to financial pooling benefits and 62% to the option to refocus. Such value creation for firms can be attributed to better liquidity management through dynamically adjusting their organizational form.

References

Ahn, Seoungpil, and David Denis, 2004, Internal capital markets and investment policy: Evidence from corporate spinoffs, *Journal of Financial Economics* 71, 489–516.

Almeida, Heitor, and Murillo Campello, 2007, Financial constraints, asset tangibility, and corporate investment, *Review of Financial Studies* 20, 1429–1460.

———, and Dirk Hackbarth, 2011, Liquidity mergers, *Journal of Financial Economics* 102, 526 – 558.

Berger, Philip, and Eli Ofek, 1995, Diversification's effect on firm value, *Journal of Financial Economics* 37, 39 – 65.

Campa, Jose Manuel, and Simi Kedia, 2002, Explaining the diversification discount, *The Journal of Finance* 57, 1731–1762.

Campello, Murillo, and Erasmo Giambona, 2013, Real assets and capital structure, *Journal of Financial and Quantitative Analysis* FirstView, 1–71.

Colak, Gonul, and Toni Whited, 2007, Spin-offs, divestitures, and conglomerate investment, *Review of Financial Studies* 20, 557–595.

Corrado, Carol, and Charles Hulten, 2010, How do you measure a "technological revolution"?, *American Economic Review* 100, 99–104.

———, and Daniel Sichel, 2009, Intangible capital and u.s. economic growth, *Review of Income and Wealth* 55, 661–685.

DeAngelo, Harry, Linda DeAngelo, and Toni M. Whited, 2011, Capital structure dynamics and transitory debt, *Journal of Financial Economics* 99, 235 – 261.

Denis, David, Diane Denis, and Atulya Sarin, 1997, Agency problems, equity ownership, and corporate diversification, *The Journal of Finance* 52, pp. 135–160.

Dimitrov, Valentin, and Sheri Tice, 2006, Corporate diversification and credit constraints: Real effects across the business cycle, *Review of Financial Studies* 19, 1465–1498.

Dittmar, Amy, and Anil Shivdasani, 2003, Divestitures and divisional investment policies, *The Journal of Finance* 58, 2711–2744.

Falato, Antonio, Kadyrzhanova Dalida, and Jae Sim, 2014, Rising intangible capital, shrinking debt capacity, and the us corporate savings glut, *Discussion Paper, Board of Governors of the Federal Reserve System (US)*.

Gomes, Joao, 2001, Financing investment, *The American Economic Review* 91, pp. 1263–1285.

———— , and Dmitry Livdan, 2004, Optimal diversification: Reconciling theory and evidence, *Journal of Finance* 59, 507–535.

Graham, John, Michael Lemmon, and Jack Wolf, 2002, Does corporate diversification destroy value?, *The Journal of Finance* 57, 695–720.

Hall, Bronwyn, 1993, The stock market's valuation of r&d investment during the 1980's, *The American Economic Review* 83, pp. 259–264.

Hann, Rebecca, Ogneva Maria, and Oguzhan Ozbas, 2013, Corporate diversification and the cost of capital, *The Journal of Finance* 68, 1961–1999.

Hennessy, Christopher, and Toni Whited, 2005, Debt dynamics, *The Journal of Finance* 60, 1129–1165.

Hovakimian, Gayane, 2011, Financial constraints and investment efficiency: Internal capital allocation across the business cycle, *Journal of Financial Intermediation* 20, 264–283.

Hyland, David, and David Diltz, 2002, Why firms diversify: An empirical examination, *Financial Management* 31, pp. 51–81.

Inderst, Roman, and Holger Muller, 2003, Internal versus external financing: An optimal contracting approach, *The Journal of Finance* 58, pp. 1033–1062.

Jermann, Urban, and Vincenzo Quadrini, 2012, Macroeconomic effects of financial shocks, *American Economic Review* 102, 238–71.

Jovanovic, Boyan, and Peter Rousseau, 2005, General purpose technologies, in Philippe Aghion, and Steven Durlauf, ed.: *Handbook of Economic Growth*, vol. 1 of *Handbook of Economic Growth* . chap. 18, pp. 1181–1224 (Elsevier).

Kuppuswamy, Venkat, and Belen Villalonga, 2010, Does diversification create value in the presence of external financing constraints? evidence from the 2008 – 2009 financial crisis, *Harvard Business School Finance Working Paper No. 1569546*.

Lamont, Owen, 1997, Cash flow and investment: Evidence from internal capital markets, *The Journal of Finance* 52, pp. 83–109.

——— , and Christopher Polk, 1999, The diversification discount: Cash flows vs. returns, NBER Working Papers 7396 National Bureau of Economic Research, Inc.

Lang, Larry, and Rene Stulz, 1994, Tobin's q, corporate diversification, and firm performance, *Journal of Political Economy* 102, 1248–80.

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

Maksimovic, Vojislav, and Gordon Phillips, 2002, Do conglomerate firms allocate resources inefficiently across industries? theory and evidence, *The Journal of Finance* 57, 721–767.

——— , 2013, Conglomerate firms, internal capital markets, and the theory of the firm, *Annual Review of Financial Economics* 5, 225–244.

Matsusaka, John, 2001, Corporate diversification, value maximization, and organizational capabilities, *The Journal of Business* 74, pp. 409–431.

Matvos, Gregor, and Amit Seru, 2014, Resource allocation within firms and financial market dislocation: Evidence from diversified conglomerates, *Review of Financial Studies*.

Morellec, Erwan, Nikolov Boris, and Norman Schurhoff, 2012, Corporate governance and capital structure dynamics, *The Journal of Finance* 67, 803–848.

Nikolov, Boris, and Toni Whited, 2013, Agency conflicts and cash: Estimates from a structural model, Manuscript, University of Rochester.

Ozbas, Oguzhan, and David Scharfstein, 2010, Evidence on the dark side of internal capital markets, *Review of Financial Studies* 23, 581–599.

Shin, Hyun-Han, and Rene Stulz, 1998, Are internal capital markets efficient?, *The Quarterly Journal of Economics* 113, 531–552.

Villalonga, Belen, 2004a, Diversification discount or premium? new evidence from the business information tracking series, *The Journal of Finance* 59, 479–506.

———, 2004b, Does diversification cause the diversification discount?, *Financial Management* 33.

Whited, Toni, 2001, Is it inefficient investment that causes the diversification discount?, *The Journal of Finance* 56, 1667–1691.

———, 2006, External finance constraints and the intertemporal pattern of intermittent investment, *Journal of Financial Economics* 81, 467 – 502.

Yan, An, 2006, Value of conglomerates and capital market conditions, *Financial Management* 35, 5–30.

Yang, Liu, 2008, The real determinants of asset sales, *The Journal of Finance* 63, 2231–2262.

Zhang, Lu, 2005, The value premium, *The Journal of Finance* 60, 67–103.

CROSS-SECTIONAL REGRESSION RESULTS

	Tobin's q		
constant	1.839	1.891	1.911
	(0.003)	(0.003)	(0.003)
$TANG$	-0.722	-0.709	-0.784
	(0.008)	(0.008)	(0.009)
$CRUNCH$		-0.192	-0.281
		(0.004)	(0.007)
$CRUNCH * TANG$			0.298
			(0.019)
$RECESSION$		-0.107	-0.131
		(0.006)	(0.009)
$RECESSION * TANG$			0.102
			(0.025)
R^2	0.033	0.044	0.045
Observations	248,230	248,230	248,230

NOTE: The dependent variable is Tobin's q. The sample is restricted to single-segment firms. The frequency of data is quarterly. $TANG$ is the ratio of firm $PP\&E$ to its total assets. $CRUNCH$ is a dummy variable that is equal to 1 if the TED spread is greater than 1 percent. $RECESSION$ is an indicator for a recession quarter as identified by the NBER. The standard errors are given in parenthesis.

	Diversification Discount		
constant	0.253	0.276	0.279
	(0.025)	(0.022)	(0.023)
$CRUNCH$		-0.111	-0.105
		(0.029)	(0.029)
$RECESSION$	-0.073		-0.044
	(0.028)		(0.027)
R^2	0.039	0.210	0.222
Observations	135	135	135

NOTE: The dependent variable is diversification discount, defined as the difference between the mean Tobin's q of conglomerate and single-segment firms. $CRUNCH$ is defined as the quarters where TED spreads are above 1%. The standard errors are given in parenthesis and computed using Newey-West with 10 lags.

Panel A. Exogenously-fixed parameters

Preference	β	0.976	Subjective discount rate
Institutional	τ	0.300	Average Tax Rate
	χ	0.900	Recovery rate in event of bankruptcy
	L_1	0.150	Linear Cost of Issuing Equity
	L_2	1.500	Quadratic Cost of Issuing Equity
	ϕ_B	0.050	Linear Cost of Selling a Segment
	ϕ_S	0.050	Linear Cost of Buying a Segment
	W	0.500	Wage Rate
Technology	α_k	0.300	Returns to Scale in Capital
	α_n	0.600	Returns to Scale in Labor
	δ	0.070	Depreciation Rate

Panel B. Estimated parameters

Technology	f	2.530 (0.180)	Fixed Production Cost
	a_1	0.150 (0.039)	Positive Capital Adjustment Cost
	a_2	0.450 (0.679)	Negative Capital Adjustment Cost
Credit Shock	$\bar{\xi}$	0.180 (0.022)	Financing Shock
	Δ	0.540 (0.212)	Reduction in Collateral Value in a Crunch
	θ	0.287 (0.232)	Intermediate Credit Crunch
	ω	2.000 (0.573)	Differential Impact on Low Tangibility Capital

TABLE IV:

TARGET MOMENTS FOR THE ESTIMATION AND MODEL OUTPUTS

	Actual moments	Simulated moments	$t-$stats
Panel A. Targeted Moments			
All Firms:			
1. Fraction of conglomerates, %	49.7	50.9	(-0.48)
Single-segments:			
2. Debt/Assets	0.232	0.343	(-12.57)
3. Tobin's q	1.596	1.659	(-1.13)
Conglomerates:			
4. Debt/Assets	0.270	0.263	(1.07)
5. Tobin's q	1.352	1.394	(-1.10)
Tangibility Discount regression:			
6. β_0^{TD}	0.294	-0.026	(7.84)
7. β_{crunch}^{TD}	-0.199	-0.161	(-0.84)
8. $\beta_{recession}^{TD}$	-0.021	-0.048	(0.63)
Diversification Discount regression:			
9. β_0^{DD}	0.279	0.269	(0.45)
10. β_{crunch}^{DD}	-0.105	-0.082	(-0.80)
11. $\beta_{recession}^{DD}$	-0.044	-0.057	(0.46)
Panel B. Additional Moments			
Single-segments:			
Cashflow/Assets		0.450	
Capital expenditure/Assets		0.333	
Dividend/Assets		-0.181	
Conglomerates:			
Cashflow/Assets		0.406	
Capital expenditure/Assets		0.109	
Dividend/Assets		-0.011	
All Firms:			
Standard deviation Tobin's q		0.382	
Default rate, %		0.2	
Transition rate from single to conglomerate, %		5.3	
Transition rate from conglomerate to single, %		5.2	

Table V:
Sensitivity Analysis

	(1) Baseline	(2) f	(3) f	(4) a_1	(5) a_1	(6) a_2	(7) a_2	(8) $\bar{\xi}$	(9) $\bar{\xi}$	(10) Δ	(11) Δ	(12) θ	(13) θ	(14) ω	(15) ω
		2.403	2.656	0.112	0.188	0.338	0.563	0.171	0.189	0.405	0.675	0.215	0.359	1.500	2.500
Panel A. Targeted Moments															
All Firms:															
1. Fraction of conglomerates, %	50.9	55.5	47.5	51.2	50.2	50.7	51.1	49.9	52.5	56.1	44.9	51.2	50.6	52.0	49.9
Single-segments:															
2. Debt/Assets	0.343	0.350	0.337	0.351	0.334	0.344	0.343	0.320	0.364	0.370	0.314	0.350	0.336	0.350	0.341
3. Tobin's q	1.659	1.893	1.498	1.715	1.616	1.672	1.648	1.597	1.722	1.946	1.431	1.677	1.635	1.756	1.607
Conglomerates:															
4. Debt/Assets	0.263	0.268	0.256	0.264	0.263	0.263	0.264	0.233	0.294	0.304	0.230	0.279	0.247	0.278	0.256
5. Tobin's q	1.394	1.456	1.336	1.403	1.383	1.398	1.390	1.380	1.407	1.455	1.304	1.398	1.388	1.415	1.376
Tangibility Discount Regression:															
6. β_0^{TD}	-0.026	0.089	-0.160	0.020	-0.005	-0.021	-0.032	-0.075	0.021	0.078	-0.334	-0.012	-0.047	0.033	-0.107
7. β_{crunch}^{TD}	-0.161	-0.147	-0.166	-0.151	-0.231	-0.159	-0.161	-0.163	-0.155	-0.070	-0.135	-0.152	-0.166	-0.080	-0.244
8. $\beta_{recession}^{TD}$	-0.048	-0.055	-0.046	-0.053	-0.033	-0.047	-0.049	-0.050	-0.052	-0.028	-0.049	-0.046	-0.054	-0.041	-0.068
Div. Discount Regression:															
9. β_0^{DD}	0.269	0.483	0.096	0.333	0.257	0.282	0.258	0.198	0.336	0.537	0.004	0.290	0.244	0.363	0.218
10. β_{crunch}^{DD}	-0.082	-0.096	-0.081	-0.082	-0.136	-0.081	-0.083	-0.087	-0.091	-0.065	-0.060	-0.085	-0.084	-0.071	-0.084
11. $\beta_{recession}^{DD}$	-0.057	-0.076	-0.052	-0.061	-0.043	-0.058	-0.055	-0.055	-0.064	-0.078	-0.049	-0.060	-0.057	-0.062	-0.055
Panel B. Additional Moments															
Single-segments:															
Cashflow/Assets	0.450	0.450	0.452	0.443	0.457	0.449	0.450	0.445	0.455	0.451	0.452	0.450	0.449	0.449	0.451
Capital expenditure/Assets	0.333	0.349	0.330	0.344	0.314	0.334	0.333	0.331	0.339	0.358	0.311	0.333	0.332	0.341	0.318
Dividend/Assets	-0.181	-0.195	-0.175	-0.169	-0.188	-0.182	-0.181	-0.186	-0.180	-0.199	-0.156	-0.179	-0.182	-0.187	-0.171
Conglomerates:															
Cashflow/Assets	0.406	0.406	0.407	0.405	0.407	0.407	0.406	0.407	0.406	0.406	0.405	0.407	0.406	0.406	0.406
Capital expenditure/Assets	0.109	0.111	0.106	0.110	0.108	0.109	0.109	0.108	0.111	0.110	0.102	0.110	0.109	0.109	0.108
Dividend/Assets	-0.011	-0.012	-0.005	-0.009	-0.012	-0.010	-0.011	-0.010	-0.012	-0.010	-0.004	-0.011	-0.011	-0.010	-0.012
All Firms:															
Standard deviation Tobin's q	0.382	0.569	0.271	0.451	0.335	0.393	0.374	0.322	0.449	0.626	0.244	0.400	0.362	0.458	0.350
Default rate, %	0.2	0.0	0.4	0.1	0.3	0.2	0.2	0.3	0.1	0.0	0.6	0.1	0.2	0.1	0.3
Transition single to cong, %	5.3	6.0	4.5	5.4	5.4	5.3	5.3	5.1	5.6	6.0	4.3	5.4	5.3	5.4	5.6
Transition cong to single, %	5.2	4.4	5.1	5.3	5.8	5.3	5.2	5.2	5.1	4.2	6.3	5.3	5.3	4.9	6.3

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TABLE VI:
COUNTERFACTUAL EXPERIMENTS

|	(1) Baseline	(2) Equal tang	(3) No entry	(4) Single only	(5) Cong only
			Panel A. Targeted Moments		
All Firms:					
1. Fraction of conglomerates, %	50.9	54.2	80.7	0.0	100.0
Single-segments:					
2. Debt/Assets	0.343	0.354	0.274	0.285	
3. Tobin's q	1.659	1.923	1.486	1.366	
Conglomerates:					
4. Debt/Assets	0.263	0.296	0.233		0.303
5. Tobin's q	1.394	1.449	1.325		1.430
Tangibility Discount Regression:					
6. β_0^{TD}	-0.026	-0.001	0.005	-0.232	
7. β_{crunch}^{TD}	-0.161	0.012	-0.042	0.005	
8. $\beta_{recession}^{TD}$	-0.048	0.006	0.012	-0.004	
Div. Discount Regression:					
9. β_0^{DD}	0.269	0.490	0.096		
10. β_{crunch}^{DD}	-0.082	-0.065	0.024		
11. $\beta_{recession}^{DD}$	-0.057	-0.050	-0.006		
			Panel B. Additional Moments		
Single-segments:					
Cashflow/Assets	0.450	0.452	0.435	0.453	
Capital expenditure/Assets	0.333	0.348	0.126	0.135	
Dividend/Assets	-0.181	-0.202	-0.033	-0.026	
Conglomerates:					
Cashflow/Assets	0.406	0.410	0.384		0.445
Capital expenditure/Assets	0.109	0.102	0.079		0.247
Dividend/Assets	-0.011	-0.012	0.016		-0.131
All Firms:					
Standard deviation Tobin's q	0.382	0.604	0.165	0.235	0.238
Default rate, %	0.2	0.0	0.2	0.4	0.3
Transition single to cong, %	5.3	5.0	3.9	0.0	
Transition cong to single, %	5.2	3.0	1.1		0.0
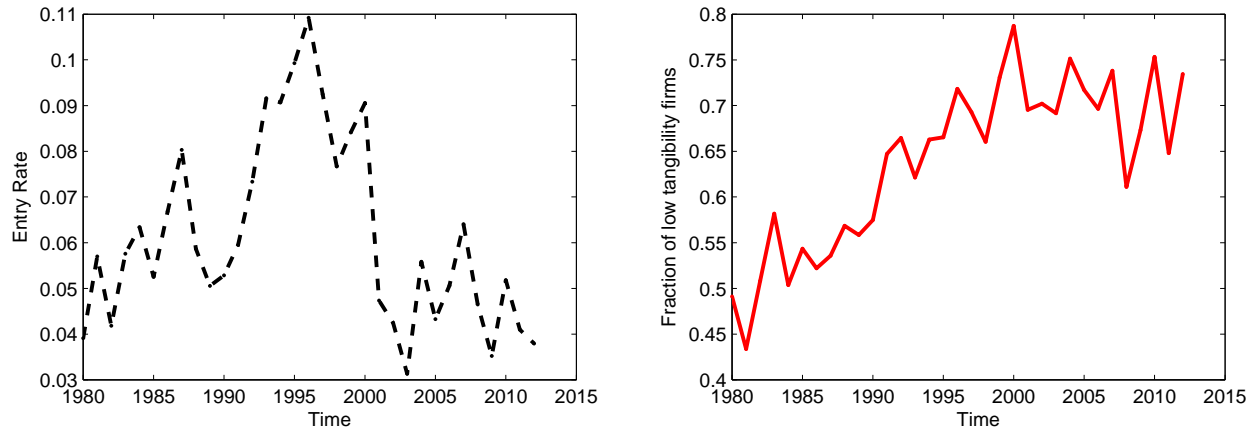
FIGURE I: FIRM ENTRY

NOTE: The left panel shows the entry rate. The right panel shows the fraction of new firms that have a tangibility ratio lower than the sample median.
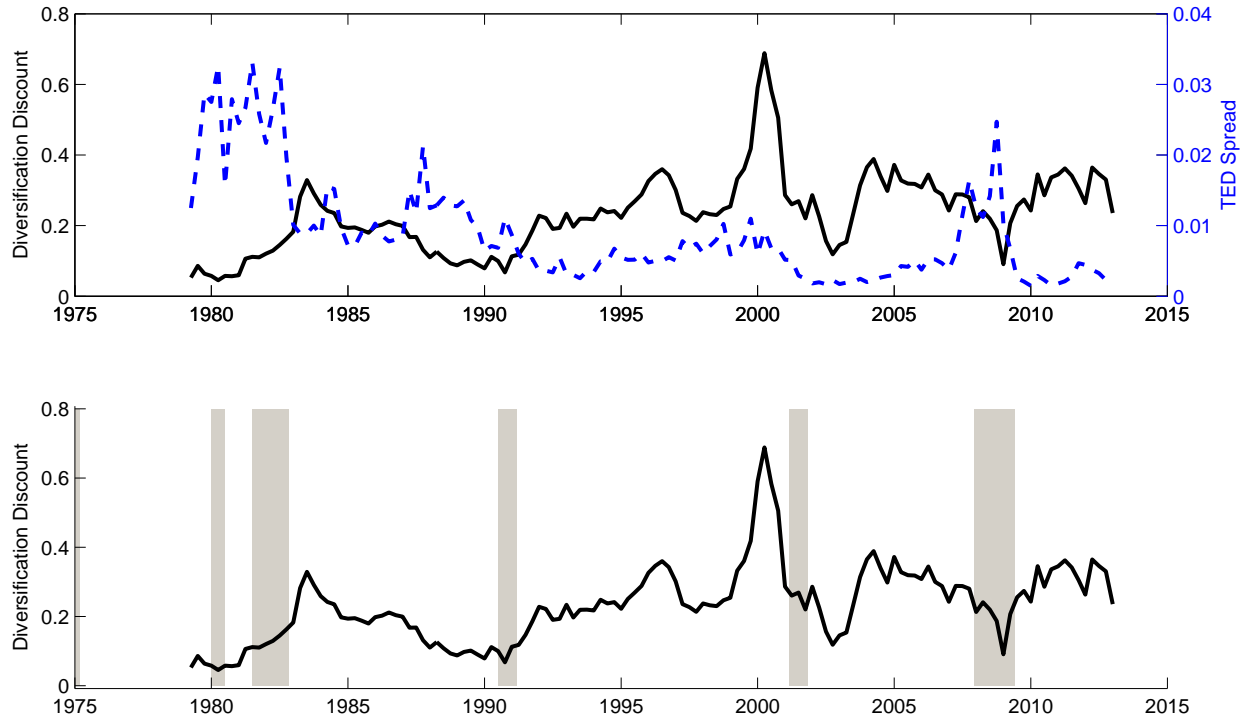
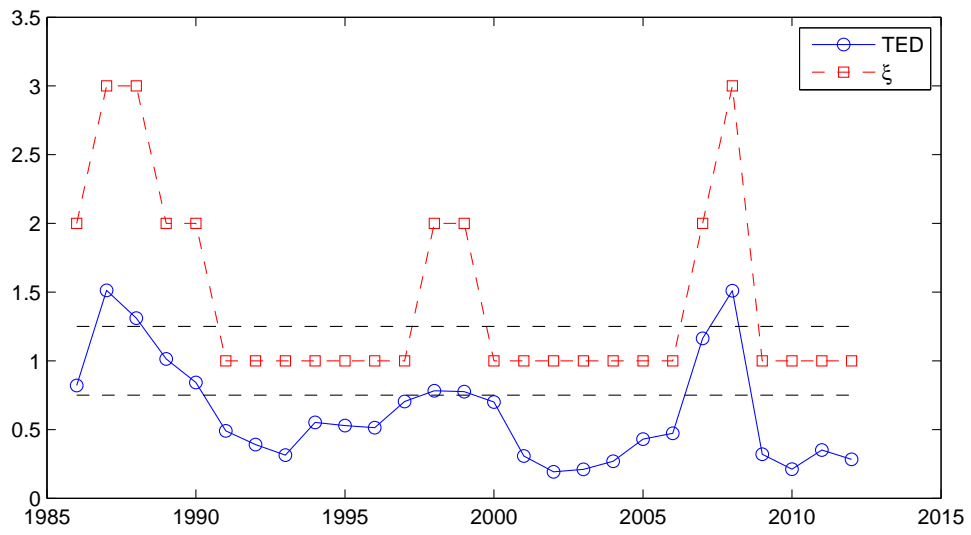FIGURE II: DIVERSIFICATION DISCOUNT AND AGGREGATE RISKS
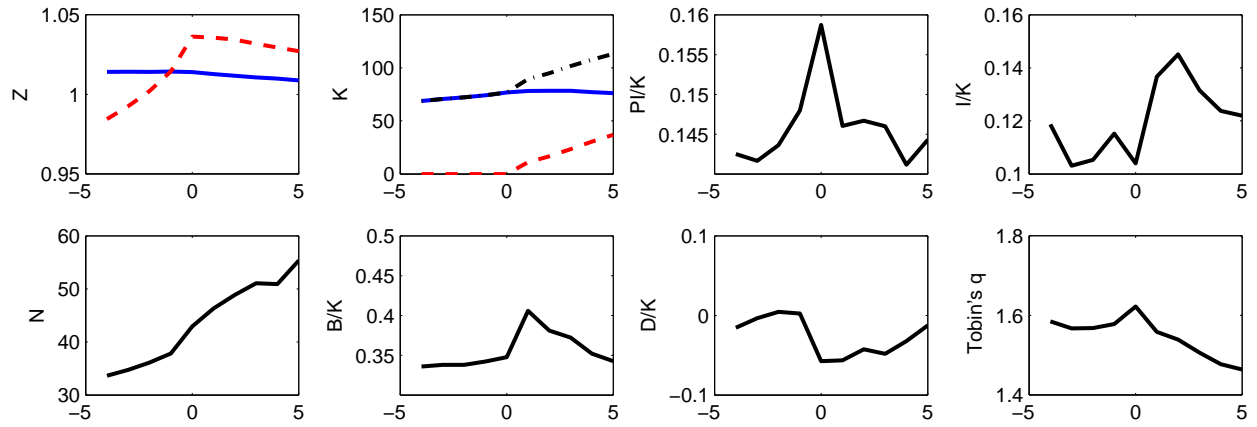
FIGURE III: TED SPREAD AND FINANCIAL SHOCK GRID

FIGURE IV: TRANSITION DYNAMICS: SINGLE-SEGMENT TO CONGLOMERATE

NOTE: The top row shows the dynamics of productivity, physical capital, profitability, and investment rate. The bottom row shows labor, leverage, dividend payout, and Tobin's q.
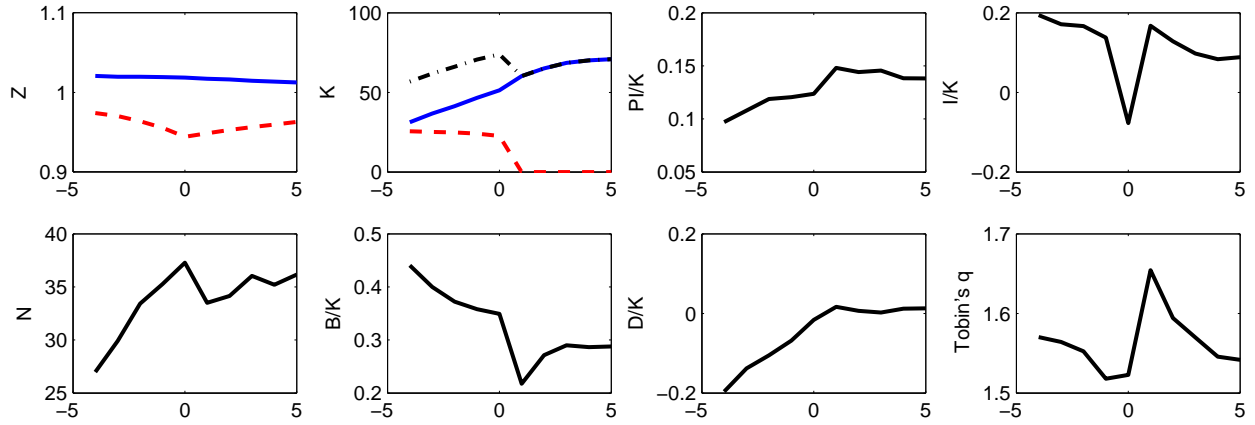
FIGURE V: TRANSITION DYNAMICS: CONGLOMERATE TO SINGLE-SEGMENT

NOTE: The top row shows the dynamics of productivity, physical capital, profitability, and investment rate. The bottom row shows labor, leverage, dividend payout, and Tobin's q.
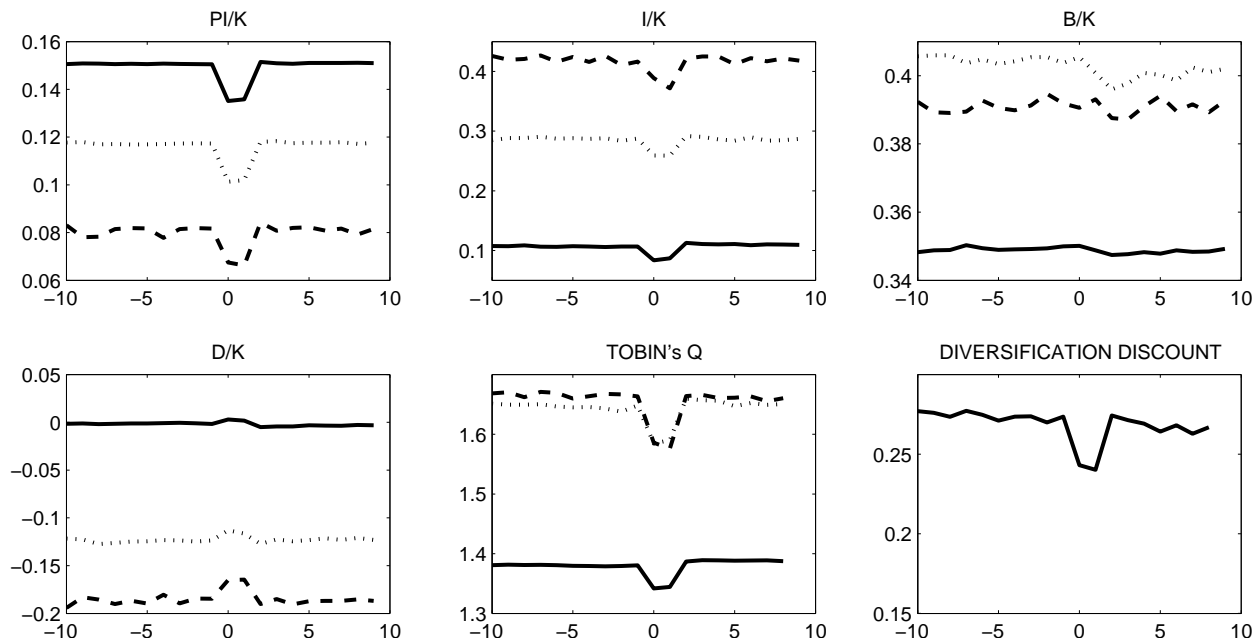
FIGURE VI: SIMULATIONS RESULTS: TYPICAL RECESSION

NOTE: The top row shows the dynamics of profitability, investment rate, and leverage. The bottom row shows dividend payout and Tobin's *q*. Single-segment firms in sector 1 are plotted with dotted lines (...), single-segment firms in sector 2 are plotted with dashed lines (- -), and conglomerates are plotted with solid lines (—). The last panel shows the diversification discount.
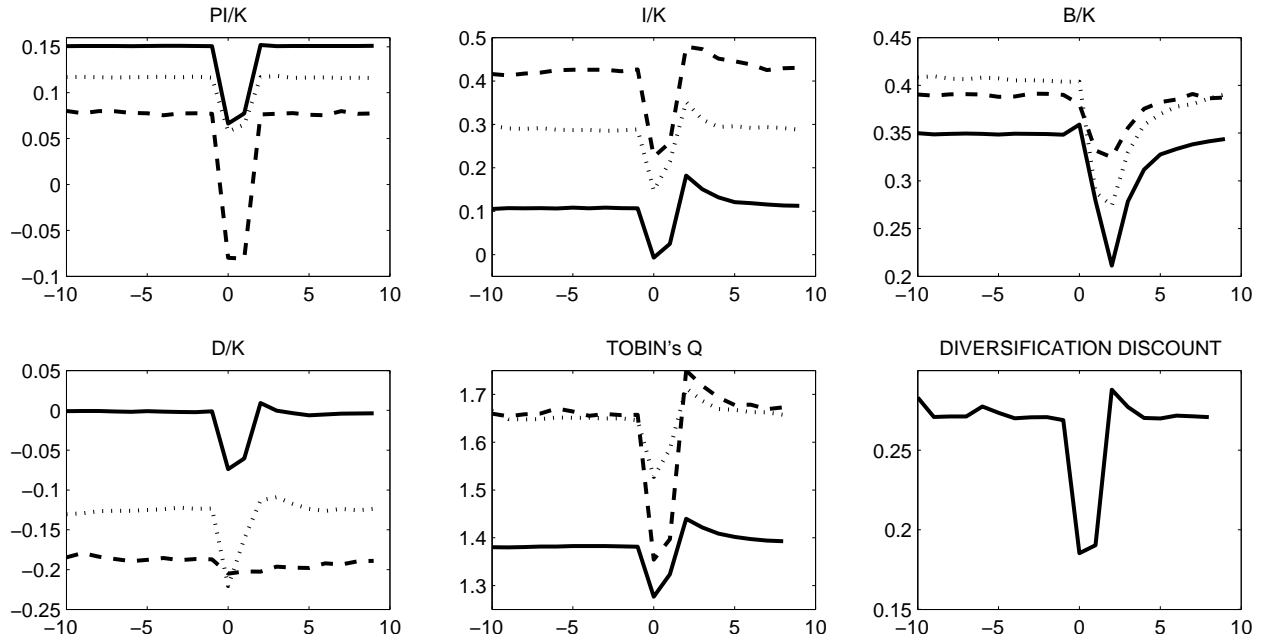
FIGURE VII: SIMULATIONS RESULTS: TYPICAL CREDIT CRUNCH

NOTE: The top row shows the dynamics of profitability, investment rate, and leverage. The bottom row shows dividend payout and Tobin's *q*. Single-segment firms in sector 1 are plotted with dotted lines (...), single-segment firms in sector 2 are plotted with dashed lines (- -), and conglomerates are plotted with solid lines (—). The last panel shows the diversification discount.